# Montessori Voices

# Guided by Nature

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# What Is NAMTA?

The North American Montessori Teachers' Association provides a medium of study, interpretation, and improvement of Montessori education. These purposes are accomplished through a widespread communication system of periodicals, an audio visual library, workshops, and research. NAMTA endeavors to create real services designed for the teacher and the school.

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Courtesy of Chris Trostel, Montessori Borealis Public, Juneau, Alaska

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Harvest, Courtesy of Mi Casita Montessori, Quetzaltenango, Guatemala

Montessori Voices

# Guided by Nature

## Special Issue

**Part III**
**Montessori Pedagogy and Place: Joining Humanity .....173**

Maria Montessori, India, around 1940

Dedicated to
Debra Hershey Guren
and
Orcillia Oppenheimer
for their ongoing support of
Montessori education and
the natural world

Courtyard of the third Casa dei Bambini, Milan, Italy

# Preface: Revelations Then and Now—Guided by Nature

by David Kahn

*One of the most rewarding features of the emerging theory of living systems is the new understanding of evolution it implies. Rather than seeing evolution as the result of random mutations and natural selection, we are beginning to recognize the creative unfolding of life in forms of ever increasing diversity and complexity as an inherent characteristic of all living systems. (Capra)*

The *Guided by Nature* theme for the Portland 2013 Congress reads, "The 2013 International Montessori Congress will allow us to look closer at how Montessori education is guided by children's natural development and how that growth fosters a respectful relationship with the environment." The chorus of voices that you will hear in this publication represents the Montessori legacy of the child and nature as an evolving vision of lifelong learning (early childhood, childhood, and adolescence) that was integral to an evolving pedagogy that is now 106 years old. What is the Montessori book of nature that scrutinizes these two natures: one nature belonging to the developing human and the other nature to the changing natural environment? Maria Montessori discovered the unfolding nature of childhood within the literal framework of a house and a garden. An ordered and prepared environment inside contrasted with a changing, evolving, prepared environment filled with living things on the outside. The children's house fully integrates the two natures of childhood with two surrounding and complementary physical environments, one man-made and the other natural.

Courtesy of Montessori High School at University Circle, Cleveland, Ohio

A child's true nature is first undisclosed, embedded in the innermost parts of the human psyche, not quite definable, obscured by the unconscious. When touched by the natural world, this hidden microcosm of attention, will, imagination, and intelligence tends toward a fiery interest in every part of life, an enthusiasm for the outer world. Montessori called this inner attraction the "love of the environment." The young child is propelled by a powerful desire to touch, feel, smell, see, hear, and to explore the surrounding natural environment. The adult

brings the little one into contact with the natural world first through random exploration aided by human touch as tiny hands hold and turn rocks, fossils, leaves, and insects. Night hikes reveal the starry firmament, the moonlight, and the shadows of the trees. What we see in these earliest childhood encounters with the outdoors is delight, activity, freedom of movement, spontaneous interest, joy, curiosity, and what we hear is a myriad of linguistic expressions beginning with naming everything. Later, there is exploration of causes, definitions, and of philosophy—the "whys and wherefores." Throughout this work, the adult is active, continually inviting more and more intimate connections between the child and nature.

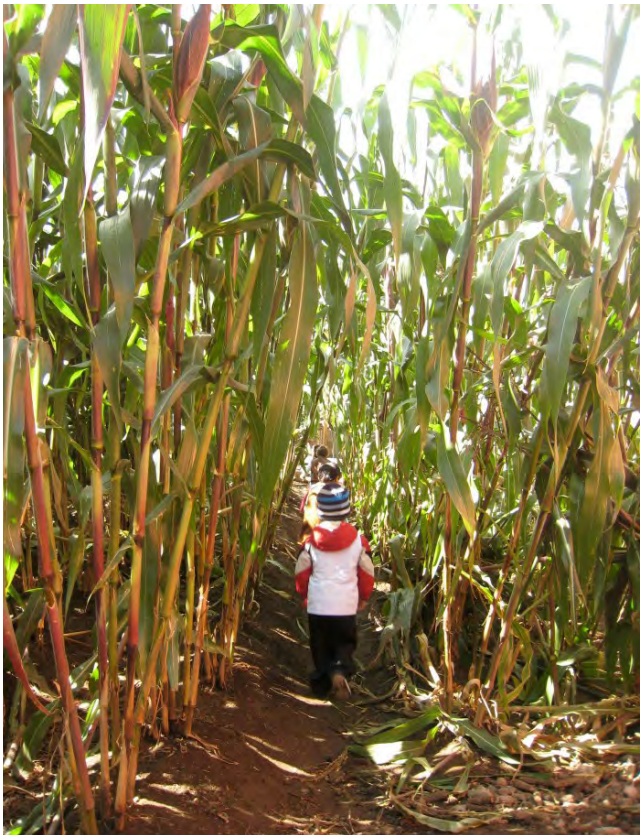
In this journal, Lilli Peller writes that the young child "should have surroundings that he can explore, understand, and use." Optimal learning experiences, which Peller termed "adventures in space" can only take place in a prepared space that is more than just utilitarian. Peller describes a whole "gamut" of sensations, high up in balconies, down below in sand boxes, in water gardens, in tubes for crawling, in high grasses, on clipped lawns, through labyrinths, around low hedges, on teeter totters, and across balancing boards. A century later the conversation has matured and we have before us a story in which nature exposes human growth from eighteen months to eighteen years, revealing that we are organic beings guided by nature from within and from without.

Adolescent work of the last twenty-five years provides insights here. The predictable developmental characteristics of adolescents, aided by living in nature and by living with each other, have underscored for us the fact that the natural world is critical to natural development This insight is more important to the future of humanity now than ever before.

Nothing substantiates the relationship between nature and development more clearly than the adolescent's creative orientation to self-expression and self -renewal through aesthetic experiences of flora, fauna, and farm. There is also the production and exchange process of the farm that is the experience of nature through harvest. Then there is the contrast between nature and the human-built world that promotes in adolescents an understanding driven by their maturing, metacognitive abilities.

Every day, adolescents are confronted by the human predicament on planet Earth. They know that the time available to identify and implement real solutions to the problem of a rapidly disappearing natural world is running out. Adolescents want to contribute to planetary challenges in a big way. They want to be heroes in their own eyes and the eyes of their peers. How are these sentiments and energies to be released?

We need the Montessorians whose work appears in this journal, these environmentalists, philosophers, scientists, and educators to aid us in our search for justice and balance. We need them to guide us as we seek to support the noble contribution that we know can be made by adolescents. These authors present us with a picture of cooperation with civilization complemented by a unified world view of the whole Earth as a living organism. That living organism is fixing to die, and this looming disaster is of our own making. The nature of the human being must be studied alongside the environment because both the natures



Courtesy of Mi Casita Montessori, Quetzaltenango, Guatemala

of the human personality and of our planetary system are playing out our destiny.

This journal gathers a distinguished group of natural historians from the past hundred years and places them on the stage as actors in the drama of an unfolding Montessori pedagogy. These philosophers and scientists of nature and history lend us retroactive lenses that show us early childhood, childhood and adolescence, focusing on critical aspects of these stages of development. They recall for us the importance of understanding the interconnectedness of life on Earth now, in the past, and in the future. Their message is one of total unity for self and world.

Montessori writes,

> This is the great task of education, to make the child conscious of the reality and depth of human unity. This conviction, however, cannot be brought about by a simple illustration. It is not enough to say to him: "Look, there is the light!" We must explain, by precise and logical analysis, the origin and the essence of this great human brotherhood. Above all, we must make the [student] understand how extraordinarily moving it is that humans are not united by their interests alone, but that a deeper bond exists at the very root of their brotherhood. ("Human Solidarity in Time and Space")

What then is at the root of the human legacy, which is also the Montessori legacy? The real fundamentals of "guided by nature" are portrayed by something deep and compelling that arouses sentiment and draws the older child and the adolescent into a "preparation for adulthood." What is at work here?

The idea of universal unity as a foundation for work with elementary children is introduced in the *The Kodaikanal Years, 1942-1944,* where we witness a theosophical vision coming out of the hills, pines, and lakes of the countryside, guided by a sampling of children of all ages and stages living under one roof. Here is the birthplace of Cosmic Education. Its visionary impact on the elementary years (ages six-twelve) goes well beyond a mere

Courtesy of Sara Guren © MDP, Hershey Montessori School, Huntsburg, Ohio

Courtesy of The Montessori Elementary DVD © NAMTA 2012 and The Montessori School of Beaverton, Portland, Oregon

intellectual understanding of nature and ecology. Cosmic Education examines the multiple levels of interdependency that exist in nature, and how they should shape interdisciplinary studies. The Great Stories (*The Origin of the Universe*, *The Coming of Life*, *The Coming of Humans*, *The Story of Language*, *The Story of Numbers* and *The Story of the Great River)* are narrative lessons with indirect didactic purposes. They arouse interest and they intensify the child's sense of belonging to the planet throughout all of time and space.

In the midst of her sojourn of seven years in India (1939-1946), Maria Montessori lived and worked at Kodaikanal from late 1942 to March, 1944. Her most prominent writings on the elementary came in 1948, summing up the Kodaikanal experience in the books *To Educate the Human Potential* and *From Childhood to Adolescence.* At Kodaikanal, Montessori's thought processes synthesized nature, internationalism, and human development to create a new framework for the "science of peace." *The science of nature is the science of peace*. (*Education and Peace* was published in 1949.)

It is the land, and the adolescent community farming the land, performing the joint processes of doing and thinking, which provides a perfect setting for a last great developmental period that culminates in the emergence of new adults who are prepared to take on the challenges of our time. The land school is Montessori's prepared environment for the adolescent, and it provides a field of action for experiencing the dynamic of human unity. At an adolescent colloquium Margaret Stephenson noted that:

> … For the third plane, the exploration is even wider, encompassing the farm and the community of the rural area. It echoes what the children explored at the second plane: civilization and how it came about. But now the exploration takes place in reality because the adolescents are actually *doing* it. Cooperation with the land, cooperation in commerce, and cooperation in the cultural life of the rural society touch materially the things studied in the second plane and afford the adolescent the opportunity to see his or her place in society. (Pendleton 40)

The Erdkinder concept replays the "adventures in space" of the *Casa dei Bambini*, and it incorporates Montessori's experiences in the hills of Kodaikanal. All of this is translated into elements of the land school: a *house for adolescents*. The *Erdkinder* concept synthesizes approaches intrinsic to the first and second planes of education and it is a design that will connect and re-ignite nature experiences

throughout all of Montessori. The critical function of the natural world is that it provides continuity in the prepared environment at each plane of education; as the child gets older, nature's role takes on a wider scope as a material for development. Nature is the ultimate psychodiscipline—a network of systems that integrates knowledge and transforms the personality at the same time.

At the primary level, the absorbent mind reaches nature through the physical indoor and outdoor space for enriched experience in the Children's House.

At the elementary level, after nature arouses the imagination, classification organizes the child's knowledge, introducing abstract principles that explain natural phenomena. Nature also provides an evolutionary sequence that points to one's place in the world. Real experience in nature is still a fundamental and essential requirement.

At the adolescent level, nature is a collaborator. The adolescent produces in partnership with nature. While cooperating with plants and animals, adolescents also need to cooperate with each other. The *Erdkinder* provides a basis for social life and commerce, and it creates a new kind of social knowledge based on farm experiences during the formative years of twelve to fifteen. In 2003, AMI's pedagogical committee, curators of the Montessori legacy and gatekeepers of Montessori pedagogical practice, observed,

> A plan for this environment has been outlined by Maria Montessori in a pamphlet titled "The Erdkinder and the Functions of the University." In the section dedicated to the Erdkinder, the three pivotal elements included are a farm, a hostel, and a shop. These are the bare bones of an environment which can become rich, versatile, and productive and, as the need arises, may expand into a veritably self-sustaining working community. Side by side with an academic education suited to young people who have gone through "the advanced method" mentioned by Maria Montessori, this multifaceted environment will provide for young adolescents, side by side with academic instructions, apprenticeships in a variety of arts, crafts, trades, professions, and vocations taught by experts in their field. Young people of this age, therefore, are not condemned to the anxieties of intellectual achievement as an ultimate end. They can continue to make purposeful use of "the hand—instrument of the intelligence" thereby not only enhancing their intellect but, more pragmatically, enhancing their possibilities. The self-assurance acquired will allow them to develop hardiness and equanimity with which to face life's vicissitudes. (*AMI Communications* 39)

Knowledge of the natural world is interdisciplinary and whole; it includes literacy, mathematics, the sciences, morality, and systems thinking all at once. Understanding the natural world means being truly educated, finding balance in life and knowledge, and attaining true freedom still framed by the disciplines. This is what the Montessori voices that you will hear in this journal have bequeathed to us. Their conversations are just samples of the rich dialogue that is our heritage, enough to remind us of what has gone before in our encounters with nature, so that we may innovate and appreciate within a synthesizing and cohesive tradition. These voices encourage us to know and to remain true to our Montessori roots as we grow wings that will propel us to new heights where we will fulfill our unique role in the planet's future.

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Shepherding pygmy goats, Telperion Farm School, Balmoral, Mpumalanga (not far from Pretoria), South Africa

*Children need a real connection and a freedom to be in nature—what I call reality, not virtual reality, where so many children now come from—artificial worlds with no contact at all with nature itself.*

*Children need to have a connectedness to mother nature. Your own Robert Bly in* The Sibling Society *quotes a Dutch scientist, Louis Balk, who says that small children need contact with nature for the full development of the neocortex (is this parallel to and as important as Montessori's reference to de Vries in connection with the sensitive periods* [The Absorbent Mind?]*). I believe they need the contact of nature herself and her cycles of life and death, for without this reality we do not have a point of reference for life. And with this contact comes a wonder for the universe itself—the last frontier to be explored—the minutiae of sustainable relationships and ecosystems.*

—Orcillia Oppenheimer

"The race down the broad walk after a busy morning," description by Florence E. Ward, American professor and visitor to Dr. Montessori's Casa dei Bambini on the Pincian Hill, around 1912

# Part I

## The Children's House: Indoors, Outdoors, Freedom Within Limits

The Children's House is an embodiment of Montessori origins. San Lorenzo, Rome, was thriving with fifty children in the middle of winter, January 6, 1907. These street children found a home, a shelter with an indoors and an outdoors, a place for self-care and social contact, a warm nurturing house with a garden.

A sense of wonder emerges when children are given free flow between indoors and outdoors, when walks are permitted in safe places such as the woods, the vacant lot next door, or in a garden of brick pathways within the school yard. Montessori materials of the indoors prepare the senses for nature's own prepared environment, a place of both structure and freedom: Joint perception becomes magic when all the community renews their eyes and ears in awe of nature's silence and beauty, and they see and hear as one whole community the surprises of the grass and meadow. Montessori Children's House is as spiritual as it is physical. The community's well-being, its body and soul, is the enterprise of the school's social life.

Parents look out of the windows and assist in the courtyard at Casa dei Bambini, casamento Operaio dell'Umanitario, Via Rottole, Milan around 1908

# The House of Children

**Lecture, Kodaikanal, 1944**

by Maria Montessori

*This article vividly describes the indoor and outdoor components of what Montessori calls Home Sweet Home. Her vision of a domestic Children's House contains many facets: rooms of varied space, beautiful flooring, gardens that educate and evoke collaboration, and places for year-round exercise. This is a definitive yet rare Montessori article that shows the profound overlap of both natural and man-made spaces in a house designed for children.*

The general idea about the buildings of a modern school is that they should be hygienically correct, satisfying the laws of healthy housing, etc. Our idea is to build them so that they are psychologically satisfying, i.e., the building should correspond to the psychological needs of the children.

First, there is the fact of proportion. The size of the building and the whole structure should correspond to the size of the child. It should, thus, satisfy his sense of comfort because children have as much sense of proportion and sensitivity to it and its corresponding comfort as we do. Unfortunately, they are never given the chance for such satisfaction in an ordinary school building where, we know, everything is made to suit the teacher more than the child. And yet a school is an institution where there are thirty children and only one adult!

In English there is the famous sentimental expression "Home! Sweet Home!" For the adult, the idea of home rings with similar satisfactory notes. But where is the child to find an answer to his need? In the "House of Children," we endeavor to give to the child the relief of feeling, for once, "at home." The question of proportion is one that pertains to psychology: we adults construct our homes with a certain sense of proportion. Our house is not something that simply shelters us from inclement weather. It is a place where we are at ease. The children want the same mental ease and sense of comfort provided by an environment adapted to their size.

Plant niche, Municipal Montessori Nursery, Vienna, Austria, 1932, courtesy of Mueller and Schneider 75:13

Considering it from the point of view of economy, the smaller house will cost much less than a big one, just as a child's dress consumes less material than that of the grown-up's. So we can use this fact in our favor in the controversy of expenditure on the child's schoolhouse problem. By following this plan of making the school building proportionate to the size of the children, we save society and ourselves from a great economic error.

When we are in an apartment building or entrance hall that has very lofty ceilings, the ceiling does not seem to be part of the house. It rather appears to belong to the sky or to any other canopy that has nothing to do with our comfort or coziness, and we would feel rather uncomfortable if we had to live in such an open sort of environment. A home should be "cozy," not a place where one feels lost. The same may be said for the child who has to live in the school building, which is suited to the needs of the adult. For the ceiling will seem as tall, if not higher, to him than did the elevated ceiling of the big hall to us. We have noticed among children of rich families who typically live in big houses with vast empty spaces between floor and ceiling and wall to wall, that, as soon as they had the chance, they make little "huts," small dwellings made from whatever they could lay their hands on and pretend to live in them. This is a common tendency in the play of the very young. And there could be no surer guide than this manifestation of the desire for a fitting construction for their living-place. We must not think merely of an environment, not merely of a shelter, but of a house.

Concerning proportion, there have to be limitations of size. If the room is too small it acts as a restriction and causes disorder. If it is too big it disperses attention. The proportion of a room, therefore, should not depend only on the possibility of ample circulation of air, or, in other words, its cubic contents, but it should be adapted to what I call "psychological proportions or needs." Hence we must measure the psychological contents of the room, too, not just the cubic feet of the room. The windows should be small and low in proportion to the children. There should be other means to circulate air than windows alone. Windows should essentially serve the purpose of being "look-outs." In short, the windows should be "psychological windows" and not merely aerating windows.

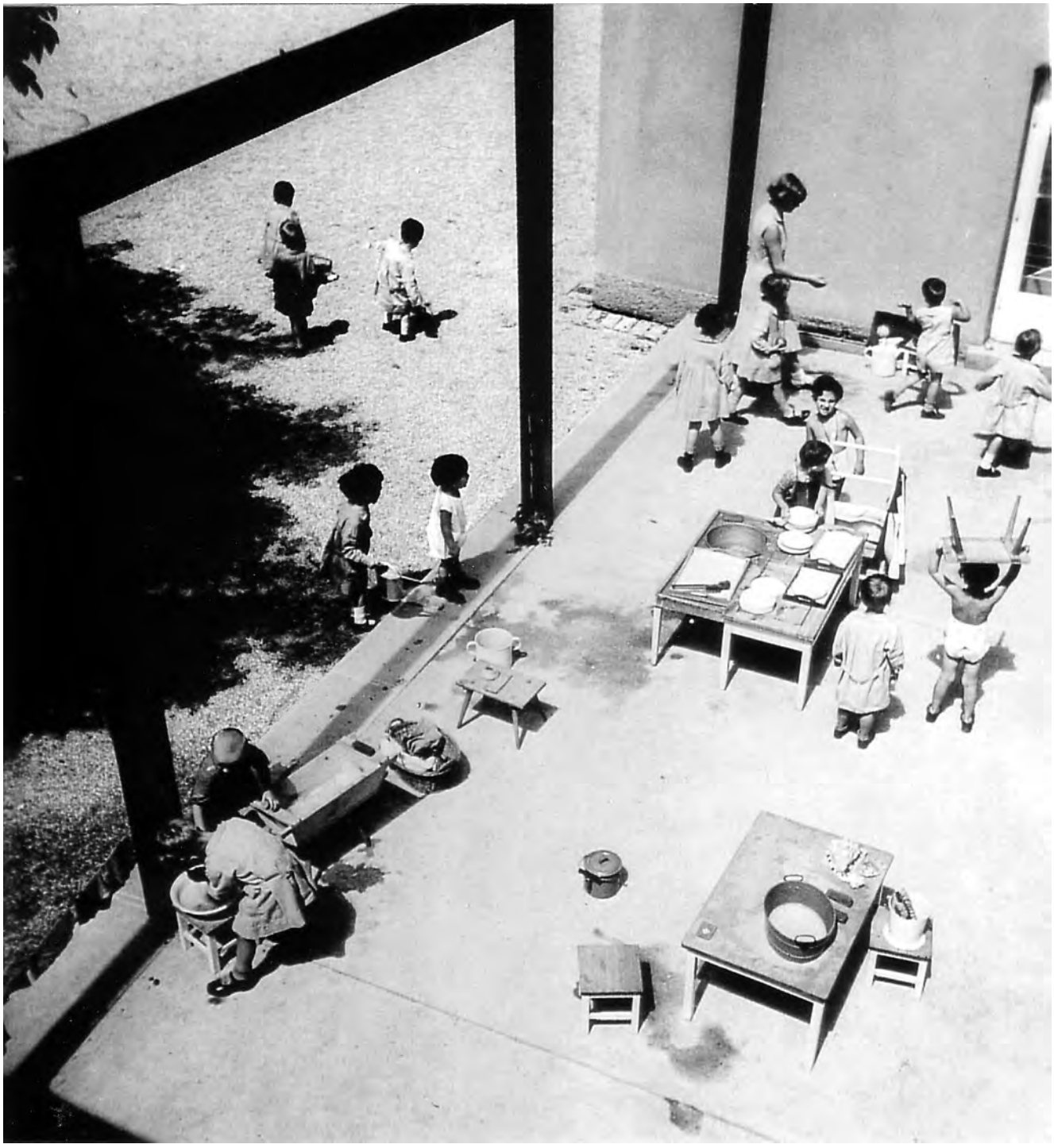
When we consider a Training College having a House of Children attached to it, we should not have the students or visitors going and hovering over the children at work. Proximity is a great disturbing factor. Instead, there should be a visitors' gallery where the children could be observed without being disturbed. In Rome, certain big buildings—ancient ones—were given for the use of children. These were reconditioned suitably by having a low hanging gallery built all around which reduced the height of the building suitably for the children. Also if the rooms available are too big, they must be partitioned off with little low walls. These could serve as stands for plants, aquariums, terrariums, etc. . . . The walls should be of the height of the three- or four-year-olds. This separation of space by such low walls is a psychological separation. They are not to separate one class from another or a "higher" group from a "lower" group. They are meant to give that limited space necessary to lessen children's distraction. With such separations the children are free to circulate. Hygiene also is taken care of, as air definitely circulates better with low walls than with complete separations by walls from room to room.

Children sometimes feel the necessity of being alone and all by themselves. Hence, little side rooms are to be provided, too. Now and then, when they feel like it, they can retire to these side rooms where appropriate activities should be provided or they can take the work they are interested in with them.

There is yet another factor to be considered in the construction of the House of Children. We know that all the children living in city dwellings are forced to grow within rooms that are rectangular "prisms." Hence they grow to be "prismatically-minded." If we look at great temples and monuments, they are built in different forms—round, etc. They symbolize the need of man to escape from the ordinary, humdrum, prismatic prisons called houses in his efforts to create other forms of environment. In

Children in the garden of Berlin-Lankwitz Children's House, 1919-1922, courtesy Mueller and Schneider 103:5

Greek art, the temples are round and the pillars are fluted in structure. In royal palaces the dance halls are elliptical in form. Public places of pleasure are not rectangular. Hence we have experimented with other shapes than the rectangle in the construction of our Children's Houses. To give rest and pleasure, we have shaped our buildings with elliptical, triangular, and circular shapes, etc. In Amsterdam, where a rectangular building was at our disposal, we put up partitions in the corners and created triangular rooms—four of them in the corners and the central room itself was hexagonal. Thus five rooms out of one were available for the children's use. The different corner rooms were utilized for different purposes:



Haus der Kinder, Vienna Austria, 1930, courtesy Mueller and Schneider 58

Lunch in the open air, the Cloister School, Via Giusti, Rome, around 1911

one for a library, one for a kitchen, another for a laboratory, and so on. To be condemned to reside in a prismatic space is depressing to the spirit.

The flooring should be of shining tiles of different colors. They could be arranged as a mosaic. Or the flooring could be of waxed wood. There is no hard-and-fast rule about it. Of course, there is the psychological basis. If we can get the help of an imaginative architect, he devises something beautiful. The importance of the flooring is very great. Whenever we walk about the room, or when one is seated, we are conscious of the floor. And hence, as far as beauty is concerned the flooring is more important than the walls.

Besides the small windows, there should be glass walls allowing plenty of natural light into the room, as well as communicating with the outer garden.

Before we actually step into the garden from the Children's House, there should be a raised verandah all around. It should be closed and sheltered. In the garden there should be "kiosks" or bowers to go into. Kiosks can be helpful for processions and marching. The usual idea of an "educative garden" in the sense of one being divided into individual strips for each child does not appeal to us as anything convincing. The garden should be the result of the collaboration of all the children. There should always be collaboration in protection (weeding), collection of fruits, harvesting, and so on. The garden should be, psychologically, a place that allows each one to do what he feels like doing.

A House of Children should have 20 to 40 children, but not more than 40. Less than 20 does not give results.

## ON GYMNASTICS

Among the many programs adopted in the USA, are societies for entertainment[1]. Those who came to these gatherings were interested in explaining the Montessori materials. Each one explained how the different senses were developed in the children with this apparatus. The Ambassador of China blindfolded himself and tried to recognize Mr. Montessori. It was only the Italian Ambassadors who said that this method was not for the Italian children. They were reminded that Dr. Montessori was an Italian herself and so the method must be Italian.

[1]What Montessori describes as "societies for entertainment" might be similar to the Chautauqua phenomenon, an adult education movement in the United States, highly popular in the late 19th and early 20th centuries. Chautauqua assemblies expanded and spread throughout rural America until the mid-1920s. The Chautauqua brought entertainment and culture for the whole community, with speakers, teachers, musicians, entertainers, preachers, and specialists of the day. (http://en.wikipedia.org/wiki/Chautauqua)

Returning to the topic of the House of Children, everything was all right except the question of the proportion of the house itself. The house must be different in order to suit the climate of the different places. They should be built in such a way as to take full advantage of available sunlight and circulation of fresh air. In the tropical countries we must protect the children from too much sunshine and light. Similarly, we require a special type of building to suit the temperate climates.

External environments, such as gardens and games—these also vary according to the climate. In Holland, where the winter is prolonged and where there is a great deal of ice and snow, ice-skating is very important as a pastime. Ice-skating has to be taught to the children. Gymnastics also change according to the country. These exercises have become so interesting and exciting for the children that special halls have been built in order to teach these sports to the children (skiing) . . . It is the environment that creates the sport and the gymnastic ability, and agility takes different forms. In Holland, in order to go from one place to another they skate or go on bicycles—even the children of three or four years. These children will naturally not be interested in basketball or tennis, etc. English games, which have spread all over the world, appear senseless when the environment is different from what is found in England. The same can be said of other forms of gymnastics. Where there are no trees, people fix poles to teach climbing. Since there is nothing to climb, it is only an imitation of movement. Exercise ought to be for adaptation to the environment.

In some places people ride on rocking horses and think they have learned how to ride. There was an idiot[2] child who was told by a psychiatric specialist to ride horseback for an hour each day. The child sat on the horse, without riding, for an hour, but nothing happened. So the same is the case with the rocking horse. Sometimes we limit the movements of children by giving them these toys to play with. When the movement that is given has no purpose, the mental exercise is detached from the physical.

In a kinesthetic therapy clinic, people are given certain instruments, which are then moved mechanically, without any effort. Exercises are done with the help of these instruments. In this room, it looks as if these people were shut in a mental hospital and this is of no use.

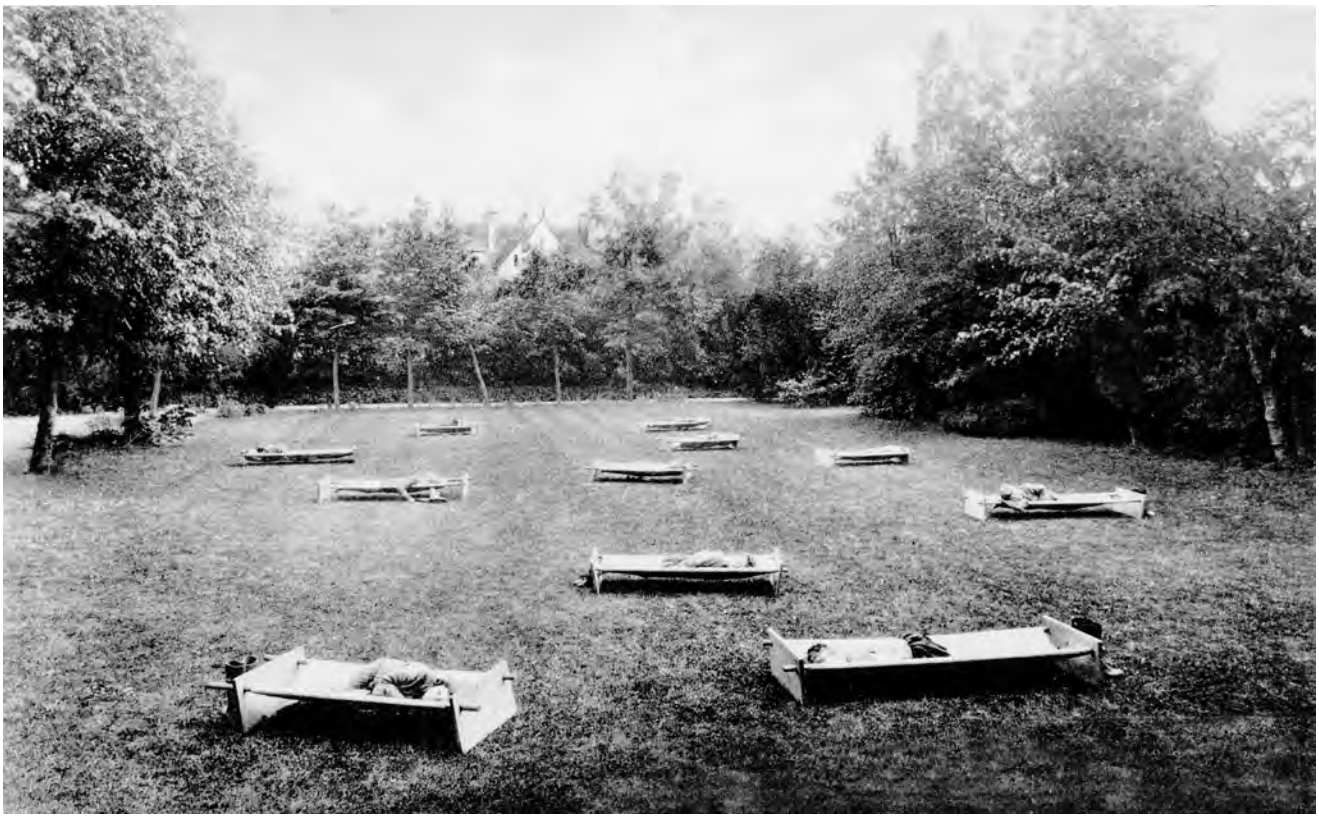
There are different exercises for the children. What is essential for the child to know? Firstly, there should be plenty of space; secondly, there should be some kind of work that makes the child use his mind as well as his body, thus bringing a perfect coordination between the two. Young people are generally more muscular (when given space) than those who are brought up in closed rooms. With the latter there is more restriction than development.

In America, when a person dies, part of his legacy goes for education. In one of these institutes, I was greeted by the children who came riding towards me, some without a saddle or bridle. Whatever is possible should be created for the child, but, as far as possible, the child should not be given toys that give an illusion of riding, rowing, etc. Gymnastics, as they are taught today, are only necessary for children who are in closed environments and not for the children who are set free.

In the USA there are many playgrounds which are suitable for children from two to four years but which are not suitable for the older children, while there are other things such as parallel bars, etc., which are suitable for the older children. Professor Séguin[3] used parallel bars in order to provoke an instinctive movement in developmentally delayed children. So he thought that these exercises would also be useful for normal children. All these exercises are only partial movements, but swimming develops every

[2] According to Wikipedia, "The terms used for this condition are subject to a process called the euphemism treadmill. This means that whatever term is chosen for this condition, it eventually becomes perceived as an insult. The terms mental retardation and mentally retarded were invented in the middle of the 20th century to replace the previous set of terms, which were deemed to have become offensive. By the end of the 20th century, these terms themselves have come to be widely seen as disparaging and politically incorrect and in need of replacement. The term intellectual disability or intellectually challenged is now preferred by most advocates in most English-speaking countries.

[3] Édouard Séguin (1812-1880) was a physician and educationist born in Clamecy, Nièvre. He is remembered for his work with children having cognitive impairments in France and the United States. He studied at the Collège d'Auxerre and the Lycée Saint-Louis in Paris, and from 1837 studied and worked under Jean Marc Gaspard Itard, who was an educator of deaf-mute individuals, that included the celebrated case of Victor of Aveyron, also known as "The Wild Child." It was Itard who persuaded Séguin to dedicate himself to study the causes, as well as the training of the mentally retarded.



Rest time, St. George's Montessori Home, Harpenden, Hertfordshire, 1917

part of the body. Today these exercises are done in the open air, so that the child gets the benefit of the fresh air. Swimming and climbing—rope climbing and climbing trees—are not only exercises for the child but they also make him sure of himself and have a practical use.

All these activities should be carried out in the open air. Jumping over heights and walking on narrow ledges are also enjoyed by the children. Children are not afraid of anything. We must observe what the children do—sometimes the most dangerous things such as hanging onto moving cars, etc.—we should try and help the child in doing these things and not intimidate him. We should prepare the environment for the children of the future. Children love escalators in spite of the fact that they fall down on them quite often. The tendency of the adult is to stop the child from doing these "foolhardy" things.

In the schools only certain gymnastics are done but the children are not allowed to do what they like and want to do. If we think that the future generation will be physically developed just by playing tennis, then we are sadly mistaken. People who are not allowed complete freedom of movement and who have to do sedentary work have created these playgrounds and these playgrounds are reactions to this passivity. The exercises of practical life are more suitable than gymnastics. The children's movements are directed by the material and while the children are busy doing these exercises, the whole hall becomes like a gymnastics hall. These are practical and safe indoor exercises.

**The Outer Environment**

Specially prepared ground should be given to the children outside where they can skate, cycle, relay, etc. Sheds and resting-places should be all around this area. Meadows are ideal places for the different exercises. Picking fruit and preparing baskets for collecting the fruit are useful as well as delightful exercises for the children. These are exercises for control of movement. Children are also interested in preparing raised platforms on the ground and in the trees. The child must be moved to activity in whatever he does.

In scouting there are exercises that have as their aim the development of the physical and intellectual side of the child and we do the same. We must first look to increase ability, and second, to increase safety by swimming, etc. All these exercises, done well, give great confidence to the child. For the smaller children, spontaneous exercises should be encouraged, for the older children, exercises should be directed.

## SCHOOL GARDENS

The garden we are talking about is not of the usual conception but the entire open space around the school, which should be vitally organized. It forms part of the living environment. The environment is not only the school building, per se, but the garden, too. The garden must also have certain psychological dimensions. Because, in the gardens usually built for the children by the city authorities, only the hygienic (physical) part is thought of and not the psychological part. So, in these great parks for children, as in New York and other large cities, the children can never go alone, because the dimensions are too great and the crowds too big, so that there is the ever-present danger of a child getting lost. Instead, the importance of the garden for the children is that they could have a life of their own with organic activity in the garden, an activity not imposed by adults. The great parks found in the large cities with lawns and lakes are not satisfying to children. On the other hand, the gardens attached to houses are also unsatisfactory. They belong to the parents and the things in them are not to be touched by the children. They are worked by the gardeners, as the children are considered to be too "small" for activity in them. So all progress of late in the construction of public parks or house-gardens does not touch the central psychological point.

What is lacking for children is an open-air environment of activity that will develop the psychic side. We must study the open-air environment as much as we do the indoor environment and its construction. This is important. It is the principle that is invariable and not the details. Many modifications, as regards to the details, are possible, but the important thing is the environmental activity of the child. The details I am going to enumerate now are based on personal experience, but it is not necessary that all the children's gardens need be as I describe.

The garden should be larger than what is usually planned as a school garden with some flower-beds only. The garden should be well-sheltered from any dangers, perhaps with an enclosure wall. This is a very important factor, for children will never be free unless the environment is safe, such that there is no danger to the child. If there is any possibility of danger, the children cannot be left alone. This results in lack of freedom and the imposition of the adult personality, in which case the children's feeling of spontaneity is curbed. But the essential part is that children should act by themselves, not alone but in groups. They will need direction in the beginning to lead them to some spontaneous interests. Hence the garden must be large enough to be satisfying to the needs of their life. It should not be too large, however. For, if even well defended, too large a garden is not satisfactory. For instance, there are the rich farmhouses. These are huge compounds or estates. The children left in them are totally indifferent, for neither adults nor children can know fully a too large and wide environment so no attachment can be made with such an environment. The same principle as for the interior of the school must prevail for the garden, too: that the children know every object and the place of every object. Here, also, the sentiment of "Home! Sweet Home!" should become "Garden! Sweet Garden!" for the child.

Let us now enumerate what the children's garden should be like. Many variations of this are possible. Also the items mentioned by me need not be in the same garden, though it is very desirable to have them.

1. The aesthetic part or the beauty of the garden is the first consideration. The garden is the place where there is an abundance of beautiful flowers, aromatic plants, trees, etc. This preparation should be given to a professional gardener and the children. Part of the education is to respect the flowers, the flowerbeds, and to learn to draw the designs for such. Just as we do for the inner environment—not to soil the furniture, the walls—the same principle is to be observed here. But it does not stop here.

2. In public parks and gardens no touching is allowed. So in our garden, the active part of the child is also to be considered. There must be provision for the children to take

part in work. Work can be of varied kinds in the garden: Preparation of soil, weeding, watering, etc. Children should do a collective piece of work. They should be guided to the technique of such collaborative work. The idea is that they should reach the point of having clear ideas of things. As in many other fields, a real artistic sense must be developed. For instance, there is the painting, drawing, and sculpturing by children. Another venue for the artistic expression of children is the development of their own ideas of laying out the garden and the flowers to be contained in it. This aesthetic part must be emphasized. For it is in the nature of man to add beauty to his environment by his work. On this principle is based the activity of the children indoors of preparing flower-vases and similar activities. Generally, traditional educators recommend individual gardens and narrow individual plots, which we think are of no use.

3. Vegetable Gardens: In this there should be two parts (a) the garden of the gardener, and (b) the garden of the children. This is a very exciting activity. The flower-garden activity is sentimental, whereas the activity in the vegetable-garden is practical. Here also collective work is the basis—collective planting, weeding, and harvesting activity should go on. This stimulus puts into practice the social side of children. The collaboration of the group is developed, because with the group activity one has striking results whereas with individual gardens no results are seen. With results, the activity becomes interesting. Many applications of activity come by growing different kinds of vegetables according to the different seasons. Then the question of consumption is seen against a real background. To make a field of potatoes has been seen to be very interesting to children of Europe. It may vary here. The collection of potatoes gives great satisfaction. When pulling a plant, one senses the great richness of abundance as the gift of the soil is felt. The special gifts of the earth are felt vividly in this activity. This leads to other activities.

4. Hothouses: In cooler climates special houses are naturally needed to grow things that are normally grown in warmer and hotter climates. The question of protection from too much extremes of climate and from pests begins be noted, studied, and acted upon. The importance of this is to show the difference that the care and intervention of man can bring about. In Holland, which is a country too cold for vines, they are grown in hot-houses with hot-water pipes running in them to give the plants just the necessary temperature. Big large grapes are produced which are consumed all over Europe, though the vine cannot grow normally there. Hot or cold houses ought to be made, though this is not possible everywhere.

5. The Plant Laboratory: It is very important that within this garden a sort of Plant Laboratory should exist to study plant physiology. This is a very interesting activity. Studying plant growth in different soils, the effect of light on plants, the growth of roots, the effect of less or more water, successive drawings of the development of plants . . . all these can be conducted in such a center. This was the idea, apparently, thought of by the advocates of "individual" gardens but not really achieved. But, by the study of organic physiology, by the careful adjustment of conditions, much of great practical value can be learned by the children.

6. Fruit Gardens: In the fruit orchard, tree climbing, the use of rope ladders, and such similar activities can be brought in easily. This becomes almost a gymnasium. There is the aesthetic value also, as many of the fruit trees are very beautiful in flower. When the fruits are ripe, then we have the activity of groups of children collecting with baskets. Bare and dry sticks and branches suddenly flower and bring forth luscious fruits. Hence potatoes and fruit trees are very important to impress on the children the gifts of nature.

There is another aspect of the school garden, meant for amusement and instruction. It is the court

and the lawn. Courts are meant for play. There should be a hard court, like the tennis hard courts, but larger and wider. Around this there should be a track for the children to walk around or run or go around on bicycles, scooters—it is something like a racetrack. On this track can be practiced roller-skating, ball-plays, skipping, pulling wheelbarrows and carts for transporting garden material or the children themselves galloping about for the sheer fun of it, playing the horse, and many other activities can go on both on the court and on the track.

Around this is the lawn. Here the exercise for equilibrium of walking on a beam raised one foot above the ground could be provided for. On one side of this court, on the lawn, can be built up a stepped pyramid. Pairs of steps, each 6" to 9" high and deep, and a platform can be arranged in succession up to six or seven layers of steps. Lines should be drawn to guide the steps of the child in walking up and down. This guided walking gives special exercise for grace of comportment.

On the next side of the lawn, a Pergola should be built. It should be shaded with some roof protection as a protection from sun and rain. There should be vertical stairs and rung-ladders, slides all around. The pillars should be colored beautifully in different colors. The platform should have seats all around for the children to sit and watch when they feel so inclined. The pillars should be thin enough for the children to hold and climb up them. The central part, the platform, is the real part for the child. It is meant as a space for mental rest.

On the third side should be built a Stall where there should be buying and selling activity going on between the children, using weights and measures. The decimal system should be used. This is knowledge in the aspect of play. The material is based on the sensorial material used by the children. They are to use and handle them. The basic units are the long stairs and the first and last of the cubes of the pink tower. The long stair of "10" is the meter. It is divided into decimeters. The big pink tower cube is the decimeter cubed which is the unit for liquid measure—the liter. The smallest pink tower cube is the cubic centimeter. Filling up the pink tower cubes and measuring water or other liquids with them is the departure for science. The weight of one cc of water is a gram. This play becomes a silent propaganda for the metric system, which is in use in all European countries except England and Russia. This system is not of any one country but of the whole world. It is based on the measure of our earth. The meter is 1/40,000,000 part of the circumference of our earth.

The fourth side of the lawn has different wooden huts, vividly colored, and they contain various tools for gardening, bicycles, scooters, handcarts, wheelbarrows, and play material of various kinds.

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Children hoeing, Sèvres, France, 1936, courtesy Margot Waltuch collection

# Nature in Education

by Maria Montessori

*This piece of writing addresses the "boundless" garden created through the web of foresight and patience combined with the spontaneous activity necessary for growing food and harvesting the bounty. Most will be familiar with this unique writing by Montessori who suggests that it is not the work and actual produce of the garden but the activities of "living naturally" that enhance the child's development.*

At the present time, however, and in the circumstances of modern society, children live very far from nature and have few opportunities of coming into intimate contact with, or having any direct experience of, it.

For a long time it was thought that nature had only a moral influence on the education of a child. Efforts were made to develop a sensible response to the marvels of nature, to flowers, plants, animals, landscapes, winds, and light.

Later an attempt was made to interest a child in nature by giving him little plots of land to till. But the concept of living in nature is still more recent in a child's education. As a matter of fact, a child needs to live naturally and not simply have a knowledge of nature. The most important thing to do is to free the child, if possible, from the ties which keep him isolated in the artificial life of a city. Today child hygiene contributes to the physical education of children by introducing them to the open air in public parks and by leaving them exposed to the sun and water of a beach. Some timid attempts at freeing children from the excessive burdens of city life may be found in the permission given to children to wear simpler and lighter clothes, to go about in sandals or barefooted. Experience has shown that the only means of curing children from tuberculosis and rickets in modern sanitaria is to expose them to nature and to make them sleep in the open air and to live in the sun. When we reflect on this, it should be clear that normal and strong children should not only be able to resist an exposure to nature, but that they would be greatly benefited by it. But there are still too many prejudices in the way. We have readily given up our own freedom and have ended up loving our prison and passing it on to our children. Little by little we have come to look upon nature as being restricted to the growing of flowers or to the care of domestic animals which provide us with food, assist us in our labours, or help in our defence. This has caused our souls to shrink and has filled them with contradictions. We can even confuse the pleasure that we have in seeing animals with that of being near a poor animal destined to die so that it may feed us, or we admire the beauty of the songs of birds imprisoned in little cages with a kind of hazy love of nature. We even think that a tray full of sand from the sea should

In the school garden, Sri Lanka, 1940s

"The gardener was a retired man from the village. He worked five days a week. He enjoyed the children and they enjoyed him as he taught them. It is always a great experience to bring the young and old together. Many times it is the volunteer who makes the best teacher," Margot Waltuch. Courtesy Margot Waltuch collection

be a great help to a child. The seashore is often thought to be educational because it has sand like that in a child's box. Imprisoned as we are in such a confused world, it is no wonder that we come to some absurd conclusions.

Actually, nature frightens most people. They fear the air and the sun as if they were mortal enemies. They fear the frost at night as if it were a snake hidden in the grass. They fear the rain as if it were fire. Civilized man is a kind of contented prisoner, and if now he is warned that he should enjoy nature for his own health, he does so timidly and with his eyes on the alert for any danger. To sleep in the open, to expose oneself to the winds and to the rains, to defy the sun, and to take a dip in the water are all things about which one can talk but which one does not always put into practice.

Who does not run to close a door for fear of a draught? And who does not shut the windows before going to sleep, especially if it is winter or it is raining? Almost everyone believes that it is dangerous and requires a heroic effort to take very long walks in the open country in rain or shine and rely simply on the shelter which nature affords. It is said that one must become accustomed to such efforts, and so no one moves. But how is one to become accustomed to such activities? Perhaps little children should be so conditioned. No. They are the most protected. Even the English, with their enthusiasm for sports, do not want their children to be tired by nature and fatigue. Even when they are quite large, a nurse pushes them in carriages to some shady spot when the weather is good, and she will not let them walk far or act as they please. Where people engage in sports, these become veritable battles among the strongest and most courageous youths, the very ones who are called to arms to fight the enemy.

It would be too soon for us to say: Let the children be free; encourage them; let them run outside when it is raining; let them remove their shoes when they find a puddle of water; and, when the grass of the meadows is damp with dew, let them run on it and trample it with their bare feet; let them rest peacefully when a tree invites them to sleep beneath its shade; let them shout and laugh when the sun wakes them in the morning as it wakes every living creature that divides its day between waking and sleeping. But, instead of this, we anxiously ask ourselves how we can make a child sleep after the sun has risen, and how we can teach him not to take off his shoes or wander over the meadows. Where, as the result of such restraints, a child degenerates, and, becoming irked with his prison, kills insects or small harmless animals, we look on this as something natural and do not notice that his soul has already become estranged from nature. We simply ask our children to adapt themselves to their prison without causing us any trouble.

The strength of even the smallest children is more than we imagine, but it must have a free play in order to reveal itself. In a city a child will say that he is tired after a brief walk, and this leads us to believe that he lacks strength. But his sluggishness comes from the artificiality of his environment, from ennui, from his awkward clothing, from the pain which his small feet suffer from their leather shoes as they strike the bare pavement of the city streets,

and from the enervating example of those who walk about him silent, indifferent, and without a smile. A club which he might join, or attractive clothes which might bring him admiration, are nothing to him. He is on a leash. He is ensnared by laziness and would like to be dragged along.

But when children come into contact with nature, they reveal their strength. Normal children, if they have a strong constitution and are well nourished, can walk for miles even when they are less than two years old. Their tireless little legs will climb long steep slopes in the sunshine. I remember how a child of about six once disappeared for several hours. He had set out to climb a hill, thinking that if he arrived at its summit he would be able to see what lay on the other side. He was not tired, but disillusioned in not having found what he sought. I once knew a couple who had a child barely two years old. Wishing to go to a distant beach they tried to take turns carrying him in their arms, but the attempt was too tiring. The child, however, then enthusiastically made the trip by himself and repeated the excursion every day. Instead of carrying him in their arms, his parents made the sacrifice of walking more slowly and of halting whenever the child stopped to gather a small flower or saw a patient little donkey grazing in a meadow and sat down, thoughtful and serious, to pass a moment with this humble and privileged creature. Instead of carrying their child, these parents solved their problem by following him. Only poets and little children can feel the fascination of a tiny rivulet of water flowing over pebbles. A child at such a sight

Gardening at Blackfriars School, Sydney, New South Wales, 1914

will laugh with joy and want to stop to touch it with his hands as if to caress it.

I would suggest that you take up in your arms a child that has not yet begun to walk. On a country road from which may be seen a great and beautiful expanse, hold him in such a way that his back is to the view. Stop there with him! He will turn around and enjoy the beauty of the scene even though he cannot yet stand upright on his own feet and his tongue cannot as yet ask you to pause. Have you ever seen children standing seriously and sad about the body of a little bird that has fallen from its nest, or watched them run back and forth asking and reporting what has happened with deep concern? Well, these are the children who can soon degenerate to the point where they steal eggs from birds' nests.

Like everything else, a feeling for nature grows with exercise. We certainly do not communicate it by a pedantic description of exhortation made to a listless and bored child shut up within the walls of a room and who has become accustomed to see or hear that cruelty toward animals is just a part of life. But experience strikes home. The death of the first dove killed intentionally by a member of his family is a dark spot in the heart of almost every child. We must cure the unsuspected wounds, the spiritual ills that already afflict these charming children who are the victims of the artificial environment in which they live.

### The Place of Nature in Education

Education in school can fix the attention of a child on special objects which will show exactly how far he has been able to stir up within himself a feeling for nature or will arouse within him latent or lost sentiments. Here, as in every other kind of activity, the function of the school is to supply him with interesting information and motives for action. A child, who more than anyone else is a spontaneous observer of nature, certainly needs to have at his disposal material upon which he can work.

### Care for Others

Children have an anxious concern for living beings, and the satisfaction of this instinct fills them with delight. It is therefore easy to interest them in taking care of plants and especially of animals. Nothing awakens foresight in a small child, who lives as a rule for the passing moment and without care for the morrow, so much as this. When he knows that animals have need of him, that little plants will dry up if he does not water them, he binds together with a new thread of love today's passing moments with those of the morrow.

One should watch little children when, one morning, after they have for many days placed food and water with loving care near brooding doves, they see the results of their labours. On another day they see a number of dainty chicks that have come from the eggs which a hen has covered with her wings for so long. The children are filled with feelings of tenderness and enthusiasm, and there is born in them a desire to give further help. They collect little bits of straw, threads of old cotton cloth, or wisps of wadding for the birds nesting under the roof or in the trees in the garden. And the chirping that goes on about them tells them thanks.

The metamorphoses of insects and the care which mothers bestow upon their offspring are objects of patient observation on the part of children, and they often give rise to an interest that surprises us. Once a small child was so struck by the changes undergone by tadpoles that he could describe their development, reporting the various phases in the life of a frog like a miniature scientist.

Children are also attracted by plants. One Children's House did not have any land that could be tilled, so flower pots were set out all around a large terrace. The children never forgot to water the plants with a little watering can. One morning I found them all seated in a circle on the floor around a magnificent red rose that had opened up during the night. They were silent and peaceful, completely absorbed in contemplation.

Another time a little girl kept looking down from a terrace in obvious excitement. Her mother and her teachers had seen to it that she had grown up with a love for flowers and gardens, but now she was attracted by something more. "Down there," she told her mother, "there is a garden of things to eat." It was an orchard, which did not strike the child's mother as being at all remarkable, but which had nevertheless filled her tiny daughter with enthusiasm.

### Prejudices About the Gardens

Our minds are prejudiced even with respect to nature, and we find it very difficult to understand.

Our ideas about flowers are too symbolic, and we try to mould a child's reactions to our own instead of following his lead in order to interpret his own real tastes and needs. This is why even in gardens children have been forced to imitate the artificial activities of adults. They find that it takes too long to place a seed in the earth and wait for a little plant to appear; and further the task itself is too small for them. They want to do something big and to bring their activities into immediate contact with the products of nature.

Children indeed love flowers, but they need to do something more than remain among them and contemplate their coloured blossoms. They find their greatest pleasure in acting, in knowing, in exploring, even apart from the attraction of external beauty.

Children caring for the aviary, Barcelona, 1930s

**Their Favourite Work**

Our experiences have led us to a number of conclusions different from those which I myself once had, and we have been led to these by children who have been left free to make their own choices.[1]

The most pleasant work for children is not sowing but reaping, a work, we all know, that is no less exacting then the former. It may even be said that it is the harvest which intensifies an interest in sowing. The more one has reaped, the more he experiences the secret fascination of sowing.

One of the brightest experiences is that of harvesting grain or grapes. The reaping of a field of wheat, the gathering of the grain into sheaves to be bound with bright-coloured ribbons, has been most successful and can become the occasion for beautiful farm festivals. The care of the vines, the cleansing of the grapes, and the gathering of the fruit into beautiful baskets can also give rise to various feasts.

Fruit trees provide similar types of work. Even the smallest children like to gather the olives, and they perform a truly useful work in the diligent search they make for fallen fruit which they put in their baskets. A hunt for strawberries hidden under the leaves of the vines is no less pleasing than looking for fragrant violets.

From these experiments the children derive an interest in the sowing of seeds on a larger scale, as for example, the sowing of a field of wheat with all its various operations. Only an adult can layout the furrows, but the children can pile up the little heaps of grain to be sown. They can then divide this into little baskets and scatter it along the rows. The growth of so many frail and tender plants gives great pleasure to the eye and to the mind. The uniform quality and the patterns made by the long parallel lines seem to emphasize their growth. Grandeur seems to come from the massing together of single items which are of themselves of little interest. The yellow stalks that toss about

1. As the result of further experiments by Dr. Mario Montessori the scientific education of children in nature studies has been further elaborated. It is impossible here to take into account the mass of work and the surprising amount of material that has been suggested solely by the interests and activities of the children themselves. It is enough to note that this includes much with respect to the shape and classification of animals and plants, and this prepares them for further study in physiology. Careful attention has also been given to the preparation of aquaria and plots for the growing of vegetables, which should be present in every school. These means for study have led to a spontaneous and purposeful exploration of nature and to a number of discoveries made by the children themselves. They have satisfied the need which children have to exercise their senses and their powers of motion and have laid the foundations for further far-reaching developments in elementary schools. It provides an answer to the problem of satisfying the interests of older children without forcing them to reluctantly assimilate ideas and terms when their interest in these has already disappeared. A younger child readily and enthusiastically lays the foundation which the older child then uses to satisfy his own higher interests.

in the wind and grow until they are at the height of a child's shoulder entrance the little group waiting for the harvest. Although our small fields were sown for the making of altar breads, we were nevertheless able to conclude that a country life is more suitable for a child than philosophy and the symbolism of flowers.

Little plots of fragrant plants can also have a practical interest. A child's activity then consists in searching for, distinguishing, and gathering the plants with different scents. An exercise in distinguishing things that look alike and in seeking out a scent rather than a flower is exacting and affords the satisfaction of discovery.

Flowers are, of course, also interesting, but gathering them is more unnatural than gathering the fruits of the earth that grow from them. Flowers seem to call insects to themselves rather than men to assist them in carrying out their eternal mission. Actually, children who have been taught how to satisfy their spiritual needs often will sit down near flowers to admire them, but they will soon get up and go in search of something to do since it is their own activity that causes the buds of their charming little personalities to unfold.

**Simplicity**

Work for a child must possess some variety within itself. A child does not have to know the reasons for sowing or reaping to have his interest aroused. He will readily undertake very simple actions which have an immediate end or which permit him to use some special effort. He will, for example, gladly pluck weeds from paths or furrows, sweep up dried leaves, or carry away an old branch. In a word, to have a field of activity and occasions for new experiences and difficult enterprises bring satisfaction to the animating spirit which prompts a child to make its way in the world.

We have pictures showing small children walking without fear among cows and in the midst of a flock of sheep, and others showing them sifting earth and carrying it away in wheelbarrows or heaping up big piles of branches from a tree.

Catalan folk dancing, Spain, 1930s

Because of the lack of a suitable environment, such works as the care of greenhouses, the preparation of water for aquatic plants, the spreading of nets to protect a pool from insects, and the like, are seldom practicable, but they would not be beyond the strength or will of a child.

**Our Garden**

A further conclusion which we reached from observing children in conditions where they could freely manifest their needs was that of limiting the field or garden to their spiritual needs. The opposite conviction, however, is common, namely, that it is good to give children a limitless space. Such an attitude is due to an almost exclusive regard for a child's physical life. The limits seem to be indicated by the swiftness of his feet. Nevertheless, even if, to be specific, we were to take a racetrack as a spatial limit, we would find it to be considerably more restricted than we had thought. Even in a large field, children always run and play in one spot, in a corner or some narrow space. All living beings tend to find a place for themselves and to keep within its boundaries.

This same criterion is also applicable to the psychic life. Its limits must be found in a mean which lies between an excess and an insufficiency of space or anything else. A child does not like one of the so-called "educational playgrounds" since it is too small for him. It is a wretched piece of property not even big enough for himself. A child whose needs are satisfied does not care whether something belongs to him or not. What he wants is precisely a sense of satisfaction. He should be able to watch over as many plants as he can come to know, as many as he can remember, so that he really knows them.

Even for us a garden that has too many flowers is a place full of unknowns that are foreign to our consciousness. Our lungs will breathe well there, but the soul is not affected. But neither can a tiny flower bed satisfy us. Its contents are trivial and not sufficient for our needs. They do not satisfy the hunger of the spirit which longs to come into contact with nature. The limits, then, are those which make it our garden, where every plant is dear to us and sensibly helps us to support our inner selves.

The criterion for judging the limits of a child's activities has created a great deal of interest. In many countries attempts have been made to interpret it practically as a garden which corresponds to a child's inner needs. Today, plans for a garden run parallel with those for the building of a Children's House.

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Grinding, with effort and concentration

# The Children's House

by Lili E. Peller

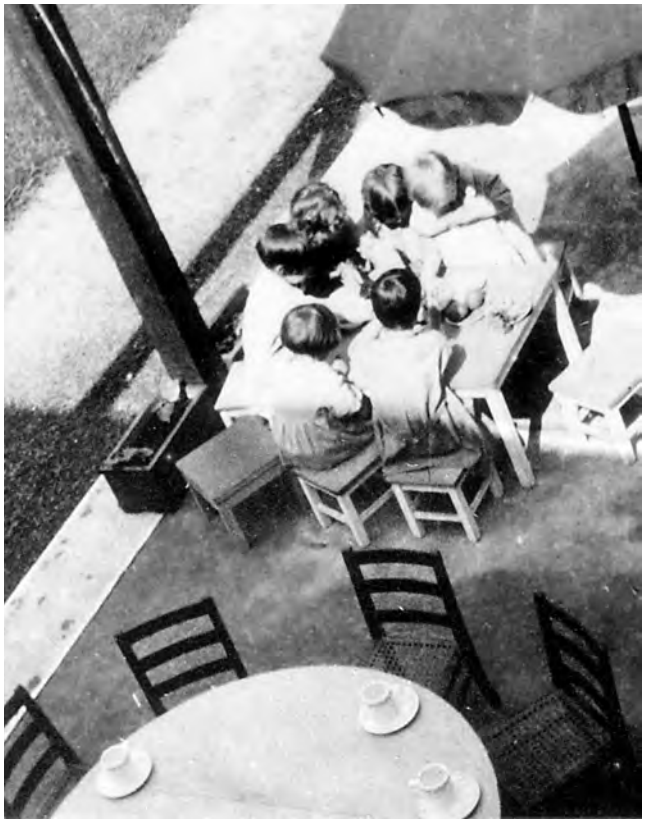
*Lilli Peller's The Children's House essay begins where Maria Montessori left off in her description of space articulations. Peller does not name Montessori specifically as she always had a desire to become independent in her own right as a neo-Freudian child analyst. But the Haus Der Kinder founded in summer of 1922 suggests a total Montessori influence as it calls for "adventures in space" with house-like rooms for different functions, both for play and for work, for practical functions: library, kitchen, workshop, quiet room, alcoves, nooks, and terraces for special individual work, with all spaces focusing on the relationships between indoor and outdoor environments.*

Emma Plank's edited papers of Lili E. Peller (Roubiczek) provide an integration of Montessori and psychoanalysis which utilizes "such divergent disciplines as biology, modern art, dance, human ecology, and linguistics for an enriched understanding of child development." (Plank, 1978) Ms. Peller's writings examine through both theoretical and practical detail a unique connection between Montessori's academic psychology and Freudian psychoanalysis which is indispensable to the awareness of every thinking Montessorian. The following is a paper excerpted from Peller's published works reflecting her unique understanding of Montessori.

> "We need in every part of the city units in which intelligent and co-operative behavior can take the place of mass regulations, mass decisions, mass actions, imposed by ever remoter leaders and administrators. Small groups: small classes: small communities; institutions framed to the human scale, are essential to the purposive behavior in modern society." (Lewis Mumford: *The Culture of Cities)*

## Introduction

We take it for granted today that "form follows function," as Louis Sullivan has said, or, rather that good form crystallizes from use. The planner of a home should know well the kind of people who will live and work in the house he is to build. Our concern here is with the house where groups of active children will spend a large part of their day.



Haus der Kinder, Rudolfsplatz, Vienna, 1930

The house is a powerful agent contributing to the happiness or the strain of its inhabitants. There is no doubt that the teacher is the most important factor in nursery school. Yet even the most devoted teacher has a limited amount of energy and resilience. It depends largely upon the layout and the

equipment of the house whether her working day is a long chain of drudgery and repetitious toil, or a sensible sequence of things which can be done with dispatch and ease.

Before there can be improvements in nursery school housing in a community, people with imagination and courage must visualize them. To achieve better schoolhouses all the teachers who are professionally alert must become interested in housing. Then it may well be that ten years from now photographs of today's nursery schools will be shown with a smile, just as today we smile at grandmother's kitchen.

Looking at some photographs hence, it will seem unbelievable that the houses had been especially adapted and planned for children, and that groups of active youngsters were brought to these buildings and lived in them for eight or more hours daily. Indifference, pessimism, and inertia are our real enemies, not discontent with present conditions.

Modern engineering can help nursery school teachers. This means that we who work with young children must state comprehensively and in detail what group care of young children requires in a building. We, the teachers, cannot do it without the architect, the technician, the builder. Neither can they do it without us and our experience.

It is desirable that nursery schools develop in a direction that will fully preserve private initiative and personal responsibility. Kindergartens in public schools are today too often schoolish and regimented. They are more concerned with readiness for academic work than with the children's need for vigorous play. If cities would provide a number of buildings for nursery schools - possibly scattered over our city parks and along city river banks - and rent them to qualified persons or organizations, this would help tremendously toward improving standards without choking personal leadership. This plan is not revolutionary or unprecedented. Cities have long provided playgrounds for children. Recently these playgrounds have become more numerous and elaborate including large sand boxes, wading and swimming pools (and many, often quite creative opportunities for climbing, sliding, etc.), and simple rain shelters. In this way the community has recognized its responsibility to provide for children's play activities.

Today most nursery schools are housed in rooms, yet we speak here about "houses." This term is not a figure of speech. We hope that in the future many nursery schools will be in detached units, in pavilions. However, even in our Utopia many nurseries will be in rooms in larger buildings. These rooms will take their pattern, their standards, from the houses built for children.

### Childrens Needs Determine the Plan of the House

We want the children's houses to be small, unpretentious, and semi-permanent structures. The young child's needs are our guide in planning his house. He has the great urge to play; in order to play well he needs protection from danger as well as from unnecesary interference, and he needs judicious help. The young child should have surroundings which he can explore, understand, and use. He needs an environment which is a compliment to his intelligence, permitting him to be self-steered, to use his abilities, to make a choice, and to make mistakes without endangering himself or others. At home the emphasis is necessarily on the things he

Woodworking shop, Haus der Kinder, Vienna, 1920s

cannot do for himself, in the children's house the burden of being small in size, weak, and impotent can be effectively lessened.

Visiting a children's house in the evening after its daytime inhabitants have gone home, we can read "off the walls" the educational philosophy of the teachers. Some schools seem to acknowledge the two main functions of the nursery school as protecting young children from danger and giving them an opportunity to play with peers. Such a school needs shelves for toys and space for play and that is all. The children are not supposed to move freely among the rooms. The adult will call them to the door when it is time to go to the toilet or to go outdoors; she will tell them when it is time to rest and when to go from one room to the next. Thus, the knobs on the doors can be high. It is even advantageous to have them out of the children's reach. The teacher can give her attention to studying, observing, and recording the children's imaginative play. She need not worry about a child wandering away. The adult "takes" the children outdoors as a group and they come back as a group. The basic principle underlying this type of nursery school is: children should enjoy the maximum freedom in their play using materials and toys as they please.

Pantry, Haus der Kinder, Vienna, 1920s

In issues pertaining to their physical welfare, the adult knows the child's needs far better and bids him what to do.

A nursery school centering its program around the children's need to play, as well as their need to gain an intelligent use of their environment, should have a building which enables the child to move from one room to another without asking the adult's help. All the rooms used by the children are connected by doors which the children can open. A cluster arrangement with a main room in the center gives direct access to all satellite rooms such as lavatories, workshop, cloakroom, kitchen, and quiet room. This arrangement also has the advantage of doing away with long corridors. Two, three, or four units can be housed under one roof. The rooms for the adults - office, kitchen, and staffroom - serve the whole school. The outdoor play space should also be directly connected with the play room. French or sliding doors connect the play room with the play space outside (be it yard or roof) giving the teacher and children an unobstructed view from the inside out and vice versa. The plan of the house should be so simple and so compact that a child can quickly gain a sense of orientation and the teacher can give unobtrusive supervision to all rooms while being in one.

The children whose nursery day is longer than three or four hours need several rooms. For the child who comes for a half-day only, the company of others is the main need; but if he comes for a longer period, privacy is as important as company. Both are needed for social and emotional balance by children no less than by adults. It seems hardly necessary to say that the seclusion must be self-sought in order to give the child relaxation and serenity. The main room may have alcoves or nooks which can be partitioned off with a sliding door disappearing into the wall when not in use, or with a door of transparent plastic, Transparent doors do not cut off the child from the group yet give him quiet if he wants to look at picture books, to rest, or to play with only one or two children. Or an alcove can be used the other way around - to protect the majority from the noise of a minority. With the carpenter bench in there, the lusty hammering and sawing need not disturb the other children. There is a notion that young children are mob minded and that when given a chance, they will always flock together into a big noisy crowd. Observation of children, for whom the company of

other children is nothing new, disproves this; they often like to play in very small groups.

### The Young Child's Adventures in Space

The qualities of space - the feeling of spaciousness or of nestling in a small enclosure, the sensation of being high up and looking down - are a source of delight for the young child. Children love a wide open place where they can run with abandon; they like to huddle in a corner or under a table covered with a blanket, or to sit squeezed in a dolls' house. The more cramped and crowded the quarters, the greater the enjoyment can be. The adults' attitude toward space is usually quite utilitarian. They cannot derive from spatial perceptions, as does the young child, the joy and the whole gamut of sensations. If children were studying adults they would put into the textbooks that most adults are "color blind" in regard to space.

Walking the balance beam, Haus der Kinder, Vienna

Children like to be high up and look down on objects and places which are familiar.

Every nursery should have a kind of balcony, or as we like to call it, a "treehouse" in the play room. The young child enjoys climbing, and he should have ample opportunity for it inside the nursery as well as outdoors. The raised balcony also gives a chance to get away from the group and, last but not least, it adds a number of square feet of play space.

Good treehouses can be reached in various ways: by a ladder, a rope ladder, or notches cut into the wall. The child can leave his treehouse also by means of a slide. Each approach presents a different hurdle to the child. He may have to crawl into the tree house through a narrow opening or to climb over a couple of rungs. Children are so taken with this "adventure in space" that they will take the trip many times in succession.

There are other spatial experiences the young child cherishes. The nursery school can offer many as the average home cannot. One school has on one side of the stairway a slide instead of a bannister. It seems superfluous to describe the delight of the youngsters, but we might mention the skill they acquire and point to the clever principle of making legitimate a pleasure which generations of children could obtain only by stealth. Of course, the stair must have a certain incline and the landing at the bottom should not interfere with other traffic in the house. Swinging up and down, gliding down a slide, climbing on the jungle gym and ladders or on a tree with low branches, constitute the more thrilling "adventures in space." The physical exertion, the sense of daring, add to the experience of space as a medium.

### The Room

*Floor.* Today the usual arrangement is to leave one side of the room free or to keep the center part of the room unencumbered. It would seem better to provide several decentralized floor areas. A part of the room can be elevated with one or two steps. The very young child loves to practice walking up and down and all children love to sit on steps. Besides the steps leading to the platform, there

might be a step leading up or down to one of the alcoves; or an alcove might be separated from the main room by a doorsill high enough to serve as a seat for a child. A good place for stationary steps is underneath a window. The children enjoy standing or kneeling there and looking out. Platforms, balconies, steps, and ladders are variations of the theme "floor." At this point, we might suggest the use of a soundproof ceiling to reduce the noise level.

*Walls.* No matter how one plans a room, one will always desire more wall space. The main nursery room is simultaneously a workshop and a display room, so wall space is needed for a number of purposes. Low screens and protruding shelves, variations on the theme "wall," help to subdivide the room and give a certain degree of privacy to groups of playing children. If many children eat in one room, screens may serve as partitions to form a number of booths. They can also be placed to help direct the traffic of children who carry plates and food back and forth. Encouraging children to help in this way allows them a legitimate opportunity to break the strain of sitting at the table throughout the entire meal. At rest time the setting up of enclosures giving privacy is even more essential than at meal times. At play time the children will soon discover that screens can create various enclosures or may even become part of their play equipment on occasion.

*Windows and Doors.* Windows admit light and their coverings (blinds, curtains, or shutters) diffuse it. Both are needed at different times of the day. The room will usually be darkened for rest period. Occasionally a darkened room may set a better stage for a story period or for the game of "listening to all the little noises" A southern exposure and a bright orange or blue curtain will, when the curtain is drawn, fill a room with color and subdued light - a pleasant and quieting effect. In a one-story building a skylight of plain or colored plastic will admit additional light. Children love to look out of the window. This function of windows is as important as the admission of light and air. We must remember that the motionless child who is listening or gazing with all his might is mentally a very active person.

Children like the experience of opening and closing a window. In homes this is usually a privilege reserved for adults. A nursery school window may have one or two small panes for the child to open without endangering himself.

Looking out, looking in, Haus der Kinder, Vienna, 1920s

With little expense a door can be inserted in the doll corner or a gate can be installed on the playground or indoors. One door can be constructed as a Dutch door, i.e. it is divided and the upper and lower parts open separately. The amount of experimentation, that is the alternate opening and shutting of the upper and lower part, indicates how much learning goes on in relation to "open" and "closed," or "connected" and "separated." After a time the playful repetitious handling gives way to an intelligent use at the appropriate occasion.

Children also love to pass things through an opening in the wall which can be closed with a door sliding sideways or upwards. Such a counter window with a shelf on both sides may be permanently useful in connecting the children's room with kitchen or workshop. The child who manipulates the Dutch door or the counter window establishes contact or withdrawal between himself and others. Here the perception of spatial relations and of social relations

intertwine. This may explain the fascination which these gadgets hold for the young child.

In planning the house we also should remember that water is an essential plastic material. There should be at least one low faucet with sink and drainboard in the main room.

*Indoor Furnishings.* Several nursery school manuals give good detailed descriptions of the sizes and proportions of chairs, tables, and shelves, the main pieces of furniture. Usually chairs and tables in a nursery group are of two different sizes. This is a commendable practice although it does not always lead to our goal, namely to provide each child with a comfortable seat. Children will draw a higher chair to a lower table, and some children will always hunt for the larger sized furniture, although they cannot put their feet down on the floor when seated. The prestige of being taller apparently more than compensates for the discomfort. As the children do not remain seated for long periods, this does not matter and the teacher need not interfere. It is not advisable to use different colors for the different size chairs and tables. This will only make the larger furniture more conspicuous and more coveted. The light weight of a chair is important, for the child likes to carry a chair to different parts of the room or outside.

A nursery for 20 children requires 20 seats, but not all the seats need to be identical. Straight chairs, rocking chairs, armchairs, small stools, straddle-seats, a bench, and floor cushions (hard cushions covered with oilcloth or plastic) give variety. Some chairs will be more appealing than others. The variety will lead to little squabbles among the children. A child who never would have cared for the armchair will become eager to sit in it when he sees how much another child treasures its "possession." The ensuing negotiations, pleading, or violence are important social experiences and necessary in group adjustment. Chairs may be painted in two or three pastel shades or some may be polished wood or aluminum (plastic chairs have excellent contours and are less heavy than wooden ones).

Only in our western culture have we given up squatting or kneeling positions which bring us nearer to the floor than the average chair. Children like to sit tailor fashion on the floor, or to kneel on a flat cushion, sitting on their heels as the Chinese do. Both positions are healthful for the child. Flat floor-cushions match low tables, some of which may have hinged tops to prop up for painting or drawing.

Tables, too, should not be uniform. The majority will be the rectangular type seating two children. In addition, there can be a large table for 8 to 10 children. Large and small tables have their specific advantages and disadvantages. Large tables facilitate supervision. A group of children, each one working with the same material (clay, fingerpaints, paper) or on a joint project, is better off seated at one table. Interest is contagious and the enthusiasm of one child spurs the others. Individual tables discourage copying a design or a clay figure. Round or half round tables are practical for meals. They take up more space but the number of children seated at one table is more flexible. One table may be a dropleaf table, or a small table can be hinged to the wall and dropped when not in use. Incidentally, silence domes on all table and chairlegs are an asset.

The variety of chairs and tables plus the fact that some may be taken apart or folded instigate the child's interest in these parts of his daily environment. His attention is drawn to those qualities which constitute the "chairness" of a chair or which are indispensable in a table. The child's discovery is a source of great joy. Soon he tries his hand at making a table or a chair out of large blocks or empty boxes. This shows initiative and intelligence.

The youngster who takes two pieces of wood, nails them together and calls them an airplane can be sure to get recognition from his teacher. Yet his intellectual accomplishment may be very small. Few teachers are equipped to see this. Their perceptiveness is geared to achievement resembling the work of an adult artisan or artist. There are glimpses of intelligence of another order. The child observes, compares, and by some kind of short circuit, discovers that things can be put to a different and new use. The more children are accustomed to help themselves and not wait for adult assistance, the greater the probability of such discoveries.

We stop here to assert that educators who want the younger generation to accept conventions without questioning have no reason to foster an experimental attitude towards chairs and tables in early childhood. If we consider it the task of education to fit children into existing molds, then it is logical

to expect the child to use each piece of equipment in the conventional way and to make it clear that any other use is a misuse.

Our goal though is a flexible and sensible use of all equipment. Most pieces of furniture can be used in several ways; they also can be abused. The child who is encouraged to observe and to experiment will soon be able to differentiate between use and abuse. All furniture for young children should be sturdy and well built and a certain amount of breakage must be expected. Children who are with well liked adults and who take an intelligent and active interest in their surroundings will rarely be deliberately destructive even when they are on their own.

All material and toys should be accessible to the children without their asking the adult's help. Here again is the recurring theme: the nursery school should lessen the discouraging burden of dependency which in our culture is heavier than in others. The primary purpose of all equipment, toys and furniture is to provide an arena for the child to build intelligence, imagination, initiative, perseverance. Another important reason for making tools and play materials directly accessible to the child is: a young child's intentions or plans are not well defined or fully conscious. He cannot put them into words with ease or precision. The layout of the nursery school enables him to translate into action impulses which are vague and fleeting. This, too, is part of the "self expression" offered in nursery school. To emphasize this point, we make a corollary statement: a child, for whom verbalization of what he wants to do no longer presents a hurdle, has passed the stage where he belongs in a "nursery."

The order of the room should be simple and easy to remember. The child has a feeling of ease and competence when he knows where to look for a thing. Our direct guidance is a burden for him; our subtle indirect guidance gives wings to his conquering steps. Thus, we will take as much effort to display things attractively as a good storekeeper takes with his wares. The color of the open shelves should be neutral and unobtrusive in order not to distract attention from the bright colored toys.

Too many things are confusing. The child cannot find quickly what he wants so gives up and turns to the adult for help. He feels the burden of his own inadequacy. Only functional things have a place on the shelves in a room of active children. Toys or materials which have not been used for some time by any child should be removed. It may be advisable to remove them permanently, or to bring them back after a few weeks, placing them in a different spot.

Some teachers follow a definite "hands off' policy. They ignore youngsters who mill around obviously bored and mentally undernourished. Other teachers are quick to spy an idle child and make alternate suggestions. We believe that a good deal of idleness is a prerequisite for plunging with whole-hearted interest into the next enterprise. If we interfere with the valleys, we will have no peaks. Before resorting to a verbal and direct proposal, the teacher should try an indirect appeal through a piece of equipment.

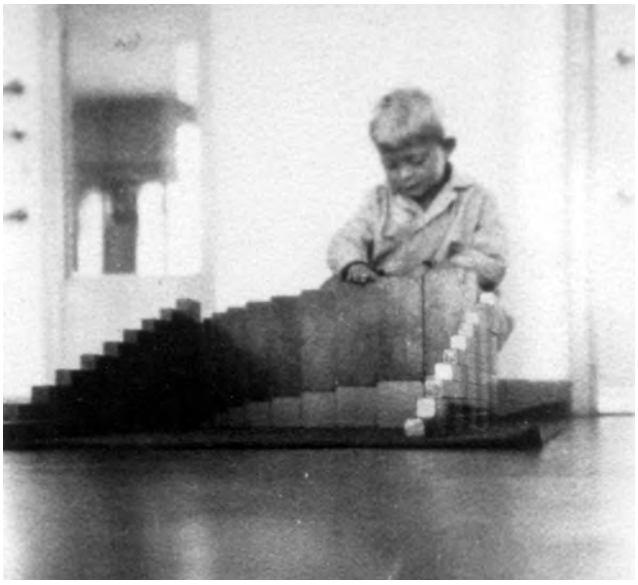
For children who are accustomed to find their materials in plain sight, things which have to be taken from a closed cabinet or from behind a curtain have a special attraction. Toys kept in a cabinet locked with a key have a particular appeal. Most young children are fascinated with a key which they can insert in a keyhole and afterwards return to its hook on the wall. Of course, a key which is so freely accessible to a group of youngsters will sometimes get lost, or be taken home by a child. One may argue: why should the teacher add another concern to her full day? There are so many things children like to play with, would not the teacher do better to concentrate her effort on satisfying the children's emotional needs? We do not say that a pre-school child who has no chance of handling a key is deprived of an essential experience. Yet he

Indoor garden and aquarium, Haus der Kinder, Vienna

does miss something. The more all "perishable" items, anything that can be lost, soiled, or pocketed, are removed from the children's reach, the more grows their destructiveness. The teacher who looks for help in stemming the tide of carelessness which requires "eternal vigilance" on her part, will usually try to eliminate more and more things which can be broken, swallowed, taken home, or ruined in some way. But some times the opposite approach is more helpful; children are delighted when trusted with "special" things.

It should be possible to move almost everything outdoors - chairs, tables, shelves, screens, and easels. Often the children are glad to do most of the moving; after acquiring a certain amount of experience, the planning can be theirs, too.

The teacher needs some place where she can keep things not intended for the children. A regular desk takes up too much precious floorspace. We have found a cupboard receding unobtrusively into the wall a very good solution. In a room for a group of active children, an adult's furniture should not take up space. While we feel this way about a desk, we would like the teacher to have a comfortable chair where she can sit without cramping her knees. Her work is physically tiring. She is on her feet for many hours. A few minutes relaxation in an easy chair can do much to restore her resilience. When she leans back in her easy chair, her eyes are at the level of the children's eyes. She has a better vantage point for observing the active community than when she stands up and "looks down" on them. But the teacher's big chair is even more important as a haven for the children. It is a special treat to be invited to sit there and look at a picture book, or an upset child will snuggle into the chair and watch the others for awhile from a safe distance. As a rule, at first a child is fascinated with all the furniture which is just his own size, but the sight of so many other children may be frightening. In this case the big chair carries the message that there is a comforting adult in the room. A comfortable chair should be part of the standard equipment in a place where children and an adult live so closely together. Of course the teacher will take on her lap a child who asks for this either by word or deed. However, when she is too busy with the group, then sitting in her chair is the next best "Ersatz."



Combination brown stair, pink tower, red and blue rods, red rods, Sèvres, France, about 1936, courtesy Margot Waltuch collection

The room can become the teacher's most valuable assistant. The teacher who wants to give her group a great deal of freedom yet does not want this freedom to degenerate into chaos, and one who wants to make her guidance more and more subtle, will find that time spent with the room and equipment pays ample dividends in improving her work. The teacher has to feel comfortable in the room and it has to satisfy her aesthetic sense. The color scheme makes the room pleasant and cheerful for children and adults. We think that children's color preferences should be carefully studied. Colors certainly stimulate or have a quieting effect. (The effect of colors would be a worthwhile study in an experimental situation where the set-up would allow comparison undisturbed by other factors). Strong colors should be reserved for those things which we want the children to pick up and manipulate, e.g. toys and tools. For tabletops, walls, shelves, and other large surfaces neutral colors are more advisable.

In arranging the room one will, as a rule, put all the materials used at one time in one corner or along one wall; under some conditions a certain amount of decentralization might be preferable. Frequently all the children's lockers for wraps will be in one part of the room. Yet there may be less general rushing and pushing if the lockers are in two places. Experience shows this may also be true for building blocks. When blocks are stored in two distant parts of the room, groups of children playing independently will be less disturbed by one another.

*Outdoor Equipment.* As mentioned before, the playground should be directly connected with the main rooms. The ideal schoolyard offers not only space for running and apparatus for climbing, swinging, and sliding, but also several areas or, as we may call them, "rooms," with varying degrees of openness. The yard itself should either be partly hardsurfaced or girded by a paved walk for tricycles, roller skates, and other wheel toys. The hard surface has the advantage of drying quickly after a rain. It has the disadvantage of harder falls. The ideal surfacing for children's play yards remains to be invented (though rubberized concrete and tanbark are good solutions under climbing equipment). Part of the yard should be shaded by trees. A pavement of bricks of hardwood or rubber is good, but the expense is prohibitive. Children spend long hours at the sandbox and it is desirable to have it shaded in the hottest part of the summer, yet every sand pile must at intervals be exposed to direct sunlight.

In warm weather an area for water play is indispensable. A tube for crawling through and a jumping board are both desirable. New pieces of outdoor equipment are being tested in various housing developments. Some lend themselves to imaginative play. Although a good selection of outdoor equipment is available today, an observant teacher will be able to pass along valuable tips to the manufacturer.

Blocks, pegs, planks, and tricycles are heavy and cumbersome and should be stored directly on the playground. A simple large bin with a padlock will do, yet a child-sized playhouse which the children can use in their play with a storage space on one side is better. The flat roof, surrounded by railings, can be accessible with a ladder.

### Concluding Observations

It seems that the public takes more interest in nursery education than formerly. If true, this may be ascribed to a kind of escapism. That is to say, an audience may be more eager to listen to problems concerning little children to escape temporarily from problems of a badly muddled adult world. We have seen evidence of this interest and we should not let it dribble away in sentimentalities. We must channel it into concrete action to achieve the well planned modern school which can provide an environment which is a complement to the child's intelligence (whether he is three or thirteen) and which can give him the opportunity to develop the independence so needed in our society today.

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*Ms. Peller (1898-1966) founded the famous Haus Der Kinder in the summer of 1922 when she was twenty-three years old and was a close friend of Montessori. Reprinted from* The NAMTA Quarterly *3:1 (1978 Spring), pp. 47-55.*

Courtesy of Tessie Schjetnan, Montessori del Pedregal, Mexico City, Mexico

# Bonding with the Natural World: The Roots of Environmental Awareness

by Louise Chawla

*With delicate literary style and allusions, Louise Chawla combines her ecological research and Montessori background to portray the unfolding of childhood in natural places. Starting with "enchantment with the world" as the basis for nature education for the child under six, the article suggests that the "loose parts" in the landscape that children manipulate and use result in optimal creative involvement. The act of finding favorite places in all weather, combined with the companionship of an adult role model, leads to a lifelong appreciation, concern, and activism for the natural world.*

Coming from Kentucky as I do, I'd like to start with a poem by a Kentucky writer, Peggy Steele. It carries us through the transition from the first delight and excitement about the world in early childhood through a sense of fellow-creatureliness in adulthood. Therefore I'm going to organize my talk around different stages in the poem. Being a poet, Steele didn't have to write chronologically, so I'm going to rearrange her verses a bit in order to follow the stages of a child's growth in sequence. The title of the poem is "Slug."

The foundation of a child's environmental awareness, the absolute foundation on which everything else builds, is *enchantment with the world*. It's the most important quality of all. In the poem, Steele is remembering when she was a little girl growing up in Dothan, Alabama:

> I got up with the light
> because every day was so wonderful
> and my mother gave me new
> shirts that looked gorgeous
> on my browned arms, early, early …

It is not just a matter of her excitement about the natural world. There is also this whole sphere of *the culture of nature*, which makes nature a human space for us. She has that, too:

> I read all the time as a girl
> and thought, "God, I love to farm!"
> "Bookworm!" my family called me,
> not meaning anything good.
> But the land, the land,
> all those writers made
> all their heroes love the land.
> Lost in the swirl of worlds
> that blew up from pages,
> me and Nancy Drew and Scarlett
> O'Hara, and the little shepherd
> of Kingdom Come
> went out back and planted
> a big radish patch at the foot
> of my best climbing tree, our
> curving, friendly mimosa.

She is learning the value of nature through culture. Another very significant piece is a *role model*—I'll be talking more about that—and unfortunately she has a problematic role model. She goes out in the morning:

> . . . early, early,
> and there they were, snails
> with their homes like belly buttons
> on their backs, and slugs, naked,
> snotty-looking, finger-long sons
> of dog turds, eating my garden.
> I picked off the pretty snails,
> carried them gently
> a block away and turned them loose
> on Mr. John's pecan grove—
> he wouldn't let the kids
> have a few pecans each fall.
> But the slugs. Yuk.
> Harry Bedsole said pour salt
> on them. I couldn't, but watched
> while he turned one into a writhing,
> dissolving, suffering slick of scum.
> I opted to take them on cardboard
> to those undeserving pecan yards.

Courtesy of Chris Trostel, Montessori Borealis Public, Juneau, Alaska

She's still a young child, but she's observing the natural world carefully, so I call this *natural sympathy* and *learning to see*. She begins to watch these creatures she's carrying to the pecan grove:

> Even the slug gained in appeal
> as summer passed.
> I saw the coordinated
> ripple along its whole body
> as it moved forward, wrinkling
> a little behind velvet black
> antennae bent like finger
> joints to sniff out the way.
> I grew careful moving their
> green-tinted mahogany bodies
> to places I thought they'd like to be.

Then comes *advanced knowledge*. She is older now, and she's beginning to read about slugs:

> Now I learn that Alan Gelperin, PhD,
> at Bell Lab in Murray Hill, N.J.,
> has spent twenty years on the brain
> of a slug—it's a microchip, he says,
> more powerful than Intel can make—
> the algorithms, the computational
> principles—the slug, he says,
> can smell as little
> as a few molecules of anything
> from ten meters away, and go for it
> on his bellyfoot, food or a mate,
> though its speed is one mile a week.
> Its brain keeps working even
> when removed from the slug.
> Omigod! That little circle
> of greenish scum on the sidewalk!
> Pentium beat the slug only
> in multiplying 12-digit numbers.
> In pattern recognition,
> the slug won, hands down.

When she has crossed the stages of having first been fascinated, to beginning to really watch the slug and imaginatively feel herself into its life, to beginning to feel sympathy for it, to then learning about how miraculous this creature actually is, she reaches the stage, ultimately, where she has a sense of its place in the world in co-existence with her own: *a sense of fellow-creatureliness:*

> But the little mollusk itself
> of the genus Limex
> with no shell to call its home—
> with its foot which is its stomach
> and its stomach which is its foot,
> going toward whatever we plant
> with its prehistoric Pentium
> model mind, knows enough
> to dig beneath the frost line
> in winter and sleep peacefully
> until we plant good things in the spring.
> And wherever we are, it smells
> us out and comes to us,
> no harm intended.

Those are the different stages I'm going to talk about, which we can hold as a model in moving children through their encounters with the natural world. As I go through descriptions of each stage, I'm going to talk about research that indicates how truly vital for children's health and well-being the natural world is. That's what I'm going to emphasize, but of course the other side of it is that it's truly vital for the world we live in to help bring children to that sense of fellow-creatureliness, because the world, this web of life, urgently needs human beings who have that sense of their place in the whole.

### Enchantment with the World

Let's begin with enchantment with the world. I want to emphasize this because I think that, as teachers, you live in a world that puts so much emphasis on factual knowledge in the head. I know that you have all these wonderful principles as Montessori teachers, but nonetheless, you are still surrounded by a culture, and probably often by parents, who are primarily interested in how much their children know and how fast. The fact that Montessori children learn so much so quickly, of course, is one of the amazing and wonderful facets of a Montessori education. But it is important to remember that that is ultimately not what it's all about. What it's ultimately all about is this enchantment with the world. Here's a caution from the writer Barry Lopez: "The quickest door to

open in the woods for a child is the one that leads to the smallest room, by knowing the name each thing is called" (151). All of the nomenclature that you do in the Montessori classroom is one of the wonderful aspects of the Montessori program. It is a room and it is a door, but as Lopez says, it's the smaller room. He continues:

> The door that leads to the cathedral is marked by hesitancy to speak at all, rather to encourage by example a sharpness of the senses.... If one speaks it should be only to say, as well as one can, how wonderfully all this fits together, to indicate what a long, fierce peace can derive from this knowledge. (151)

Even though I talked in terms of stages, beginning with early childhood enchantment with the world and moving to a sense of fellow-creatureliness, each stage leaves an enduring predisposition. You never want to lose this enchantment with the world, and the ultimate goal is to create schools and programs that preserve this as their foundation.

**Nature: A Favorite Place**

Information about children's relationship with nature has been coming out from many studies from all over the world. I'm going to go through some of them that I think are most relevant to you as teachers. One of the things that we've been learning is that children really do feel a magnetic attraction to nature as long as they feel secure and safe there. Traditionally, they have been running out to the woods and into the fields—there is no question it was something children did, and parents weren't afraid when they did it and children weren't afraid to do it. But one of the critical things in this world where we have a fraying web of life is that we have a more and more dangerous world. We also know from research on television that one of the main

Courtesy of Pacific Crest Montessori School, Seattle, Washington

Courtesy of Annie Fisher Montessori Magnet School, Hartford, Connecticut

effects of television is to create what researchers call the *mean world syndrome.* Yes, it is a dangerous world, but the more that people watch television, the more they feel that it is a dangerous world even beyond all the probability of risks actually out there. As you know, we live in a world where television is an overwhelming feature of many families' and children's lives. So not only is the world actually more dangerous than in the past, but there is also a perception that it's even more dangerous than it really is. We also know that children who fear nature will avoid it. But otherwise, children gravitate to it.

There's a wonderful little theory called the Theory of Loose Parts, originated by Simon Nicholson. He was the son of the painter Ben Nicholson and the sculptor Barbara Hepworth, so this is an artist's theory. The theory is that the more loose parts there are for children to manipulate and move, the more creatively they will play. Nature, of course, is the supreme source of loose parts, so it's a landscape children can mold and move. Water, for instance, is infinitely malleable.

When I reviewed studies that observe places that children actually use in comparison to their favorite places, I found that even when children have natural landscapes where they feel safe around their homes, they are never seen to be out there more than about fifteen percent of their time. Even in the best time studies, they're almost always right near home, in the streets and the sidewalks and yards near home—up through the elementary school years. This is where they are within sight and call of their parents, where they can dash inside as they need to. But when you ask them about their favorite place, again and again all over the world, they name natural areas (Chawla, "Childhood Place Attachments").

So why are these places where they actually don't spend so much time so salient to them? Well, for many reasons. A few might include that they can meet friends, explore, get dirty, create new worlds, and find privacy—all free from adult interference. I will be talking about the importance of adults as role models, but one of the great virtues of the natural world is that it's a place where you can go and be *away* from adults. I think that that raises

a question for schools as we have more and more children who don't have access to nature around their homes. We have more and more parents afraid of letting their children go out and explore the natural world around their home. Therefore more and more responsibility falls on the schools to create access to nature, to make those safe natural areas around the school where children can have these experiences and explore. We know from many, many studies working with children in ethnographic ways that one of the great values of the natural world is that you can get away from adults there and make your own worlds yourself. So that raises a problem for the school: How can you be a school that creates access to the natural world and that gives children time to just be in natural settings in their own way? Lots of space, of course, is an advantage, for those of you who have the luxury of farm schools or large campuses, but even small schools can naturalize their school yards. One of the special virtues of the Montessori method is that a teacher learns when to step in and when to step back. In terms of the child's relationship with the natural world, it is particularly important to step back to allow children freedom outside to make worlds of their own.

We also know children have a special attraction to the natural world because when you involve them in design projects they always include natural elements—gardens and trees and natural spaces as something that they especially want to see. There was a very simple little study done by Ménie Grégoire in projects north of Paris. The north of Paris is like the South Bronx. These were children who lived in a concrete world. The researchers first asked them to draw what they see when they look outside the window. And they drew the concrete world: other buildings, roads, cars that's all there was outside the window. And then in a second drawing, they asked the children to draw what they would like to see when they look outside the window. And every single child drew trees and green and flowers and animals.

There's another whole body of studies involving people's place preferences that presents people with slides of different kinds of landscapes and asks them to pick the ones that they prefer. Younger children and adults overwhelmingly pick natural landscapes as their preferred places. Adolescents—this may not be true for Montessori farm school adolescents—but adolescents in the United States overall have what the researchers Rachel and Stephen Kaplan are calling a "time out" with regard to nature. It's not that they don't also value natural landscapes. It's not that they rate them as not liked, but as their first choices they will frequently pick a bus stop where they can get downtown, a mall, a downtown area—someplace where there is a lot of social activity and things to do. But other than this "time out" in adolescence, children overwhelmingly prefer the slides of natural areas.

**Nature: A Favoring Place**

So we know that for children, nature is a favorite place. What we're learning recently is that it's also a *favoring* place, a place that's vitally important to children's health and well-being. We talk about moving away from an *anthropocentric* world view, where we value nature only in terms of its utilitarian value—what we can get out of it. That is one important way of valuing it, but in the end we want to be talking about an *ecocentric* world view, where, again, we have that sense of fellow-creatureliness, a sense of the value of nature in its own integrity. We're also learning that there are *childcentric* reasons to value nature, because it's important for the health of children. I think you are familiar with Rachel Carson's wonderful book *A Sense of Wonder.* It's a classic. She began the latest wave of the environmental movement, and nobody was better qualified to speak than she was, as a great naturalist. I think that it is particularly apt that she wrote this classic statement on the young child's contact with nature. She asks this question: "What is the value of preserving and strengthening this sense of awe and wonder, this recognition of something beyond the boundaries of human existence? Is the exploration of the natural world just a pleasant way to pass the golden hours of childhood or is there something deeper?" (88). She presents her own reasons to value the sense of wonder, and I'll close with those. But we're learning many other ways that she did not yet have information about. She probably sensed them intuitively, but now we have accumulating evidence.

People observing how children play have seen that when they play in green spaces where there are trees and vegetation and water, as compared to built concrete play areas, they play much more creatively. Simon Nicholson's theory of loose parts really does work.

There have been some amazing studies done right here in South Chicago. Those of you who know South Chicago—do any of you know the big housing projects in South Chicago? Well, from a social scientist's point of view, these are the perfect setting for natural experiments. You have these vast tracts of public projects where all the buildings are made according to exactly the same plan. This is an experimenter's dream world. You have a population who are all the same socio-economic class. You don't have to worry about how that mixes up your results. When an apartment comes up, people are assigned to that apartment. The bureaucrat hasn't even seen the place, so it's a totally random assignment. Again, the experimenter's dream world.

Taking advantage of these conditions, Andrea Taylor, Angela Wiley, Frances Kuo, and William Sullivan at the University of Illinois at Urbana-Champaign have done a series of astounding studies. One of the things they've done is to go around and look at people's use of the public spaces there—because there is one thing that varies. Around some of these buildings the original landscaping took hold and the trees grew and they're big, mature trees now and the grass has grown, but around others the trees died and everything was asphalted over. So that is what varies. And they found that, first of all, people gather in the areas with the green, with the trees, much more than in the other areas. They also found that the children in the green spaces play more creatively and interact with adults more frequently and more positively. Another researcher, Mary Ann Kirkby, observed that you're more likely to find play groups of mixed boys and girls in the natural areas of playgrounds.

Research that's been done in Sweden with preschool children studied children in schools that have what Scandinavians call "outdoors in all weathers" programs—and when Scandinavians say outdoors in all weathers, they really mean all weathers. I worked in Norway for two years, and outside the window of my office there was the back of a kindergarten. It would be, from our perspective here, a blizzard, and the children were running around in the snow. The snow would be blowing horizontal and they were having a wonderful time. Of course, if you don't do that, you don't get out very often in Scandinavia. Some of the programs work on the basis that every Wednesday or every Thursday, the class goes out all day regardless of the weather. In other programs, the class spends five days a week outside, so the children are out almost all the time. Patrik Grahn and other researchers in Sweden compared a preschool that had an "outdoors in all weathers" program with a traditional school that had paved cycle paths, built play equipment, and few trees. They found that the children who were outside playing in natural areas had fewer absences and a greater capacity for concentration. They played more imaginative and elaborated games. They invented stories that would go on from day to day in their play, whereas the play in the built area was more broken up and didn't have these sagas, so to speak, that the children developed. Physically, the all-weather children showed better balance and agility on fitness tests (Grahn, Martensson, Lindblad, Nilsson, & Ekman).

We're also learning that for children who face challenges and obstacles—it could be chemical, it could be from the harmful family backgrounds that they come from—nature is healing. The same people who've done the studies I described in South

Courtesy of Pacific Crest Montessori School, Seattle, Washington

Chicago have also begun to do work with middle-class families in Chicago's suburbs with ADHD children (Taylor, Kuo, & Sullivan). Controlling very carefully that all of the children have the same diagnosis for the same level of attention deficit and hyperactivity disorder, they asked parents to keep logs of their children's symptoms and time logs of what they were doing, when they were playing, and where. Then they had students in landscape architecture go around and rate the levels of nature in these play spaces. Then they put the two records together. They found that the more time children were playing outside in green areas, and the greener the areas according to the landscape architecture students' ratings, the more likely it was that their parents' logbooks recorded a lower level of ADHD symptoms following their play.

There is a doctor, Aaron Katcher, who has been working with clinically aggressive children who come from homes where they've been exposed to high levels of aggression or high levels of neglect. These are abused children. He has created programs where they take care of animals and gardens. The transformation that he records—in Montessori terms, the normalization—of these children under these conditions is remarkable. Each child is responsible for an animal. The children really take to heart that they need to take care of these animals, that the animals need them. And so they feel that they are doing something meaningful.

When I was in Norway I worked on a study about a city farm in Trondheim. City farms reflect a European belief that all children should have access to farm life on a child-friendly scale. We observed elementary school children coming to visit this farm. We interviewed the farm manager and teachers: What were their goals? What did they want the children to be taking away from their visit? The farm manager wanted the children to have a good time and just have happy associations with farm life. The teachers wanted the students to learn something: How many stomachs does a cow have, and what kind of food does each animal eat? But when we interviewed the children, they thought they had come to the city farm to take care of the animals. They thought that if they hadn't come that day, who would have fed the animals? Who would have cleaned out their stalls? They took their caretaking seriously.

### Role Models and the Culture of Nature

Another significant piece is role models and the whole culture of nature. You probably know this often quoted statement by Rachel Carson:

> If I had influence with the good fairy who is supposed to preside over the christening of all children I should ask that her gift to each child in the world be a sense of wonder so indestructible that it would last throughout life.... If a child is to keep alive his inborn sense of wonder without any such gift from the fairies, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in. (42-44)

We have studies coming in from all over the world that demonstrate the wisdom of her insights. Researchers have approached teenagers in environmental clubs who have made an early commitment to environmental activities, as well as adults who have spent their lives as environmental activists or environmental educators. When asked about the significant life experiences that motivate them to do this work, two things come out overwhelmingly again and again. One is that there is this place I knew in childhood (Chawla, "Significant Life Experiences Revisited")—and the teenagers even say that now. In a study with teenagers by Daniel Sivek, they talked about a childhood place, a special place that they had when they were younger. Sometimes people find a special place in adolescence, such as a favorite hiking trail, but whenever it is discovered, it is some place in the natural world. Then they talk also, again and again, about some special person who showed the value of natural places (Chawla, "Significant Life Experiences Revisited"). There's a researcher, Robert Bixler, who has a nice term for these sources of connection to the natural world. He calls the accumulated time spent outdoors playing in natural areas "outdoor capital." He also emphasizes the importance of a role model who involves the child in a process of "environmental socialization," because he and colleagues have done a study with middle school and high school children that has shown that playing outdoors in nature, by itself, doesn't mean that children will necessarily care for the natural world. They could want to be off-road vehicle drivers. You need to put the two pieces together—being outdoors and having a role model who demonstrates the value of the natural world (Bixler, Floyd, & Hammitt).

There are studies of elementary school children that rate the children's environmental attitudes. The more that children report playing in natural areas—the more they say they do things like taking care of pets and hiking and camping with their families and so forth—the higher they score in terms of pro-environmental attitudes. There was a wonderful study that a landscape architect, Margarete Harvey, did in England. She went around to schools with the same socio-economic population and simply counted the number of trees, the variety of different species of trees and bushes, and the nature areas, like birdfeeders and garden beds and rain gauges and so forth, in the schoolyard. She found that the more trees and the more evidence of nature activities there were in the schoolyard, the higher the children scored in pro-environmental attitudes.

We also know that books and TV programs about nature can be positive environmental influences on people. In research on significant life experience, they come way down the list after the two most frequent responses—a significant person and a special place—but they are also important.

### Learning to See and Natural Sympathy

Here again are the words of Rachel Carson, returning to the theme that, yes, facts are important, but never forget that enchantment with the world and sense of wonder come first:

> If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow.... It is more important to pave the way for the child to want to know than to put him on a diet of facts he is not ready to assimilate. (45)

This principle reminds me of a story that Miss Margaret Homfray told about the St. Nicholas School in London, when a classroom was invaded by ladybugs. The children were stomping on ladybugs everywhere they found them. The teachers kept saying, "Don't stomp on the ladybugs. Please don't stomp on them!" But the children kept killing them. So the class started to study ladybugs. This was a subject that was literally in the air. The children learned the life history of ladybugs. They learned that ladybugs eat aphids and farmers love them. They learned stories about ladybugs in different cultures. They made model ladybugs with shiny outer wings and tissue paper for the inner wings. And nobody stepped on a ladybug anymore. The teachers no longer had to say, "Don't step on the ladybugs." None of the children would have thought of doing such a thing. Instead, they got down to the ground to observe the ladybugs carefully and see whether they really did these things that the children were learning about.

So learning to see is vital, and you can see the teacher forming the bridge there. That's the role of the significant adult. People rarely remember a significant person as one who says, "You need to protect the environment; the environment is important for all these reasons, so you need to get out there and protect it." That's not what they say. These are people who notice things, who look, who watch. They say, "See this." They show things in the natural world. They validate that it is something worth noticing and worth letting be in its own sphere of existence.

Courtesy of Montessori Center School, Phoenix, Arizona

### Advanced Knowledge

Rachel Carson leads us into this form of connection as well: "Once the emotions have been aroused—a sense of the beautiful, the excitement of the new and the unknown, a feeling of sympathy, pity, admiration or love—then we wish for knowledge about the object of our emotional response" (45). There are different kinds of knowledge in terms of helping to foster in children ecocentric values and a sense of stewardship for the environment. Yes, environmental facts are important. A research review by Mark Rickinson has shown that children who know more about the environment tend to value it more. Even in studies with urban children who have little access to nature, those who report having more environmental education in their schools also report doing more environmentally friendly things.

But we know there's another really important piece here: This knowledge needs to begin with the local environment, the world that the children are familiar with, that they see around them, where they can have a positive effect. David Sobel has coined the wonderful word *ecophobia.* His rule is "no tragedies before fourth grade." He warns that teaching about big, unmanageable, potentially catastrophic environmental problems out there can actually be damaging for young children unless you have this foundation of first beginning with learning about the local world where they can have a positive influence. Eventually, when they are adults, we hope they can have a positive influence even on the global scale. But they need to begin with the local.

Another critical piece of environmental learning is learning the skills for taking action. We know from all of the studies on the sense of competence that there are many pieces here. First of all, children—and adults, too—must *want* to act, so they must *want* to care for the environment—and the emotional foundation is motivating that. They need to know *how* to act, and they need to *believe* that they can take effective actions and that their actions can really make a difference.

I'm the international coordinator of a project for UNESCO called Growing Up in Cities, which has produced many examples of children's contributions to community development. As part of this project, children in one of the poorest districts of Buenos Aires, Argentina, participated in a curriculum called The Neighborhood as a Child's Habitat, which was created by the landscape architect Robin Moore and his Argentinean partner Nilda Cosco (Cosco & Moore). It included, in the end, doing something in the local environment to make a better world for themselves and other people. In a couple of the Buenos Aires neighborhoods, this process involved taking a vacant lot with the goal of being the catalyst to bring community groups together to turn that lot into a functioning plaza. Through these kinds of projects, children learn that they can make positive changes, and that's a vital piece of knowledge.

Ultimately our goal is that children reach a biospheric or ecocentric world view that includes a sense of fellow-creatureliness. Some relevant research has been done by Wesley Schultz, a social psychologist in California. He showed two groups of people slides of animals, including some pictures of animals being harmed by the effects of human actions, such as a seal caught in a fishing net and an otter in an oil spill. Before people viewed the slides, they were given two different sets of instructions. Half of the people were told to make careful observations, but as objectively as possible, taking a neutral perspective. The other half were asked to imagine how the creatures in the pictures felt—to think about their reactions and try to take their perspectives. After people had viewed the slides, they completed an environmental attitude questionnaire. Those who had been asked to take the animals' perspectives scored significantly higher for biospheric concern. Considering that this was one short intervention, we can speculate what the effects will be when teachers ask children to imaginatively inhabit other creatures' lives over the extended period of a school year.

Children have a natural sympathy to identify with individual animals and creatures, given that inspiring role model who shows them how to see, how to really look and see. But how do you go from there to valuing whole habitats—in some ways a much more abstract idea? Beginning with the local, beginning with what's in their schoolyard, beginning with the individual creatures, that is the way to begin. But then we have to move from there to an understanding of how these creatures depend upon whole habitats, whole ecosystems, whole webs of interdependencies in which we are just one part, which we need to

share with all the other elements of the web of life. To go from individual creatures to respect for whole systems, that's a bridge. That's a bridge people don't cross automatically. I think that's a vital bridge that teachers need to help children across.

In closing, I'll give you Rachel Carson's own answer to her question about the "something deeper" in addition to just the pleasure of encounters with the natural world during the golden years of childhood: "Those who contemplate the beauty of the earth find reserves of strength that will endure as long as life lasts" (88). Her intuitions were completely right. There is a body of research now that I reviewed in a recent book chapter (Chawla, "Spots of Time") that shows that when you ask adults what these childhood memories of that special place meant to them, people say most often that it left a center of calm and stability that they turn to in moments of emergency, a reserve of calm that they can draw upon.

A woman named Anita Olds, who designed spaces for preschool children, did a workshop exercise and systematically kept records of the responses of more than three hundred people. She first asked people to think back to a place where they or someone close to them was wounded, either a physical wounding or a psychological wounding. She gave them time to imaginatively recall that place. Then she asked them to imagine a place for healing from that wounding. And for more than three hundred people, every single place of healing was a natural place. Occasionally it was an indoor/outdoor space, a room with a big window out to some beautiful view or out to a patio with plants. But always, nature was there in the healing place. She makes the argument that the raw materials for these memories of nature as a place we can return to internally as we need it, our ability to imagine it and reinhabit it, comes from the vividness of the child's early encounter with the natural world and a child's special way of knowing the world, when it is all enchanting.

### Questions and Answers

***Q.*** *In the city farms that you mentioned, has any study been done on the long-term effects of that within the population itself, for the adults who live in that city?*

**A.** I haven't seen that coming out, but it would be very difficult to do because the farms are just there. They're there for children in the neighborhood, like little toddlers and their parents, to just come through. So they're open for one and all; there would be no control group that didn't have access. Some farms do have neighborhood committees where families can become members and sign up to come in at certain hours and help maintain the farms. And there is always at least one paid staff person. So those would be the families most intensively involved, but the farms are open for everybody at all times to just come through. So it would be hard to know who has and who hasn't benefited.

***Q.*** *For the outside-in-all-weathers classes that you observed in Scandinavia, were children playing freely or did they have structured time outside?*

**A.** Both. Some of these really are outside schools, where the children spend almost all their time outside. There are all kinds of structured activities, where the children learn about ice fishing and berry picking, and they learn about berries and they learn about fish and they learn about historical skills and jobs and Norwegian culture and the stories and folklore that go along with that. So as in a good Montessori program, that's all woven together with the use of the outdoors. And then some schools use it more as just an outdoor play space, those who are not out as much and still primarily use the indoor classroom for other activities.

***Q.*** *In all the studies that you mentioned, I guess they all put forward the positive ecocentric values that the natural world brought out in the children. Did any of them say why the natural world evokes this response from children and from adults as opposed to the concrete jungle that most of us reside in?*

**A.** I think we're only beginning to reach that. Stephen Kaplan and Rachel Kaplan, at the University of Michigan, have led the study of people's preferences among slides of different landscapes. Stephen Kaplan has proposed that nature is a restorative environment because it is mentally tiring for us to focus on non-natural things, whereas—and there are a lot of studies also with adults showing this—when people are in natural environments, that is somehow restful. It's restful in physical terms and restorative to our mind and to our powers of concentration. In the Swedish preschool study, for example, one of the things they observed was the children's power of concentration (Grahn, Martensson, Lindblad, Nilsson, & Ekman). And concentration was also, of course, a big dimension of the study with the ADHD

Courtesy of Chris Trostel, Montessori Borealis Public, Juneau, Alaska

children (Taylor, Kuo, & Sullivan). These researchers put it in terms of Stephen Kaplan's theory that nature is a mentally restorative environment, particularly in terms of our human powers of concentration. Why, exactly—people haven't gotten that far yet. But observing and testing how people concentrate in natural versus non-natural environments, yes, they're seeing that much.

***Q.*** *I'm experiencing in the past year or so a tendency for parents to be more reluctant to let their children have this extended play free of adults. They want to be there, which totally destroys the freedom and initiative of the children to do their own things.*

**A.** Very much so. As I said, I think schools seriously have to accept that they have yet one more responsibility on their shoulders now, and that is ensuring that children do have secure access to free play in the natural world. They can no longer assume that children are getting that in their play when they go home from school. We know that a lot of children, more and more, are not, exactly as you said. Unfortunately parents haven't had the Montessori training, and they don't know when to step back and not interfere.

***Q.*** *Could you comment on the bridge a little bit? I know it's probably when you go from local to global or local to cosmic. How would you encapsulate that bridge in one minute or less?*

**A.** I think it's a basic issue. The world is filled with people who care for their individual pets, care for their individual gardens, and don't go any further than that. And so with the children, too: As they care for individual animals in the classroom and care for the garden space and the outdoors around their classroom, the plants in the classroom and so forth, they won't necessarily cross that bridge themselves. So it requires a conscious effort, bridging by the teacher, to place those animals in their larger habitats, to move from the individual, as I said, from the one to the whole, to a sense of that creature's life or that tree's life within the whole ecosystem, the whole habitat and how every element within that habitat is necessary to the whole. Of course, one wonderful way to do this is with

migrating animals: monarch butterflies, birds, creatures that move through habitats. Then you can begin to move from the local to the global. Each of these dimensions of environmental awareness is an essential piece, and I think that's where advanced knowledge is an essential piece.

On the frontispiece of his book *Growing Up Green,* David Hutchison adapts those wonderful chapter titles from Montessori's *To Educate the Human Potential:* "The six-year-old [is] confronted with the cosmic plan. The universe [is] presented to the child's imagination." I think it's so important that Montessori didn't say that the universe presents itself to the child's *knowledge:* She said the universe presents itself to the child's *imagination*. And that's what Wesley Schultz's research about imaginatively taking the perspective of another creature is showing.

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Hand washing on the patio, Sophia College, Bombay, around 1942

# Exercises of Practical Life: 3 to 6 compared to 6 to 12

**Kodaikanal Advanced Course, India, 1943-44**[1]

**Lecture 76**[2]

by Mario M. Montessori

*This simple, first-published article by Mario Montessori was written in Kodaikanal, India and reveals a great Montessori truth that has never been so explicit: there are developmental stages for practical life that cross over into nature study and living experiences. Although more abstract, the second plane has a strong practical life component that connects the six- to twelve-year-old to the real natural world. This emphasis on the second plane makes an even stronger, more unified connection between the developmental continuum that is completely embedded in the natural world before and after elementary.*

**Exercises of Practical Life**

There are parallel exercises between those in the House of Children and the children between the ages of 6 to 12 years.

| House of Children, 3–6 years | Elementary, 6–12 years |
|---|---|
| 1. Care of the Person and Care of the Environment | |
| (a) Hand washing | (a) The systematic care and washing of the feet, as a preparation for hiking |
| (b) Learning to dress and undress | (b) How to wash, iron, fold and mend clothes, sew buttons, remove stains, and make emergency clothes |
| (c) Putting everything back in its place, replacing insets back in frames—all the exercises in exactness | (c) Preparing parcels, placing everything so that they take the least possible space and make it easy to carry. The easiest way to carry something heavy is to carry it on the shoulders or around waist. This gives no fatigue. Strap the baggage to the body. Carrying with the hands is very tiring. |
| (d) Observation of complex actions shown with analyzed movement so that each motion is done with exactness | (d) *Exercises in Provisions*—Put the things to be used first on top. This is preparation for going out for a night or for a few days so that it becomes imprinted in the memory. Think of every action in sequence and arrange things carefully. |

[1]The 1943 Advanced Course in Kodaikanal is universally understood as having been the seminal moment in the development of the Elementary Montessori curricular framework, i.e., Cosmic Education.

[2]As you see, this is a synopsis of a lecture and not the lecture itself. When Maria and Mario Montessori gave an International Training Course, such as the Kodaikanal Advanced Course of 1943-44, there was often an approved synopsis printed and distributed to the students as a help for their study. Most of these only exist now as faded artifacts, having been printed by a mimeograph (inking) technique.

| House of Children, 3–6 years | Elementary, 6–12 years |
|---|---|
| 1. Care of the Person and Care of the Environment | |
| (e) Observation of the environment and orientation in time; to know the daily division of work | (e) To observe practically and scientifically distances, and climates; to track the apparent path of the light of sun, possibly by instruments, and to orientate by sun and stars. The art of tracking back your way in a forest. Using a sundial in the open to tell time from the sun.<br><br>*Forest Sense*—One may or may not have acquired a sense of direction; It is acquired when one is small. Trees have one side covered with moist greenery with the other side barren, depending on the direction of moist wind. Orienting to one's position and direction using a pocket compass. |
| 2. Social Relations | |
| (a) How to greet each other, to be polite and mannerly | (a) *The Moral Field*—Special social behavior and special social rules:<br><br>1. To respect old people;<br>2. To help the weak;<br>3. To care for the wounded;<br>4. To help generally;<br>5. Respect the animals and plants in the place we go through;<br>6. Not to try always to be the first;<br>7. To avoid useless discussion;<br>8. To withstand with dignity one's own failures;<br>9. Not to whine or to grouse. |
| (b) Development of *obedience* and the habit of decision based on the conscience of the individual | (b) Development of the sense of faithfulness and fidelity. This leads to fulfillment of aims and collaboration with many acting cooperatively. Energy becomes multiplied in the collective effort. *The social instinct* is satisfied. Discipline becomes a social science. |

Children serving soup, Laren, Holland, 1940, courtesy Margot Waltuch collection

Children silver polishing. Laren, Holland, about 1938, courtesy Margot Waltuch collection

Preparing a new garden after the war, Paris, 1918

| House of Children, 3–6 years | Elementary, 6–12 years |
|---|---|
| 3. Movement | |
| (a) Analysis of movement. One acquires perfection of movements by eliminating unnecessary movements, which gives elegance. | (a) Analysis of one's thoughts, words, and impulses. These must be controlled by the mind. One must not offend another person. Do not contradict another or use violence. Games of mental control should be practiced. Not to take part in what others are doing when there is no need to do so and not to get in the way of others. |
| (b) Walking on line | (b) Disciplined marches (this teaches order and the synchronization of movement). Rhythmical songs should accompany these marches, as the boredom of the forced march tires much more than physical fatigue. It is the spirit that gets tired more than the body. Remembering the rules of the road. When camping out, religious songs come out automatically, especially when it is dark. This affects all people, especially primitive ones. This is one exercise for the children at night. |
| (c) Silence lesson | (c) To keep perfect silence by perfect immobility and to know the different sounds of the environment, especially at night. The stars and the moonlight help the children to meditate. |

| House of Children, 3–6 years | Elementary, 6–12 years |
|---|---|
| 4. Exercises of the Senses of Smell and Touch | The corresponding exercises are very vital to the spiritual life of the child. Walking by night with grass or rock under one's feet, walking astride on a narrow path, walking without making noise, not to strike on the heel, or press on the toe but to walk flat, on the middle of the feet, bending slightly forward at the knees (this distributes the weight of the body and thereby lessens fatigue). Walk with toes slightly pointed inwards (the Native Americans[3] are great experts in proper walking). Learn to walk in a forest without disturbing twigs; if the path is narrow, then walk sideways, stepping from rock to rock. Go up or down hills with sideways steps, putting legs into the hillside sideways. (This gives a cutting edge and also the leg cannot bend sideways.) Recognize the sound of water and judge the height of a waterfall if near it in dark. Finding one's way in dim light.<br><br>*Use of hands:* This is very important in going through forests and in hill climbing. To be able to hang on three fingers, flatten and hug against a rock wall to put as much friction as possible between you and a fall. Learning to get a firm grip. Learn to pull one's self up by the arms only as the feet are apt to slide.<br><br>*Use of rope:* To be able to use it vertically or sideways. When using a rope sideways, one must be on the inside of the rope between it and the wall, holding the rope with both hands. If the rope is taut and the individual slips and falls, he will fall against the rope, which will support him and stop him from falling down the precipice. In the case of vertical climbing, the child should be taught to place the feet against the wall and walk up holding the rope tight. This is not at all tiring and it is like walking on level ground. This gives good leverage and is an impetus to overcome gravity. The feet must be used and not the knees.<br><br>These things should be done as a preparation for an outing: scaling a wall, throwing a rope (tie an iron ring and throw it, jerk, and set the ring), getting dry wood down from a tree for fire, etc. |
| 5. Exercises of Order: Putting Everything Back in Its Place | Learn everything: Learn to leave things as found without leaving any mess behind. Leave not a trace when striking a camp. Learn to cut turf as a square or a circle, lifting up the whole turf. Leave the ashes and rubbish in the pit and cover it up with earth and the turf again. Respect the purity of water. |

[3]Montessori used the term "Red Indians," which has since fallen out of favor and is now viewed as a pejorative. In 1943, however, this terminology was socially acceptable. "Red" was used to distinguish American "Indians" from East Indians, or people from India.

| House of Children, 3–6 years | Elementary, 6–12 years |
|---|---|
| 6. Gymnastics: jumping, climbing up small trees, cycling, swimming | Climb tall trees or high rocks with the help of ropes, pole vaulting, technical swimming (different strokes), rowing boats and canoes. Swimming must be compulsory as otherwise they will lose all the fun of the excursions. The school must prepare them for these outings and the preparation must be intense.<br><br>Where possible, ice-skating and roller-skating must be taught. Different kinds of sport such as boxing, target shooting, fencing, all athletic games, stick, javelin, dart, and disc throwing, cycle racing, riding, jumping over hurdles, driving horses (facing the tail of the horse), driving cars, pitching tents, taking them down and packing them up, making parcels, loading and unloading animals. The latter is an art for if there is no equilibrium the animal will unload itself, especially if it is a donkey! Laws of gravity, the triangle of forces and other such scientific things must be taken into consideration.<br><br>Learn to light a fire especially when it is raining (during rain make the fire big enough). If there is a huge fire, then the raindrops cannot reach it as they will become vapor before they reach the fire. For this, a large amount of wood is necessary. This is a secret of the Native Americans.<br><br>Improvise plates for eating, to make and create a place for sleeping on ground. The cowboys make a pit in which they put their bottom while sleeping and they are comfortable for the whole night, that is, if the ground is not damp.<br><br>The child should learn how to lay a trail for others. One of the ways is to push the plants down on either side with the feet. To build a raft for crossing the river—this has its own technique. If two trunks are put together they float and the space in between is to be filled up with another. They should learn how to build shelters from rain, build permanent shelters, build bridges, and gauge distances.<br><br>Children should be taken on one or two trips in the year. Everything should be planned out beforehand, the itinerary, the expenses, timetables, and so forth. On these trips children will put into practice what they have learned, their knowledge of plants, animals, the lives of the insects and observation of nature in general. They can also collect specimens, biological, botanical, and their collections may be for the school, the house or the museum. They can observe facts of geography and collect geological specimens. They should observe the animals in the zoo and on the farm, visit botanical gardens, see how the cattle are looked after, know how to fish, go to historical places and also see the pre-historical excavations in the neighborhood, if any. |

| House of Children, 3–6 years | Elementary, 6–12 years |
|---|---|
| 6. Gymnastics: jumping, climbing up small trees, cycling, swimming, continued | Children between the ages of 10-12 should visit the places of work and production, i.e., industrial centers and factories to see how the minerals are extracted from their ores and to come in touch with the products of civilization and learn under what conditions man produces different articles. To live with commercial fishermen and help them in their work, and to do the same with the miners. To visit farms where agriculture is carried out scientifically, to visit printing presses and to see how the dailies are being printed and distributed. To visit the centers of exchange and trade, to clock the arrival, and loading and unloading of boats in the harbors, to travel in bullock carts and boats, to row and to be towed along.<br><br>All this is directed at helping the individual to prepare for the period of rest between the ages of 12 and 14 years. This helps the child to gain an intimate contact with the world. The child must explore the social conditions of man and the different aspects of society and of nature. |

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*Dr. Mario Montessori (1898-1982), son of Maria Montessori, dedicated his life to the preservation, dissemination and application of Montessori's works.*

Child washes cloths for classroom which over the next several days will be sprinkled and ironed, folded and put away, Sèvres, France, courtesy Margot Waltch collection

Courtesy of Prairie Hill Learning Center, Roca, Nebraska

# Ecosystems in the Backyard: Preparing a Diverse Outdoor Environment for Primary (Ages Three to Six) Children

by Mary B. Verschuur

*Mary Verschuur chronicles the outdoor work of Lincoln Montessori School in prairie, forest, and indoor greenhouse environments, pointing out the application of the prepared environment principles to the natural world. Implicit to the design are opportunities for caring, including various practical life exercises with outdoor tools blended into each habitat. The repeating cycles of nature and its seasons are part of the yearly cycle of children in multi-age groups, adding to sensory richness and hands-on tasks. Lincoln Montessori School demonstrates how schools can model simple and well-thought out solutions with minimum expense and maximum engagement.*

*It is impossible for children to value ecological systems until they know that they exist.*
*—Louise Chawla and Roger Hart*

The yard surrounding Lincoln Montessori School (LMS) is not a vast one. The school is built on two lots, and an adjacent vacant lot was purchased shortly after the building was completed. This is not a large area to accommodate great eco-diversity, yet within and without the Children's House and grounds, three distinctly different plant environments have been established, each in keeping with the size and experience of three- to six-year-olds.

Nebraska is not an area of the country that lends itself to using the outdoors as an extension of the prepared environment. It is not feasible to expand the classroom to the patio or to take one's work outside during most of the school year, but the climate is not so severe as to preclude outdoor play or activity throughout most of the year—with the right clothing. Integrating the outdoors with the indoors is challenging but not insurmountable in such surroundings.

An outdoor environment, even for play, requires preparation, but to concentrate solely on a playground is to ignore the vast potential and unaffected diversity that comprises the world of nature. It is infinitely more complex to plan an environment that is aesthetically pleasing yet offers opportunities for play and for experiential outdoor learning as well. Diversity "provides increased play options for children—enabling playing and learning to be more closely linked" (Moore 98). It also offers places where spontaneous exploration and observation of plants and nature in different habitats can occur. Arousing interest in the world of nature through providing outdoor spaces where a person can observe and engage in meaningful activity is sensorial and practical. It is the very first step in discovering nature and one that is entirely appropriate for children under six. The appeal of offering the children more than a mere playground prompted the creation of two outdoor and one indoor micro-ecosystems that make available to the children at LMS (exclusively a Primary program) opportunities for a wide variety of ecological experiences.

The three environments thus developed are a prairie, a forest, and an indoor addition to the school building that is a sunroom turned greenhouse, where tropical plants, cacti, and the children's own plants can be grown and nurtured, even in the coldest weather. Each space has its own character and its own function, and each nurtures some distinct plant life as well as particular plant growth patterns. The environments support an abundant insect life, not to mention birds and small animals. The three areas are relatively small, making them manageable for those who use them, and all are in close proximity, allowing the children to experience and to examine one or the other in minute detail or

to make comparisons among all three. This level of sensorial exploration is appropriate and practicable for three- to six-year-olds.

There are rich layers of reality just waiting to be discovered in nature if we take the time to observe all of them. There is order, structure, and repetition in nature. There are plants and seeds, flowers and leaves, birds and insects, all waiting to be noticed if we provide places and spaces, not just for children, but for everyone to do so. What follows is a description of a plan of action implemented at one Montessori school to prepare a diverse outdoor environment.

### The Prairie

The prairie was the first setting to be developed and was the brainchild of the school's director, Larry Verschuur. Having grown up in a small town on the edge of the prairie, Larry had more opportunity than most to experience the emptiness of the plains and the lure of "wild places." The vacant lot at LMS was obviously an open space that lent itself to development, and here the prairie environment evolved. Earth was moved in and contoured to fashion several rolling hills separated by small valleys. Buffalo grass, a native prairie grass, was planted across the lot. The hills were left, for the most part, treeless—just as the prairie might have been long ago. The prairie grass is only occasionally mowed, so it remains soft and resilient when the children roll down the slopes or gather around "campfires" in the valleys.

A small grove of trees in one hollow was left to become what the children make of it from day to day: a house, a den, or a place to hide and seek. A natural climbing tree on the south side of the lot remained to provide a climbing structure. These formed the nucleus of what then became a natural playground where creative play evolves.

It may sound a bit desolate, much like the virgin prairie must have been, but anyone who has observed children will be well aware that the most common play props used by children are those items found on the ground. Foraging is a natural instinct, and the sticks, twigs, nuts, leaves, flowers, rocks, and even trash discovered lying about are often gathered and used in play. Additionally there is a frame set off in one corner and a number of loose boards with which the children can build or deconstruct a house. There are large stones that can be moved from place to place to create a structure or a gathering place, and there is always room for a ball game, the hills and valleys offering little resistance to an energetic four- or five-year-old. Sliding mats can be brought out in winter and glide safely down the low hills, and when an occasional tree falls over, as one did once, it can remain in situ for several years, serving as a ship, a balance beam, and a seat for adults and children.

The wide-open space of the prairie invites plenty of creative play. Through their games and their treks across the grass or up and down the hills, the children come into contact with many of the basic elements of the natural world. There are rabbits, squirrels, and ground squirrels scampering about, digging and burying their treasures in holes they make in the ground. There are ants and a myriad of flying insects hovering above the warm grass. The full force of the unshaded sun and the unusual feel of the prairie grass can be experienced by the children, as can the shelter found in the valleys on windy days. In contrast, they can savor the strength of the wind by standing atop one of the hills. All of these experiences offer a distinct contrast to the adjacent woodland forest, where trees and wildflowers preclude running about, where bushes cut the wind and foster a diverse plant life. The forest is a place to hide and to be alone, to watch birds and insects, and possibly to meditate.

Courtesy of Lincoln Montessori School, Lincoln, Nebraska

### The Forest

The forest at LMS came into being largely through the effort and generosity of a family whose child attends the school. Richard Speidell credits his enthusiasm for trees, plants, and the outdoors to his experience in the nursery. His nursery, however, was not his childhood bedroom and changing area but rather his father's tree nursery! (Roger Hart, who has studied and written extensively about children and outdoor environments, reports that he was also the son of a nurseryman [Hart 64].) Richard began to spend his summers at the tree farm as soon as he was old enough to ride out to work with his father. Although he had chores to do around the nursery, the expectations were reasonable and he always had the time and the freedom to explore the places that comprised his private jungle. There were growing trees everywhere, some large ones and others just getting started. There were busy places where pruning and planting were in progress, and there were quiet corners where he could get lost or sit silently and observe the sunlight on the leaves and grasses or the birds and insects going about their work.

The forest at LMS, for which Richard donated many of the trees and shrubs (not to mention labor), has become the second eco-environment at LMS.

Courtesy of Lincoln Montessori School, Lincoln, Nebraska

Richard's goal was to create a natural environment where children might learn through observation, discover through exploration, and come to know some of the natural world, not by being told about it but by being active in it.

The forest encompasses many of the settings described by Robin Moore in his 1996 article in *The NAMTA Journal*. It is separated from the prairie by a series of vertical tree forms that create a "wall" through which a "gate" or entrance marks the transition from playground to forest. There are primary and secondary pathways and changes in the topography occasioned by a variety of ground coverings.

The forest space has an inherent structure and order, similar to that of the indoor classroom. It invites observation and repetition of the activity as each child explores. The paths and plants define the structure, the cycles of nature the activity. Low branching trees and those that sprout from their stems are designed to attract the smallest children. Taller trees offer varieties of shade and shelter. Plants that look alike can be closely inspected for subtle differences. Wildflowers on the forest floor are not only aesthetic but attract all kinds of bird and insect life.

The goal has been to provide a rich diversity of species within the plant life and to use plant regimes to create micro-climates in small areas. For example, a child might experience the different effects of shade by hiding under small bushes and then hiding under a large tall tree. Through this encounter, the child is offered the chance to discover the effects of shade and shelter by way of practical awareness.

Care of the environment is an important aspect of any Montessori classroom, and just as the children mop up spills or sweep up crumbs inside, the outdoor space requires its own kinds of care. Pruning dead heads off the wildflowers, pulling weeds, raking, and clipping offer practical life activities to the children. Lessons about the care and use of the tools that facilitate this work are presented just as are the broom and the mop in the classroom, and all the tools have appropriate storage places to which they can be returned after use. The seeds, leaves, and wildflowers provide materials for flower arranging, leaf pressing, and seed sorting and classification, allowing the children to gather and to bring their outdoor work indoors.

The permanency of a year-round prairie and a forest close at hand and accessible to all ensures that the children have opportunities to experience the seasons and other cycles in nature that come only once a year. Because the Montessori philosophy espouses the ideal of children remaining in the same prepared environment over a three-year period, the children can grow in their experience of the outdoors. The materials are there for them to use and to come back to as they mature. The sensorial encounters of the three-year-old among deciduous and coniferous trees can provide the practical experience upon which to build a botany lesson or one about climate for the six-year-old. The ant or ladybird crawling up a four-year-old's arm provides a living model for the study of the parts of an insect at a later stage. In using the spaces, each child is allowed to choose, repeat, and concentrate according to his or her own age, experience, and interest. The principles of the indoor environment transfer fully to the outdoors.

### The Solarium/Greenhouse

Although the sun room was not designed specifically as a greenhouse or even as an environment for the children's use (it was to be an extension of the small office space), it quickly became a plant place of yet another sort. Full-length windows on the north, east, and south sides of this twelve-by-twelve addition to the school building made the room an attractive place for plants, especially when the weather got cold and they had to be brought inside lest they freeze. In addition, a friend who raises exotic and tropical plants had some cacti that had grown too tall for his small greenhouse: "Wouldn't we love to put them in our sun room?"

The greenhouse simply evolved and is the most recent and unplanned of the plant environments. It is tropic and desert all rolled into one. It is heated by the sun all winter long and supports unusual plants that are of great interest to the children, who come in to feel the prickly cactus needles or to admire and sometimes pick an exotic flower. The plants need relatively little tending other than watering and a certain amount of cleanup when they shed blossoms or leaves, and the older children have taken these chores into their stride.

There is less insect life in the sunroom than outdoors, although spiders do seem to find their way in and have built some fascinating webs between the plants. What has become equally exciting to the children is the effect of the sun as it moves across the sky and changes its angle of direction in the course of a day and in the course of a season. Through observation the children are introduced to the rotation and tilt of the earth in a purely sensorial and experiential way. They also observe the effects of clouds passing before the sun and feel the climatic result of a day without sunshine.

On a more practical level, the greenhouse has allowed the children to engage in planting activities all year long. Seeds and cuttings flourish in the sun-filled room, and the tender plants are nurtured in a special place, off the beaten track, where there are fewer little hands fingering the seedlings. Flowers can be raised during the winter and early spring. Later these can be planted in the flower bed outside. In fall, the seeds are gathered from the dead flowers and the cycle is begun again for the next year. This is something that we had always tried to do in the classroom, but the extra-special environment of the greenhouse has provided a much less risky control of error.

### Conclusion

Maria Montessori pioneered the concept of a prepared environment as an aid to development. She advocated that that environment match the child's needs so that the child's energies and interests become focused. With motives and means for purposeful activity at hand, the adult can step back and allow the child the freedom to discover by doing things for him or herself.

The three botanically and biologically diverse micro-settings that have been described here do just that. They extend the prepared environment of the classroom beyond its four walls and increase the range of practical and sensorial experiences available to the children while matching their physical and developmental needs. Each space offers a concrete representation of the natural world that can be touched, smelled, handled, and cared for, or simply observed and noticed.

The world of nature, the observation of its cycles and places and spaces in which to engage with the natural world, present lessons about life to the children. In the forest a child can discover that all life forms grow, develop, reproduce, and die. This is not appropriate information to "teach" at this

Courtesy of Lincoln Montessori School, Lincoln, Nebraska

level, but by becoming familiar with the cycles in nature through observation and experience, a child will have a base upon which to build more theoretical speculations about the cycles of human life and endeavor in the future.

In a similar vein, by bringing nature into the lives of the children, they may become more sensitive to the pleasures of the natural world and more concerned for its care and nurturing. Again, I would stress that "teaching" about ecological disaster is not appropriate here, but coming to appreciate and value nature through observation and experience may give ecology and environmental concern greater meaning at a later stage of development.

Like Larry, Richard, and Roger quoted above, Thomas Berry, one of today's most outspoken environmentalists, attributes his concern for the planet and its resources to a youthful encounter with nature. His story of "The Meadow Across the Creek," which he tells in his book *The Great Work,* illustrates yet again the impact of contact with the outdoors. Berry claims his coming upon a meadow of lilies growing among thick grass, framed by mountains in the distance and a blue but cloud-studded sky above, shaped his basic life attitude and provided him with a sense of what was real and worthwhile in life. He was not aware of the significance of the "magic moment" at the time, he says. But what is clear is that it was not a lesson, a lecture, a rule to be memorized, or an advertisement that shaped his thinking about life but an encounter with the beauty and expansiveness of the natural world.

The miniature eco-environments at LMS may strike chords in some of the children who spend time there. At the same time each offers yet another direction in which the adult can follow a child who chooses to discover and possibly learn from the natural world.

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Courtesy of Rusty Keeler, www.earthplay.net

# At Home in the Natural World

by Jim Roberts

*Jim Roberts captures the challenges of walking with small groups of children under six, building confidence in bushwhacking trails and walking on brambles. Mr. Roberts gives many clues as to indirect teaching moments while enjoying the ramble with an emphasis on opening the sensory pathways without the clutter of names, which can often give young children a false sense of intimacy with the natural world.*

If the children are to be at home in the natural world, then they must be able to move about in it with ease and confidence.

Recently I took a group of children on a walk in a wooded overgrown margin behind their school. They had been seeing this area out the window ever since they had come to school, but they had never been back there. Several times as we began the walk, I heard one child reassuring another, "I'm not scared, are you?" Like many city children, they had never entered even the patches of the natural world near their homes and school. Showing the children that they could move through an area like this—and that it was fun—was more important than the few names and facts I gave them along the way. The most important thing I have to tell children in the woods is not some fact of biology, but the rule, "Step on the briars and brambles, then they won't tangle your legs as you walk." This rule is useful in itself and gives the children a point of interest to focus on as they learn to watch their steps and move carefully. I've had children tell me, after a few months in my class, "I can walk in the woods now because I know how to step on the stickers."

Giving the children an opportunity to learn to move with confidence over rough terrain is one of the most important things we have to offer during the primary years. Like the ability to swim, the knowledge that they can get through thickets and over streams gives the children a confidence that goes far beyond direct application of skill. But unlike swimming, acquisition of this skill does not depend on having special facilities or special training for the teacher. You just have to go outdoors and give the children a chance. Near almost every school, there are vacant lots and wild margins where the children can learn the basic skills of moving through the wild. These areas may not be the most beautiful to our eyes—frequently they are littered and contain a not very interesting variety of plant life—but such an area can still be an excellent learning experience for the children. As for your own skill, you can learn along with the children. You can be more helpful to them, of course, if you practice some on your own first. And naturally, you will want to familiarize yourself with an area before you take the children into it.

Just as the children use real knives to prepare vegetables in the classroom, they must be allowed to take reasonable risks outdoors. It is not reasonable to allow a child to risk serious injury, but skinned knees, wet feet, and dirty clothes are a small price to pay for learning that you can take of yourself in a rough environment. Such minor problems often serve as controls of error and may even be learning experiences in themselves.

If you start when the children are young enough, you can depend on them to develop good (and conservative) judgment of their own abilities. I've very rarely told any child that he could not try something he thought he was ready for, yet I've never had a child hurt in the woods. Many times I've had to bite my tongue to keep from telling little Paige that the place where she wanted to jump from a high bank across a stream was too hard for her, and the child has shown me that she knew more about her

abilities than I did. Often you can "help the child to do it by himself" and thus let the child develop the ability and confidence to really do it by himself next time. Give Jamie one hand—for balance, not for support—as he crosses the stream on rocks or a log. Hold Emily's hand as you jump the stream together. Stand at the bottom of a steep bank as Matthew climbs down, so that you can catch him if he starts to fall, *but keep your hands off him.*

Soon the older children will want to find their own way through the woods. Let them lead the way while you stay back with the less able children. (You can see better from back there, anyway.) Our only rule on that count was that the children had to stay in my sight. If they didn't, a terrible punishment befell them: they had to drop back and follow me for a while.

At our school, there was a deep gully beside the best trail in the woods. Actually, the trail was about three feet from the drop-off, and I always stood close by so that even if a child had gone berserk I could have intervened, but I warned the children of the danger and they felt that it was their responsibility to walk by without falling in. More than one child has told me proudly, "I can walk by the big hole. I won't fall in." Experiencing this danger taught the children that they could be responsible for themselves in a way which they had rarely experienced. By the time the children were seven, I was taking them to places where even adults must be very careful. But I knew they could handle it, and more importantly, they knew it, too.

The more excellently designed playground pales beside the physical challenges and opportunities of a good patch of woods. Once your children begin to have confidence in their abilities to move through the woods, they will want to go back again and again. Soon they will be entrapped by the fascination of the natural world. It will be their home.

### The Difference Between an Apple and a Pear

In order to be at home in the natural world, the children must be able to see what is there. This may seem obvious and simple, but my experience suggests that observation is a learned skill, a skill which certain activities can help the children to develop.

In the school lawn one spring morning, I noticed that the cinquefoils were blooming everywhere, so I thought I would teach the children the name of this very common wildflower. I picked one, showed it to the children, and named it. I asked, "Who can find a cinquefoil?" To my surprise, many of the younger children had a hard time finding one. How could that be, I wondered. I could pick twenty of the dazzling yellow blossoms without moving a step. Is the world of a three-year-old such a blur that he cannot separate out such a distinct sensation as this star shining in the grass?

I was reminded of an experience of my own before I became a teacher. I was traveling deck passage on a ship into Indonesia. The customs officials detained the ship for a day while they searched for things being smuggled into the country. When they finally finished and left, one of the other passengers said to me, "Well, they missed the attaché cases." What attaché cases, I wanted to know. He showed one to me, and then I saw for myself that scattered among the backpacks and bundles were several dozen shiny new black attaché cases, hardly the kind of luggage any of the passengers were likely to be carrying. If I, as an adult who had looked at that pile of baggage for hours each day (not to speak of the customs officials who were searching for such things), could miss something so out of place and so obvious, what does this imply about how we use our senses?

I have become convinced that experiences like this, while unusual for adults, are commonplace for young children. Almost every day when the children came in from the playground, at least one had a quartz pebble or persimmon pit he had found and wanted to show to the others. There were hundreds of these things on the playground, and we had shown them until I feared the older children must be sick of them, but each tiny child who brought one in seemed to feel that he had made a great discovery. Could it be that this child, after months on the playground, had focused on a persimmon pit and really seen it for the first time? I came more and more to believe that this was the case. After all, children who have been seeing triangles all their lives suddenly begin to point them out everywhere after some work with the geometric cabinet. Is this just their joy at having a name for a familiar shape, or is it that they are perceiving for the first time a new entity in the "blooming, booming chaos" of their sensations?

What, I wonder, does a person see in the woods if he has never had an occasion to focus on wildflow-

ers or to notice the shape of a leaf or the texture of a bark?

When I first started teaching, most of my comments in the woods were directed toward helping the children learn the names of various things. The children taught me that it was more important to help them learn to focus their attentions. Even when I do a three-period lesson—"Who can find a sweet gum tree?"—it is more an exercise in focusing of attention than an attempt to teach a name. When I walk in the woods with children, I point out distinctive characteristics of certain plants—the smooth silvery bark of the beech, the odor of crushed wild cherry leaves, the square stem of the mints. In the beginning, I did this in hopes that these distinctive characteristics would serve as keys by which the child would remember the particular species. Now I do it to help the children to focus their attention, to say, in effect, "Pay attention to the different kinds of bark. . . . Notice the odors of plants. . . . Look at the shapes of stems."

The true naturalist notices every aspect of every plant. The keys by which we identify a particular species are merely a device for beginning to know a plant. I never discuss all aspects of a plant with a child (or an adult) to whom I am introducing nature, for this intimate knowledge is something a person must reach on his own. However, a child can begin to reach this kind of knowledge at a very early age, as a story told to me by the parents of one of my children illustrates. One summer day, Billy (age 6) came home with a tiny underdeveloped apple he had found. His father insisted teasingly that it was a pear, and would not budge from this opinion. Billy went out again and came back later ready to deal with his father. He brought a small branch from an apple tree and another from a pear tree. He showed his father the difference in the shapes of the two fruits and the difference in the leaves. Then he said, "Now close your eyes . . . feel the leaves . . . this is how an apple leaf fells, and this is how a pear leaf feels . . . now smell . . . this is how an apple tree smells, and this is how a pear tree smells . . . so NOW do you know the difference between an apple and a pear?"

Courtesy of Rusty Keeler, www.earthplay.net

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*Jim Roberts received his AMI primary certificate from the Montessori Institute of Atlanta in 1973. Reprinted from* The NAMTA Quarterly 2,*2 (1976): 9-17.*

Courtesy of Montessori Center School, Phoenix, Arizona

# Montessori Special Education and Nature's Playground

by Nimal Vaz

*Nimal Vaz takes us to the essentials of Montessori as an aid to life for all children, particularly children with special needs. She challenges teachers to truly provide experiences in nature: observing anthills, identifying bird nests, or taking an olfactory walk with a legally blind classmate. Finally, she demonstrates how a child's interest in practical life, math, language, sensorial, biology, botany, geology, and geography originates with direct experience in nature.*

### Understanding Special Needs

The phrase *special needs* refers to the educational requirements of a child who is outstanding in a particular capacity. The term is valid in that the children we have in mind deviate from the average and need special understanding and care. The term is used loosely today to include all children who differ from the norm. It applies to the mentally retarded, the physically handicapped, the emotionally handicapped, those with cerebral palsy, autistic syndromes, learning disabilities, ADD, ADHD, as well as the gifted child.

Do we want to slap any of these labels on our children?

> "Why isn't this child who appears to be of normal intelligence learning to read?"
>
> "Well, because he has a learning disability."
>
> "But how do you know that he is learning disabled?"
>
> "Because he appears to have normal intelligence but he isn't learning to read."

This is a type of circular reasoning known as *reification* (Payne 32). The danger in this type of sloppy thinking is that it prevents children from being helped. Special needs children have suffered too many indignities and have waited too long for effective education for us to play word games.

We who work with this child have to understand that this is a child first, the specialty second, if he is to succeed. This is the greatest need of the special child. In Montessori we have so much to offer this child because for us education is an aid to life.

As you all know, Montessori worked with these special children from 1898 to 1900. She writes in her book *The Discovery of the Child:*

> I had the intuition that the methods of Seguin were not merely an attempt at helping inferior beings, mentally defective children, but they were based on principles far more reasonable than those in use in ordinary education. Here indeed the result was not only that the pupils "learned something," here one witnessed an awakening of the personality. (25)

Montessori goes on to tell us this method of educating these children was different from the methods used in regular schools of the day (also today). But the "methods" were not particular to an "inferior mentality," meaning special needs children.

> On the contrary these different methods contain a system of mental treatment that was very logical and superior to that being empirically applied to normal children. Slowly I became convinced that similar methods to normal children would lead to a mental awakening and a beneficial modifying action in them also. I had in fact come upon an experiment of scientific pedagogy! (25)

This is why an integration of the special needs child in a class of normal children is possible. Montessori tells us:

> It is possible to draw comparisons between defective [special needs] and normal children if we consider children of different ages, that is, compare those who have not the power to

> develop (defectives) with those who have not yet had time to develop (very small children). Backward children are judged mentally as being children whose mentality closely resembles that of normal children some years younger. In spite of the fact that in such a comparison there is lacking the consideration of initial force innate in such differing degrees in the two natures, the comparison is not illogical. (36-37)

So, for Montessorians to integrate the special needs child with the normal child seems to be a perfectly sensible thing to do.

### The Importance of Nature

But what has nature got to do with education? Why is nature so important for the young child? It is because man is both a spirit and matter. The young child, as Montessori tells us, is both a physical embryo and a spiritual embryo. For the spirit to soar, for the creative mind to take off, the material body must be firmly grounded in reality. Nature is real—there are controls of error in nature that keep us on the correct path on our journey from the concrete to the abstract. If the mind is not grounded in reality, it wanders in the realms of fantasy and illusion.

Today's children are alienated from nature. Therefore, we as adults need to explore avenues for providing environments in the midst of nature for the young child or for bringing nature into our environments.

Dr. Montessori has been called the greatest naturalist, as well as the greatest ecologist of all time. Her impression is that an appreciation of God and man should be the essence of education. Montessori was of the opinion that each living being takes something from the environment, but each gives much more than it takes. These are the natural connections.

Chief Seattle of the Northwest Nations, speaking to the government in Washington, DC, who wished to buy the lands of Chief Seattle's people, asked, "How can you buy the sky? How can you own the rain and wind? My mother told me every part of this earth is sacred to our people.... My

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ancestors said to me, this we know. The earth does not belong to us. We belong to the earth" (cited in Jeffers n.p.).

So it is with the little child—the child's place, his environment should be the natural environment. He belongs to the Earth.

Today, the world of adults seems to have missed this natural connection—children almost from the time of birth live lives alienated from the natural world. In *The Discovery of the Child*, Montessori writes, "In our time and in the civilized environment of our society, children however live very far distant from nature, and have few opportunities of entering into intimate contact with it or of having direct experience with it" (98). Richard Louv's book *Last Child in the Woods* describes the accumulating research that reveals the necessity of contact with nature for healthy child and adult development:

> Our society is teaching young people to avoid direct experience in nature. Rapidly advancing technologies are blurring the lines between humans, other animals, and machines. The postmodern notion that reality is only a construct—that we are what we program—suggests limitless human possibilities, but as the young spend less and less of their lives in natural surroundings, their senses narrow, physiologically and psychologically, and this reduces the richness of human experience. (2-3)

Dr. Montessori continues:

> Nature has, little by little, been restricted in our conception to the little growing flowers, and to the domestic animals which we depend on for food, for labour, or for defence. Besides that, our minds have been shrunken, have adapted themselves to harbouring contrasts and contradictions, have even confused the pleasure of looking on animals with that of being near the poor creatures destined to die in order to feed us, or that of admiring the song and beauty of birds imprisoned in little cages—a kind of nebulous "love of nature." Does there not also exist the belief that by transporting a little sea sand to some receptacle like a tray one is giving immense assistance to children? Very often it is imagined that the sea-shore is educational because sand is found there as in the receptacle. And so within the confusion of this world prison of ours, we arrive at the most unnatural conclusions. (99)

Nature, as Montessori remarks, frightens most people. Even today primitive society is fearful of natural phenomena. On first viewing the glory of creation—primitive man's first impulse was fear. Most people dread the air and sunshine and the earthly soil, "dirt" as it is called in American society. Children are constantly admonished, "Do not get dirty." "Do not remove your socks and shoes and go into the sandbox." How else is the child to experience the sand and the soil? To know is to love.

Montessori tells us:

> Set the children free, let them have fair play, let them run out when it is raining, take off their shoes when they find pools of water, and when the grass of the meadows is damp with dew let them run about with bare feet and trample on it; let them rest quietly when the tree invites them to sleep in its shade; let them shout and laugh when the sun wakes them up in the morning, as it wakes up every other living creature which divides its day between waking and sleeping. (100)

Writing in *The Formation of Man*, Montessori referred to a subconscious pattern in society:

> An *Organization* of evil *(Male)* has been formed which assumes the semblance of good *(Bene)* and is *Imposed* on the whole of humanity *(Umanità)* by *Suggestion*; when we combine the initials of these characteristic words and form a word, we then get: OMBIUS.... The social ombius dominates the child. (50-51)

Adults think they know what is good for the child, what the child needs. Adults, in this way, misguidedly conclude that children are happy playing in specially contrived sandboxes and playscapes structured by the adult mind for children. The joys of exploring and climbing a tree are lost—adults also think that children take pleasure in seeing caged birds and animals. Montessori writes in *The Discovery of the Child*, "When, having been kept in restraint by us, having been degraded and irritated by the prison, the child kills insects and other harmless animals, it seems to us natural; we do not realize that this mind has already become estranged from nature" (101).

In the twenty-first century, modern man is losing this bond with nature. We as Montessorians need to be able to rise above the ombius to get ourselves out of this box, to shake off our paradigm paralysis and to return the child to nature in our own prepared environments.

When we study the lives of many creative and gifted individuals—mathematicians, artists, physicists, poets—we see that as children, they explored and enjoyed nature. My recent reading or re-reading

has included *The Pleasure of Finding Things Out* by Richard P. Feynman (who won the 1965 Nobel Prize in physics for his many contributions to physics, especially quantum electrodynamics), *In the First County of Places* by Louise Chawla, *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder* by Richard Louv, *The Sense of Wonder* by Rachel Carson, photographs by Nick Kelsh, as well as *String, Straightedge, and Shadow: The Story of Geometry* by Julia Diggins. All these authors comment on the importance of nature as forming the construction of the mind, as does Montessori—which is why nature is so important to our special children.

A common thread that runs through these books is that there is always a caring adult who draws the child's attention to the value of the world of nature. Richard Feynman tells us about his father taking him for walks in the woods and telling him what was going on in the woods—not just naming the birds and the trees. Feynman says his father in this way taught him to really notice and observe things and then perhaps discuss and question his observation. This was one way of developing intelligence, his ability to find things out himself (4).

In *A Sense of Wonder,* Rachel Carson tells us, "Exploring nature with your child is largely a matter of becoming receptive to what lies all around you. It is learning again to use your eyes, ears, nostrils, and fingertips, opening up the disused channels of sensory impression (67).

Writing in *Spontaneous Activity in Education,* Montessori tells us it is the quality of being able to observe nature in great detail and, more importantly, of being able to get the child excited about these observations that will help the child come to his own conclusions. This is the idea behind the Montessori dictum of "give the child a key to the universe."

### Biology and the Prepared Environment

We need to remember that the child aged three to six in the Children's House, normal and special, still has the absorbent mind, and the sensitive periods are working overtime. Today we know for a certainty because of the new brain discoveries that the brain development of infants and toddlers proceeds at a staggering pace. By the age of two, the number of synapses reaches adult levels; by the age of three a child's brain has one thousand trillion synapses, about twice as many as an adult. This number holds steady through the first decade of life. After this time, a process of pruning begins—the brain selectively eliminates excess synapses.

How does the brain "know" which connections to keep and which to discard? This is where early experience plays a crucial role. When some kind of a stimulus activates a neural pathway, all the synapses that form that pathway receive and store a chemical signal. Repeated activation increases the strength of that signal. When the signal reaches a threshold level (which differs for the different areas of the brain) something extraordinary happens to the synapse. It becomes exempt from the elimination and retains its protected status into adulthood. Scientists do not yet fully understand the mechanism by which this occurs, but they conjecture that the electrical activity produced when neural pathways are activated gives rise to chemical changes that stabilize the synapse.

These findings confirm that brain development is a "use it or lose it" process—so important to the special needs child. As the child gets older, the pruning accelerates. But those synapses that have been reinforced by virtue of repeated experience tend to become permanent, while the synapses that were not used often enough in the early years tend to be eliminated. In this way experiences—positive or negative—that young children have in the first years of life influence how their brains will be wired as adults.

We as educators of the primary child in the first plane of life are so blessed, because we are in the fortunate position of helping the children's synapses grow. This is the age when interest becomes fixed and here is our chance to get these brains hooked on nature by preparing an environment for the children that relates richly to the natural world.

Montessori was a scientist, and much of her intuitive knowledge of young children came to her from biology. She tells us that nature prepares environments for the young and cites as examples the anthill, spider web, bird nest, and so on. She discovered through her observations that the young child, being both a physical and spiritual or mental embryo, will require an environment containing things that will help both his physical and mental life. Many adults will say at this point that we do have beautiful environments for the children at home and in traditional day care or

preschool experiences for young children. Infant toys, furniture, etc., are more and more attractive; however, these are designed by adults who, I feel, have not sufficiently observed young children to know what they need.

Montessori's genius lies in the fact that she was able to combine the principles of science and philosophy into a comprehensive system of education known as the "Montessori Method," central to which is the "prepared environment" for the primary child. Unfortunately, the principle of combining education and science has been elusive to the American public. As the head of Columbia University's Teachers College tells us, "At this moment philosophy is central to education. Equally important in the future will be biology" (cited in Kantrowitz & Winger 45). For us Montessorians, the future is now.

The Montessori prepared environment is a beautiful example of the philosophy-education principle—combined with the latest scientific discoveries—overseen by an educated, intelligent adult. Yet there are people who ask today, "Is a prepared environment really necessary for the young child below the age of six? Wouldn't it be better for them to run around in the fresh air unfettered in gardens and be free?" Montessori's answer is that if this were the case, if what the young child needed was freedom to run about and lie in the sun, children may as well be cats or lizards.

The second answer to this question is that often today there is no loving adult at home to take care of the young child. The fresh air is polluted. Very few homes have yards or gardens the child can run around in. Adults are also afraid to let children wander outdoors on their own.

The third answer is that the present-day home is not geared to the child. The furnishings, the rhythm, the tempo of the home are usually geared to the adult. There is very little for the child.

The child of this plane is an explorer, like early man; everything is new to him. So Montessori set about building an environment for this child in the beginning though trial and error. She finally came to

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understand that this environment had to be made up of three parts:

- The child in the first plane of development with his absorbent mind, sensitive periods, and human tendencies.
- The adult—trained as an observer of the child and his needs.
- The physical space.

As such, physical space of the Montessori prepared environment will contain:

- The material necessary for carrying out the exercises of practical life.
- The sensorial materials.
- The language and math materials as well as extensions of the language, to include geography, geology, botany, biology, history, science, music.
- Those things necessary for the development of the religious and moral life.

Finally, the Montessori prepared environment is based on six basic principles:

- The concept of freedom.
- Structure and order.
- Reality and nature.
- Beauty and atmosphere.
- The Montessori materials.
- The development of community life.

We will not discuss each of these in depth at this point. We will only talk about those areas that directly pertain to this lecture.

### The Exercises of Practical Life and Nature

So we begin with practical life—we all know what these exercises are. They are the very breath of the Montessori environment, the foundation of the Montessori program. Broadly, these are classified according to:

- Movement exercises—elementary and advanced
- Exercises for the care of the person
- Exercises for the care of the environment
- Grace and courtesy exercises to help oil the wheels of society as well as to learn the ground rules of the prepared environment and the rules of human behavior.

Montessori goes on to tell us that the practical life exercises are best done outdoors. In this way the exercises will help the blood circulate more freely and help the lungs breathe in fresh air. She also lets us know that these exercises are the only real and proper gymnastics. The gymnasium is the environment the children live in. Rolling a rug, brushing shoes, washing a table, sawing wood, digging in the garden, raking leaves are all exercises in which the whole body is engaged. The constant movement of rolling, polishing, cutting, digging, sawing, etc. helps the child move its arms and hands to strengthen the muscles in a better way than by usual gymnastics. The exercises of practical life are also work.

My trainer, Miss Lena Wikramaratne (full disclosure: she's my aunt), used to say:

> Until very recently the need for training in muscular movement at the pre-school level was not at all considered in education. The increasing lack of motor-visual coordination became more and more apparent in the kindergarten classes. With this there came to be noticed a lack of hand-eye coordination which in turn resulted in deficiencies in speech, reading and writing. So remedial efforts began to be taken which again were confined to the artificial gymnasium and exercises with man-made structures such as measured stairs, fixed trampolines and steel climbing frames. This training, like that used for caged animals in a zoo, does not allow for observing, thinking or judging distances or heights. In the world of nature there is scope for the perceiving and thinking mind in coming up against the unexpected and exercising the senses and muscles. These naturally help develop coordination and integration and enhance the powers of the intelligence. (29)

The walking on the line exercises done outdoors as well as the silence exercises in nature are invaluable to the special child. Play listening games outdoors. Rachel Carson says, "I believe children can be helped to hear the many voices of the earth and what they mean—the majestic voice of thunder, the winds—the sound of surf, or flowing streams, and the voices of living things. No child should grow up unaware of the dawn chorus of the birds in spring" (84).

### The Sensorial Materials and Nature

Let us talk about the sensorial materials. Montessori's view is that every young child who walks into our environment is like early man. The child moves through the same process of discovery from concrete material to the abstract. Montessori's genius lay in the fact that she could take the abstract concepts and put them into concrete form in the sensorial material. Our role as intelligent guides of these children is to help them discover and explore the world of nature using the materials as a key.

The child absorbs many impressions of sound, taste, color, smell, and touch by living in the world. He wants to explore the world. He is constantly bombarded by sensorial impressions. Montessori tells us "give the child the world," which seems impossible until we understand that in the first C*asa dei Bambini* she incarnated the qualities of the world, the colors, dimensions, shapes, sounds, touch, and taste, in the Montessori materials. The materials were not developed to give the child new impressions, but to order the impressions already received.

Take the children on walks so they can see flat land, the horizon in the distance, which is a straight line, a *horizontal* line; the zigzag lines of mountains; the serpentine lines of rivers and streams. Children can see vertical lines of trees, cylinders in tree trunks and branches, spheres in fruit on trees. You will be amazed at the new discoveries the children make.

The trays of the geometric cabinet taken outdoors will help the children see circles, right-angled triangles, squares, hexagons, and spirals beautifully revealed in earth and sky.

Children enjoy looking at rocks and crystals. Once a rose quartz broke in my class, and the children were amazed to see that the pieces, big and small, revealed the same inner structure when examined with the magnifying glass. All crystals of a given mineral have the same inner lattice structure.

When a fish in the aquarium dies, we fish it out to study its parts in greater detail. The children examine the parts of a fish using a magnifying glass and then draw and color it.

The botany cabinet, with the leaf shapes, is a piece of equipment made for nature study. Children enjoy searching for leaves to match the contents of the cabinet. From here it is easy to go on to fruit and flowers in the environment. The petals of an iris open into hexagonal blossoms, the calyx of the rose into a five-pointed star. This leads to discovering the secrets of beauty in the symmetry and harmony and variety of nature's forms.

This in turn leads to the categorization and classification of smells and taste according to the smelling and tasting jars.

This year we have in our environment a legally blind, special-needs child. She enjoys the nature walks so much. Rachel Carson tells us, "Senses other than sight can prove avenues of delight and discovery, storing up for us memories and impressions"—so true in this child's case. "The sense of smell, almost more than any other, has the power to recall memories, and it is a pity that we use it so little" (83).

The child in the Montessori prepared environment may not use the sensorial materials until he has had a presentation in the correct use of the materials. It is only then that he can pass from the known to the unknown, the concrete to the abstract. To help this passage, the young child should be encouraged to explore the prepared environment, using the sensorial material as "keys." Where can we find "spheres" in the indoor and outdoor environments? Where do we see linear leaves? Can we smell a scent in the garden similar to one in the smelling bottles? These activities, plus the memory games, help the child to grow intellectually by making connections with nature, the world we live in. This is education for life.

### The Mathematics Materials and Nature

As Dr. Montessori often remarked, geography, biology, and mathematics are not in books. When man gathered knowledge of these he was able to put it into the symbols of words, signs, and illustrations. With the invention of printing, all of these facts are now recorded in books. But knowledge must not be separated or isolated from the world of nature, which is and has been the source of all man's experience. The modern child is forced to imbibe only the results of that experience and so loses interest. This emphasizes one of the basic defects in the present teaching system—imparting knowledge for performance rather than for "interest." Interest cannot be aroused by extraneous propulsion because it is an inner desire, welling up from an innate positive feeling that stirs within. Interest grows in the individual

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who is in harmony with the natural tendencies of the human spirit in tune with nature.

Each one of us has a mathematical mind. It is sometimes called our sixth sense. When you enter a room and notice a picture on the wall hanging crooked and adjust it, you have used your innate sense of measurement. When you shut your ears to loud sounds you express a desire for harmony.

Animals have a natural sense of direction and distance. Spiders, who never studied engineering, spin an almost perfect spiral web. Most birds observe the principles of symmetry in the structure of a nest. The child of man needs to be introduced to these facts of nature and be allowed to discover for himself and explore the wonders of the natural world, always keeping in mind that mathematics is not in books.

Early man used his human tendencies to judge, reason, and calculate, among other things. The young child, working through the practical life and sensorial material, gains the necessary skills to work with the mathematical materials. These skills are to order, to be exact and precise, to calculate, and to repeat to perfection.

It is our duty, then, as adults to see that the child has a chance to practice these skills of everyday living in the prepared environment. We have silverware and dishes for the child to classify and order, laundry to be folded precisely and exactly, to calculate how many place settings are needed for lunch. Repetition of these skills naturally leads to perfection. When we take the child outdoors the child will be able to see, as early man did, mathematics—in dimensions, shapes, measurements, by walking the field (how many steps?), by observing shadows. This work makes mathematics fun for the child instead of memorizing "dry facts" from a book.

When this is done, these sensorial explorers will be able to begin their journey of mathematics from the concrete to the abstract through manipulation, experimentation, and invention.

### The Language Materials and Nature

Language has been called the greatest abstraction of man. Its main purpose is communication. The Montessori language material focuses on its two aspects, spoken language and written language. Once again keeping in mind that this young child is an explorer of the prepared environment, the adult should be ready with enough spoken language lessons for the enrichment of vocabulary in both the indoor and outdoor environments.

My fellow AMI trainer, Dr. Annette Haines, takes the view that the adult is the largest piece of language material in the environment. The richness and quality of the language program is determined by her.

Language training exercises that include stories, poetry, pictures, discussions, and general topics of interest should be a daily adventure for this child. Nature walks, where the adult can relate interesting stories of the natural fauna and flora, habitats of birds and animals, are invaluable. Mario Montessori used to call these "rambles" in nature. This is what the

young child will remember in later years, the joyful discoveries he made while on these rambles.

Written language is introduced as a parallel exercise, beginning with sound games and sandpaper letters, leading to reading and writing creatively and ending in sentence analysis. The teaching in Montessori is done indirectly, so it is of interest to the child if the adult writes a caption for each picture (preferably nature picture) on the wall and a short list of words from the picture to be placed next to it.

It is wise to remember that creative writing depends so much on the child's experiences. So the prepared environment should have many experiences: "hands-on" experiences relating to nature for the child in the "language extension" work extending to exploration in geography, geology, art, music, and science.

To quote Miss Lena Wikramaratne again: "Dr. Montessori says, 'Peace is what every human being is craving for, and it can be brought about by humanity through the child.'" The adult's role here is to encourage the child in his intellectual growth and make sure this formation is fed by "*active experiences* in the *real world* to which each [child] is led by the laws of nature" (31).

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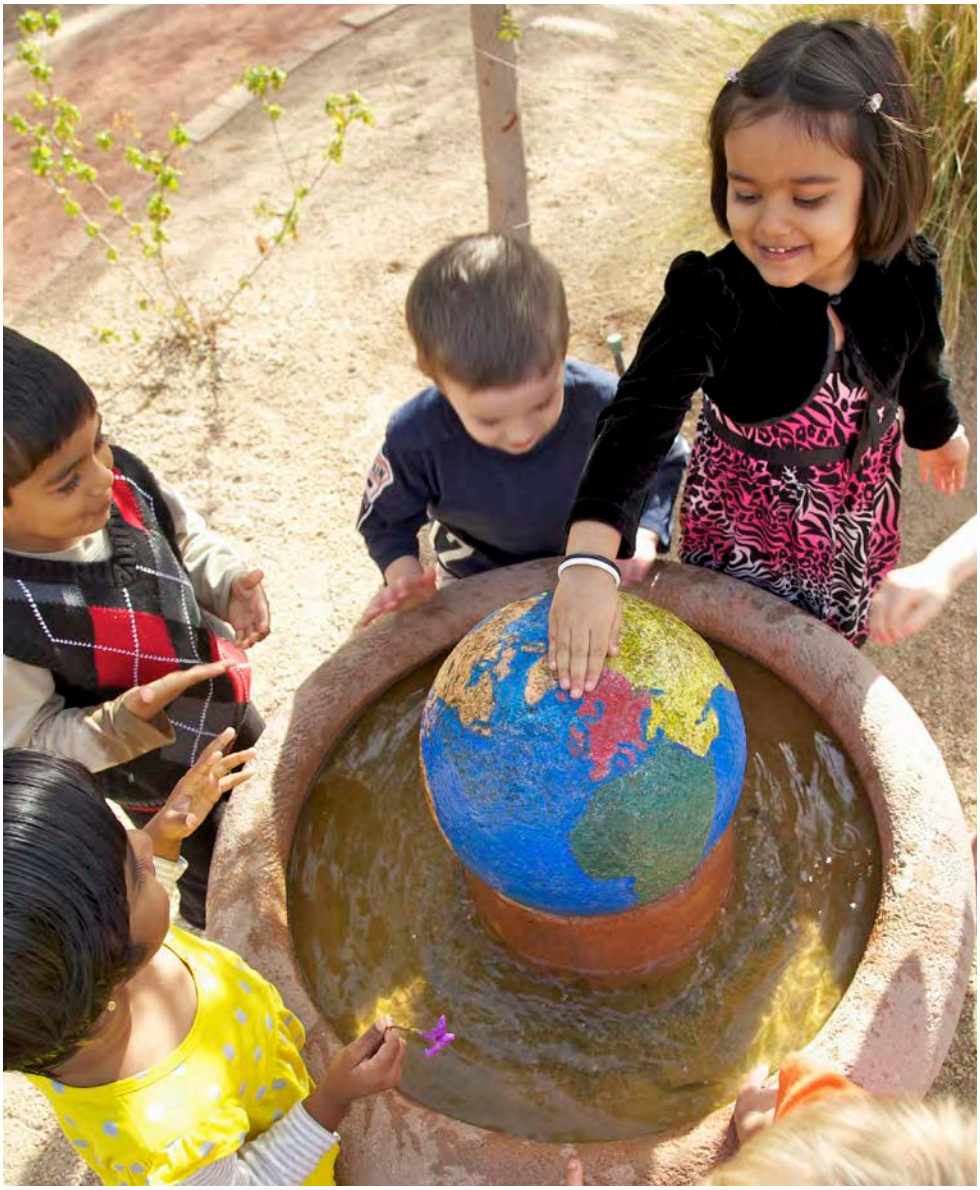


Courtesy of Montessori Center School, Phoenix, Arizona

# Part II

## History of the Universe, the Earth and the Integration of the Human Personality

Kodaikanal, India and the spiritual mystique of the Theosophical Society inspired Mario Montessori Sr. and Lena Wikramaratne to make their foray into the biodiversity of an outdoor environment that was different from their respective homelands.

Teaching children of different cultures, ages, and stages allowed both writers to see that their own deep sentiments for the out of doors were absorbed uniquely according to the developmental characteristics of their students. They were aware that living in nature shielded both adult and child from the horrors of World War II, and that the trees, soil, plants and animals, waterways, fields and mountains provided a commonality of land lore and related human bonding that made the tragic circumstances in the world seem distant.

Camillo Grazzini writes, "The cosmic sense pervades all of Montessori's work, both her thinking and her educational approach for all the different planes or stages of development of the human being." The moral and responsible side of development finds its root in the sustainability of nature and the human understanding of what is needed to enhance the planet rather than to decimate it. The child's contact with the earth and the enlightened adult is the combination that will guide the child's higher character and understanding of complex interdependencies that lead to unifying global collaboration that Montessori considered essential to her concept of peace.

Lena Wikamaratne

# The Kodaikanal Experience: Chapter I

## Kahn-Wikramaratne Interview

*The Kodaikanal years were from late 1942 to March, 1944, a period of internment for Maria Montessori against her will in India. Yet in these remote hills a fanfare and training course emerged, and so did the inspiration for an in depth unification principle for the elementary program which we now loosely call "cosmic education."*

*These two interviews with Lena Wikramaratne and Mario Montessori Sr. capture a period of new thinking about Montessori education that personifies the interdependent components of land and water, air and energy, animals and plants, alongside the human-made world. Both Mario and Maria Montessori lived near a complex that housed families with children from infancy to age eighteen, and this location is considered to be the inspiration for their emerging insights around childhood and adolescence.*

DAVID KAHN: The Kodaikanal experience was instrumental to the completion of the Cosmic Education ideal. Miss Lena, you worked closely with Dr. Montessori and these children in the realization of this integrated, cultural approach. Can you begin with a little history about Montessori in India?

LENA WIKRAMARATNE: Yes, you see, I had searched for Maria Montessori once before and wrote to all the embassies of the world. None of the embassies know where she was at that time. The war was on. A friend told me that they had seen a piece in the paper saying something about Dr. Maria Montessori visiting the Theosophical Headquarters at Madras. I wrote. I received a letter saying yes, she was there with her son. The letter said that no courses would be given that year because, unfortunately, something had happened. Mario, her son, was put into an Italian detention camp because of the Italians coming into the war.

That was 1940. Then I received a second letter stating Mario was returned but she had to recuperate and she didn't know when the next course would be given. Then I received a third letter by the end of the year saying the next year they would be having the course. So I went. In the first three lectures, she gave this wonderful cosmic view of the child, showing how the child is more than just something that plays or something you just enjoy. She saw things differently. The child had a real mission to perform which was the making of the human personality, and that there were great depths in spite of what we see as dependency and simplicity. Montessori saw a great potential in the child. The first three lectures were beautiful. I had been working with two educators from the West, from London University and from the University of Chicago who had been giving us some lectures on preschool education and Montessori was so much better.

KAHN: What were these Western educators saying?

WIKRAMARATNE: The professor from England had been sent through some kind of exchange for university people. Another was a woman from Wheaton, Illinois, who had been sent on an exchange fellowship. The two got together and were giving a survey of modern trends in education, which I began to follow at the university because I had been doing some teaching at the time. I disagreed with them because they felt that the child between two and seven years needed only fantasy and play. The English professor was saying we should have sand boxes and water play and stories and whatever; rolling toys, gross muscular movement; old tires to roll, etc. And I would think of our children running up and down hills, climbing trees; why should I have to put them in these sand boxes? The American

professor was telling us that John Dewey developed preschool education with a singular environment of toys and home artifacts, such as Mommy's hat, clothes, shoes for dressing up fantasies. They also had toy utensils for simulating housework because their whole idea was that the child imitates everything that the adult does.

KAHN: This was the Dewey environment.

WIKRAMARATNE: Yes. One day, I made my fellow teachers furious. I challenged the idea of just keeping children happy in school. The child didn't come to the world just to be happy. My father and my mother brought me up exposing me to everything about the world. I am still eager to learn because of that interest that had been imparted to me. And I said where in your program do you communicate interest in the environment around you? I didn't know very much about the potential of the child except what I remembered from childhood. My parents were full of interest and they gave me interests in everything when I was very young and taught me many things. My father was an agriculturist. He was interested in industry, economics, and history; he gave us all of that when we were very young. So I thought then that children were eager to learn. Why can't children have the same interest in learning as adults have? What has gone wrong? I asked one professor and she said she did not know. So these two people, great educationists and philosophers from the West couldn't tell me anything. I was so happy I found Maria Montessori.

KAHN: You found Montessori in 1941; did you get to meet her personally?

WIKRAMARATNE: Yes, when they wrote me that letter I immediately gave my resignation from my teaching contract. Everyone thought I was crazy.

KAHN: Was this an unconventional thing to be doing, taking this Montessori training?

WIKRAMARATNE: Yes, but when I heard from them, they said that the Indian government had sent many, many teachers to listen because she was giving this marvelous psychology of the child. I went on my own, of course, from Sri Lanka through to Madras, then met the two of them. I still remember the first day I saw her. The Theosophical Headquarters had cement floors, woven bamboo walls and roofs for big conventions. Three hundred students had arrived for that course; and we lived in little rooms like this (office size) two in each.

KAHN: How did she achieve this stature in India so quickly?

WIKRAMARATNE: That is a long story. You see, she was lecturing in England and this was after the Civil War in Spain. She had come in touch with the Theosophical Society in England. It was founded by Ann Besant in collaboration with a Colonel Olcott. They felt that if they could bring all religions under one common roof, then people would not have the antagonisms and tensions. They also felt why wait until adulthood to transmit these ideals. She and Dr. Montessori were hoping to communicate peace through the child. Dr. Montessori was saying that peace can only come through the child. Then after establishing this contact with Theosophical Society in London, later on George Arundale who had operated the Theosophical school in London, invited Montessori to India, when he became president of the organization.

KAHN: So this was the root of the Montessori following in India. Montessori really stemmed from the Theosophical Society and was not promoted by any educational movement.

WIKRAMARATNE: That is correct.

KAHN: What was your training like with Maria Montessori?

WIKRAMARATNE: Oh, the delight, the pleasure, the joy, the wonderful vision that I was able to get from the first three lectures. I kept on each week saying, I have to stay with you, I have to stay with you. This course of four and one half months is not enough for me. And of all the 350 people who took the course, I was the only one who told her that. They gave us pieces of paper, the diplomas, after the course and I said I didn't want it; I have to come back to Maria Montessori. I was able to learn so much. Maria Montessori was speaking Italian and I had studied Latin and I could follow the gist of what she was saying, and Mario, of course, in stumbling English, usually translated. So I would write every word she said and I used to write every word Mario said. I would go over notes all the night long and write my own lecture, which we had to turn in. I used to watch the presentation carefully. All the students used to go away after the lecture;

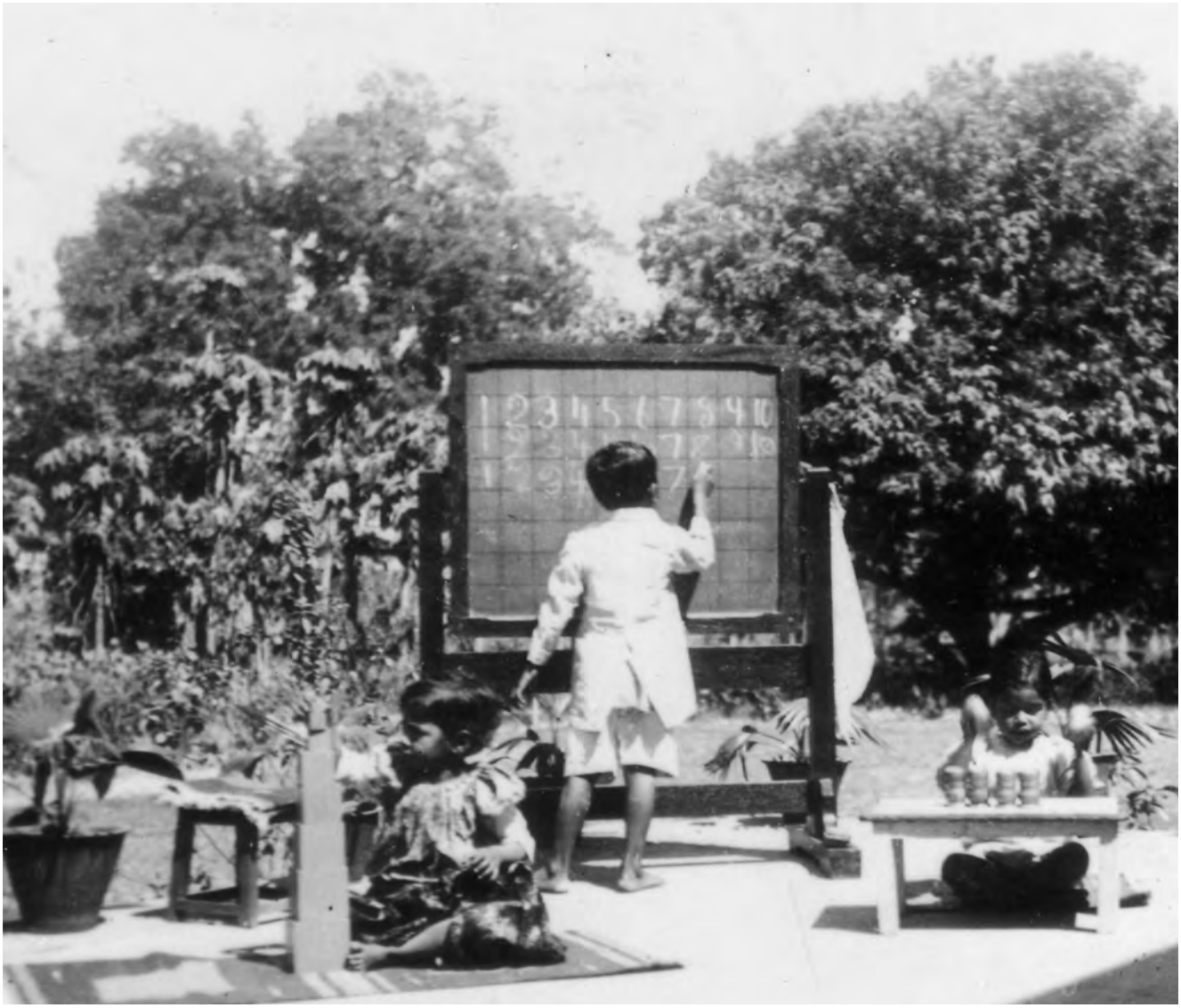
Silent prayer before dining, Sophia College, Bombay, around 1942

I would run up there and work with my notes and that was the only practice I did. We had only three sets of materials for 350 people. If I didn't do that, I would never have gotten my hands on those materials. And then I would sit on my own little cot and pore over the psychology and philosophy and write my exercises. That is the way I did it.

At the end of the course we received phone calls and letters from the civic authorities saying that all foreigners had to leave Madras within 48 hours because the Japanese had bombed us. This was the beginning of 1942. Immediately the Theosophical Society took responsibility for looking after Maria. With the British Government's help, they planned to send her up to Kodaikanal, which was in the hills. I had to go. I found the city on the map and wired my father. He came. I told him I had to be with those people. This was what I wanted. My father stayed and listened to the lectures. He was a man who loved children, not only his; he was interested in all children. He said with the war and with the Japanese bombing he wouldn't take me there. I told him I didn't want to lose them. I won't be able to learn what I want to learn now. I was just infused with this whole thing. And I said I am not taking my degree; I don't want it. I must go to Kodaikanal. That week, I received a letter from a cousin of mine whom I thought was in North India in Simla. But he had been sent to a new university which was three miles away from Kodaikanal down the mountainside. He said "I am here now for my philosophy course. Before you go back to Sri Lanka, come and see me."

KAHN: That was lucky!

WIKRAMARATNE: It was a God-send. So I showed the letter to Papa and he said we would take the train and go around and then we would fly back to Sri Lanka. We took the train to Kodaikanal. And upon arriving, there was the seminary director, a Frenchman called Father Guthier. I am mentioning him because he is a famous historian and an anthropologist. Papa and he just got on beautifully. When Papa told him about me, he said why do you have to worry. You can leave her with me; I will look after her. That is how I came back to Dr. Montessori. The priest found me a home in a cottage close by to where they were, by the lake, which was beautiful. Often I used to run down the hill to their house which the Theosophical Society



Working outside, Allahabad, India, 1928

happening. I want to see the spontaneous activity. I wanted to see it happening.

KAHN: How old were these children?

WIKRAMARATNE: There was a girl who was four. Another girl 4 ½. The boys were three and two and one half. I loved that. I was the first to work with two year olds. Many European schools were not taking children until they were four.

KAHN: Did the school expand?

WIKRAMARATNE: Yes. Kodaikanal was a place where English, American, Swedish, and Dutch had their own schools for their older children; but the babies were not in school. So when they saw me starting this little place with four children, within a week I had fifteen. They brought their babies to me. Gradually, Dr. Montessori gave me guidance in the evenings which kept her busy, for she had been quite depressed being forced to live on this mountaintop. The Theosophical Society had given her a marvelous American girl, Norma Makey to help Montessori write her books. She was revising old material resulting in two new publications, the *Absorbent Mind* and the *Discovery of the Child*. Norma Makey was the editor and translator. We all kept Dr. Montessori busy those years from 1931-1944.

KAHN: So now you had fifteen children, and you supervised them all.

WIKRAMARATNE: Yes, and every night I would go to Montessori and tell her what happened that

day with the children. Little by little, the parents who were sending those babies saw what a great thing it was. We used to go out for rambles, or walks, every day. At noontime, Mario joined us and showed them leaves and flowers and we would go fishing in the pond and bring the pond animals home. Maria made aquariums and terrariums, even for the little ones. So parents said, "If you can do so much for the little ones, can you take my older child? This child is not good in mathematics; this child is bad in spelling; this child is having trouble in reading."

KAHN: Now you had very few materials, as I recall.

WIKRAMARATNE: Yes, Dr. Montessori had one set of materials and my father ordered one set for me from Adyar. The rest of the card materials, we made each day. When material making became so profuse, I called another girl from Sri Lanka who could draw for me. I also took a male artist from Kodaikanal and a carpenter to make the materials.

KAHN: Impressive. I'm told that the Kodaikanal experience generated the botany materials, the story of the universe, geography charts, that sort of thing. Is that right? How did it happen?

WIKRAMARATNE: When people saw how these children who first came for some tutoring began to work, and how they blossomed, they wished to remove them from the schools. They came to me and asked, "Can you take them on for higher work, totally?" So I went to Dr. Montessori—What do we do with these older children? I won't have books to teach them. She said, "You have the best book, the book of the world, which is the book of nature. Don't worry, take them. You can find English material. English is fine for doing reading, writing and all kinds of literature. Father Guthier said we could have his books from his seminary." The American school had a marvelous library and because there were lots of American children in my school, they said we could use their library books. So by the end of the year, we had 60 children. Amazing, isn't it? And of course, my father thought I was crazy, all these children in a little cottage. So he leased the adjoining building.

KAHN: Were these tuition-paying children?

WIKRAMARATNE: Yes, they paid us a little. They were all wealthy. We had Americans, Swedes, French, Greek, and English children.

KAHN: How did you deal with the language situation?

WIKRAMARATNE: Most of them know English. Some Indian children didn't, but they picked it up very quickly, so it grew. Anyway, toward the end of the year, we were able to advertise a course. So Indians came to take the course, in which I assisted. Some of them brought their own children, so we had lots of Indian children too.

KAHN: Did Mario take on teaching responsibility every day?

WIKRAMARATNE: Yes, every day he would come to the school. We used to go together and pick the moss and marsh plants and come back and make the terrariums and the aquariums. We used to bring samples from nature and keep them to let the children see the different ways of life.

KAHN: Part of cosmic education is the Story of the Universe. Where do you think that originated? Did that come from the Kodaikanal experience too?

WIKRAMARATNE: No, that idea Dr. Montessori had before, but she had never been able to put it together and give it as a course, until what happened at Kodaikanal. During the first two years with the children, we had made so much material for geography, for botany, for biology, exploring scientific nomenclature. We planted the beds according to the natural order of plants, out in the garden. For the geography, Mr. Montessori built whole structures with rock, clay, and wood to show the formation of mountains and what happens to clay soil and sandy soil in the sun.

KAHN: So you were making real materials and creating real experiences in nature. This is somewhat of a contrast to the approach to cosmic education in our present training. We were not trained in this manner.

WIKRAMARATNE: Yes, it is wrong the way the natural sciences are given in training now. I have to say it. Because what trainees are getting in how to present classified terms to the child. But they

themselves do not know that much about nature. They must go out into the natural world or else they won't be able to show anything to the child. And that's where it begins.

KAHN: Then they really don't have enough experience. So the children learn the classifications before they learn the lore and the common names.

WIKRAMARATNE: This is unfortunate. The orientation of the world must come first, before you begin to classify. So what is going to happen, unfortunately, will be that the elementary classes will be limited to the knowledge that they have gained in the junior course and that knowledge will be like textbooks.

KAHN: Well now, the training courses argue that they have developed key materials which isolate universal facts of nature.

WIKRAMARATNE: We had developed them in Kodaikanal; there was nothing more to develop. That's why she said, after two years of developing, "Lena, we made all this. Why don't we give the junior course?"

KAHN: What in relation to elementary materials had been made before Kodaikanal? What was the real contribution of Kodaikanal? Wasn't there already a junior curriculum derived from Mrs. Joosten's work in Holland?

WIKRAMARATNE: Dr. Montessori had ideas as to how to develop the curriculum for the older child. They had done some experimentation in Laren, Holland, where they had done some of the biology material. We had that. Some of the mathematics had been done in Spain. That is where she wrote *Psychoartihmetic.* They had some of the key materials already made. But when coming to Kodaikanal a whole new world opened up for Mario. He was mostly experimenting and seeing how it was classified. So we started from scratch in every subject.

KAHN: Using these key materials you made in Kodaikanal, aren't they the same key materials that are being presented now?

WIKRAMARATNE: Yes.

KAHN: However, those were spontaneously evolved with the children. Now the materials that we are working with are fixed materials that are in fact taught to the children.

WIKRAMARATNE: That's what I was objecting to. Because they are teaching nowadays. They are not exploring. They are not discovering.

KAHN: So your ideal situation would be for the teachers to be trained with key materials but they should evolve their own materials out of their own experiences?

WIKRAMARATNE: No, not evolve. Know how to discern the world of nature with those classifications that she gives you. We didn't go to teach the child the parts of the flower. We collected flowers and brought them in. I still do that with my own trainees in Kansas City and San Francisco. I go out and collect the leaves. Then we say, what shape is this or that. Then we refer to the cabinet of leaves. What is happening now is they are learning a linear leaf from the leaf cabinet and then looking to see if it exists in the world of nature. The vision, the preparation, must be there before you begin to classify.

KAHN: You have the total picture first and then classify. We do that to some degree but not enough. If you were to design a training program based on Kodaikanal, what would be your approach?

WIKRAMARATNE: I'm trying to do it in a little way by giving special study courses on geography, geology, botany, zoology, and astronomy. So I am doing it during the summer weeks. After a series of eight lectures, I'll get the trainees in and I tell them, let's go for a ramble first and bring back all kinds of plants. I tell them what are the differences you see in the stems and leaves, etc. I do as much as I can on an observation basis. And then I tell them to look at the textbooks. What are the classifications in the books. That classification you must put in the materials. Make them yourself; don't only buy it from Nienhuis.

KAHN: In other words, you evolve the materials yourself, based on what the kids find. You make a classification key of plants in the area and that is the real experience.

WIKRAMARATNE: What I was able to discover with the children after we had done that, these nature activities with both the eleven and twelve-year-olds in Kodaikanal and in Sri Lanka was that they were

much better than the trainees I had. I got University lecturers to give key lectures; I gave them my whole scheme of cosmic botany. I asked them to come and give this overall knowledge of botany from this angle of mine—the cosmic view. They were able to lecture. And I sent my eleven and twelve-year-olds to the same lecture that I sent my trainees. The lecturers told me that my children were better than the adults, because the adults were trying to remember the classifications, whereas the children knew them. And then my eleven and twelve-year-olds made their own books of botany. They didn't make it in cards; they made them in albums, like you make your own albums. They began with kinds of trees. You can't show the parts of a flower before you have seen many of the kinds of flowers there can be in the world. Then you see all those flowers have the same parts, just like all mankind has a head, shoulders, a neck, two arms, two legs.

Watering, Bombay, India, 1940

KAHN: So you look for a variety to begin with and then you go on from the particulars.

WIKRAMARATNE: Yes, that is the exact preparation. So the children saw the differences before we showed them how culture has classified them. You see, we couldn't have classified them before we became oriented.

KAHN: In other words, they would say in their own common language what the differences were.

WIKRAMARATNE: They hadn't book knowledge only.

KAHN: Now my training tells me that teaching the key allows them to see more differences. In other words, what they would get from the idea of the petiole would be that there are different kinds of petioles. They may not every have noticed a petiole before until they were given the key.

WIKRAMARATNE: Yes, but if you give them a whole host of flowers and tell them now what does each one have. Oh, it has this colored part; it has a stem that you can hold. Then you can give them the name petiole. That is the sensorial preparation before giving names.

KAHN: Ok, then you work from experience. You have the real specimen first. That's what they say in my training too.

WIKRAMARATNE: Yes, but I wouldn't do the specimen like many do at the workshops where they had ordered a hundred tulips form a florist shop.

KAHN: In other words, go into nature.

WIKRAMARATNE: Yes; every flower will have those parts. So why order a hundred tulips, or whatever?

KAHN: It should come from an organic experience that is in the child's life.

WIKRAMARATNE: Of course, because that is where we begin from the very first—from birth to three. The child has oriented himself in the world. What does Montessori say? All those impressions are taken in—so now help them to classify. Mr. Montessori took us out at least once a week and showed us things. It was beautiful. His goal was to

Lena Wikramaratne reminisces with Dr. Montessori, Amsterdam, 1979

widen interest, to give us preparation for the work of seeing and observing nature, and learning how to discern differences before you give the classification of things. So then we came home in the night and talked things out. That was the direction Dr. Montessori gave us—how to put them in different classifications and how to draw them. Mind you, that is why I took on an artist—to do all the cards—the parts of a flower and then the parts of a stem, parts of a pistil, and on and on until we came to the natural orders.

KAHN: And then this work was since taken by Mario and then institutionalized later on through the Bergamo training. However, you yourself haven't taught much of the junior curriculum since that experience, have you?

WIKRAMARATNE: I did it with my own children in Sri Lanka up to the 15-year-olds.

KAHN: Did you have to make materials all over again?

WIKRAMARATNE: Not all, I took some of the material from Kodaikanal and then did some more back in Sri Lanka for the local plants and geography and history. I worked hard on materials. For instance, the History of Life and the World Chart that we show now, we made that from scratch. We bought, or Father Guthier gave us, blank newsprint for material making. And we used lamp-black and dyed it black to show the world before man came. For that scroll chart to show world evolution we took poster paint and painted on the newsprint. That's the way we did it.

KAHN: You had a scroll chart of the whole development. That's interesting. I guess a new teacher goes through this experience. With your first group of children you can be spontaneous and develop with the children. Then as you get seasoned, in the classroom, some of that is lost. Anyway, the flaws you might be ready to perceive in new training for cosmic education are related to the fact that it's not a first generation discovery and it's got to be transmitted and can't be transmitted except in a fixed manner. Isn't that the way it goes?

WIKRAMARATNE: Yes, but what I would say is, I have been begging that they make it in a two-year course, bring back the teachers so they can come to study the subjects from that cosmic angle by themselves—the geography, the geology. We would set foundations of giving the cosmic view. Let them study their own subjects for one year and find out facts to support the cosmic view.

KAHN: Speaking of the cosmic view which is related to the past geological eras, where do you think that idea comes from in Montessori?

WIKRAMARATNE: From Dr. Montessori. From the very beginning when she saw the normalization of those children in her first experiment, that was the time that she really began to see that those children had something bigger to contribute to the life from that cosmic point of view. So having been a biologist, a scientist and a mathematician, she began to relate it then to the natural law of order. Then she and Mario came to view it when she saw the children of all nationalities in Kodaikanal actually giving response to this natural world in the same way. That's the time she said, let's do this advanced course.

KAHN: Cosmic education, like everything that's inspirational, runs the risk of being packaged and a cliché.

WIKRAMARATNE: It shouldn't be packaged. We have to create people with interest. If you just learn the charts and dump those on the children, what is the interest you have gained? You have to go out. I am writing a little book called *Child Nature and Nurture* and it's a plea for reestablishing relationships between parents, the children, the home, the community and the whole earth. Children must go out and explore nature. And every Montessori school should be able to do that.

KAHN: Why did Kodaikanal end?

WIKRAMARATNE: In March of 1944 the war was over and the British government said Montessori could move around.

KAHN: Do you think she was anxious to leave at that point?

WIKRAMARATNE: I think she was tired of being confined. I wanted to stay. But she was interested in visiting my homeland, Sir Lanka. She told me she always wanted to visit the land of Sinbad the Sailor. She had read about the island as a child. So we set off together to find a new work—to collaborate with the child once again—the child in nature, in Sri Lanka, and we found that success repeated itself, and our discovery at Kodaikanal was confirmed.

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*Miss Lena Wikramaratne (1909-1982) was a student and colleague of Maria Montessori. In 1965 she founded The Montessori Training Center of Northern California with Vera M. Kenison. She was president and director of the Montessori Education Center in Palo Alto, California.*
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Mario Montessori

# The Kodaikanal Experience: Chapter II

## Kahn-Montessori Interview

DAVID KAHN: You once alluded to Kodaikanal as a community in the hills. Can you begin by describing what kind of conditions you had there?

MARIO MONTESSORI: We were supposed to be interned in Madras. And then we did stay there. But people realized that my mother's health would be damaged and they allowed us to move to a higher place where there was a better climate. The road to safety and salvation was Kodaikanal. We found a house which met our needs, with a minimum of stairs, a fireplace, a garden in the front and a garden in the back. The garden in the front was on the same level as the house. The garden in the back was my escape route which was on a downhill plane.

KAHN: Escape from what?

MONTESSORI: Night and day I was with the community of people who were preparing for the course lectures and working with the materials. I did the usual observation of practicals. But after I was able to go into the woods out the back way to meditate and be alone a little bit. You must remember that during that time there was much destruction going on in Europe. The only time I could think about my children who were back in Europe was in this time alone away from the people.

KAHN: You were separated from your children then?

MONTESSORI: Yes, they stayed here in Holland. I knew my son was involved in a dangerous situation. He was with the underground; he was taking the RAFers through enemy territory to a place near Belgium where they could cross to go back home. And my two other children were under the care of Aida who was later on to become my second wife. They were safe—but the place was full of bombing and so on. And I was really worried.

But that is the personal aspect. Now I will tell you another point of view. There were people who came to stay and share our solitude at Kodaikanal. There was one young lady who came there and took a house just a few steps up on the hill. She started a Montessori class which I could observe every day. That was Miss Lena Wikramaratne. We had an excellent communication.

KAHN: So at least in your grief there was one consoling fact that you had a Montessori class there. In that first session you had only four children—then your number mushroomed overnight. What did you do with these children?

MONTESSORI: I did a bit of everything. I went outside to visit them, to interest them in nature. How did the trees grow. We had a little garden that was worked by the children. They took care of the flowers. They cultivated the plants. We had every variety of species to enhance classification. We went to the garden to observe—many times just to see.

KAHN: Any particular activities?

MONTESSORI: In particular, they observed and detected different aspects of the plants.

KAHN: How did you work it? Would they see a model plant?

MONTESSORI: That's right. Each species has its respective parts that conform to the composite. They could see the plants were really different yet still belonged to a universal plan. That was really a surprise to the children.

KAHN: You made terrariums. What inspired terrariums?

MONTESSORI: Biology includes not only plants, it includes animals. It involves relationships. I wanted to show the children the possibilities of survival within a reconstructed environment. So we created these terrariums to show the collaboration between plants and animals. We would catch one animal at a time, observe them in our constructed surroundings and then return them to nature after a while. When the curiosity of the children seemed satisfied, we would move on to a different animal and a different concept.

KAHN: How did you illustrate the principles of survival?

MONTESSORI: You had to construct the environment in order for the animal to live. For each animal there was a special environment suitable for its survival. I would do much of the preparation. I had to. The work would involve a great deal of thought and application. In order to make the animals eat, I used to catch by the neck and they opened their mouth. (AHHHH) And then I would put meat inside the mouth. That was the funny part; these animals don't eat while imprisoned in conditions that are not natural. They would starve to death. We tried everything to get the animals to eat by themselves. Finally we realized that we had to feed them forcibly.

KAHN: Did your mother have a direct role in these activities?

MONTESSORI: No. She was a great scientist; she actually took a degree in biology after she finished her study of medicine. She was very interested. She would think the profound thoughts working by herself in the house. I was busy with the animals. Why didn't they eat? I was still pre-occupied. One frog simply wouldn't touch her food. She was becoming thinner and thinner—just a skeleton. Then one day, I got so mad I threw a pebble at her and she pounced on it, and took the pebble in her mouth. I realized that some animals were possessed with the instinct of eating only animals that move. This was a great cosmic mechanism, because their eating would consume the living surplus. Eating only that which moved meant that the consumers would eliminate the living over-population.

That began to give us an idea. Dr. Montessori and I would talk. For everything that exists, there must be some force to calibrate the surplus. This seems to be the underlying characteristic: to render service without being conscious of doing so. The carnivores which feed on other animals help to keep fit the kind of animals upon which they feed. They eliminate the weak and the unhealthy and keep the rest alert, so that the ones which survive are the best of the race. The service they render is shown by what happens when they, as eliminating agents, have limited the species. Dr. Montessori used to say—God knows if the fish eggs all hatched and survived, the sea would become crowded. It is very simple. If every fish survived, there would be no water and we would all drink the fishes.

KAHN: So the realization of the cosmic education ideal worked something like this. You and Miss Lena would work in nature and with the children. And then you would come back each day and talk to your mother and she would make comment.

MONTESSORI: Yes, the idea would grow. Animals and plants were attached to nature in all sorts of ways. The animals depend on water, on plants and also nowadays, they depend on man, who creates possibilities for certain types of animals to develop and evolve. Plants depend on sunshine, water, earth, men, and animals. This is a real aspect of the world's functioning. We saw purpose in everything that existed; nature's equilibrium would be maintained. The mountains, the rain, why didn't it rain here, and why did it rain there—the atmosphere, the sun—each had its role to play.

KAHN: The interdependency of life and the network of ecology is hardly a new insight. What was really special was its relevancy to the education of children. What kind of developmental effects did it have on children? How did you make the connection that cosmic history would be an aid to the development of elementary children?

MONTESSORI: We wanted to give reality to the children—and to show the principles of reality.

KAHN: Some would argue that purpose in nature is strictly hypothetical.

MONTESSORI: Exactly, everybody has their way of seeing things. I merely wanted to show them the

facts so the children themselves would realize what exists and draw their own conclusions.

KAHN: But Montessori and yourself have derived from this experience not only a factual picture of nature, but a vision of appreciation and love.

MONTESSORI: Yes, we had many occasions to make moral lessons with the children regarding facts in nature. In Madras, for example, the local people are afraid of crows—they view them as a horror. It is a part of the local culture to fear these crows. There was a hill for all to view where the people used outhouses—and the crows very often would immediately descend to get at the feces while these people were using the toilets. It was quite an inconvenience.

These people were near a village of fishermen, and they had no facilities. We saw this type of thing. Over the years, these birds were considered unclean. But we tried to communicate that every creature has its cosmic task. And some of these tasks were not pleasant to human beings. The children might consider the task horrible. We changed their impression to think how marvelous that everything has its task. We should be happy that crows clean up this mess. And then the children would give other examples coming from their experiences. Dr. Montessori meant for us to bring God into the life of the children. The reality and wonder of creation should be dealt with in such a fashion that the children cannot only see it but absorb it into their sentiment. They will feel that our world is a good place to live in, and a place where generosity is expressed with the very breath of life.

KAHN: Another part of cosmic education is the charts and the timelines. Doesn't your original work in Kodaikanal run the risk of banalization of cosmic education in the packaging of these charts and timelines? What do you think?

MONTESSORI: We tried then to work with the child in nature, to show the erosion of land, the sedimentary formation—we would try to help the imagination of the child with real experiences. If you take all the charts and timelines and call it Cosmic Education, that is ridiculous. It goes much further than that.

KAHN: How do we deal with teachers in training who do not have the knowledge and appreciation of nature that you have? Where do they get the feeling for nature?

Montessori child, Sophia College, Bombay, around 1942

MONTESSORI: Well, they do get an illustration of the facts, and if they don't have this kind of sentiment, they should develop them with the children and through the children, using real natural materials. People always say that nature education is too expensive or that it would frighten the children. But when we worked with the children, we simply showed them what's there. You could always demonstrate and give proof to the children as to what's happening. For instance, I would build a sandbox. If you wet sand, it stands up. If it is contained by a cylinder, it pushes together. When you take the sides of the cylinder off, it pushes together. Then you sprinkle the sand with water, and the sand crumbles. All that took place on the earth, in the oceans. There are certain things that stay up for a long time—those are the mountains. Their material is hardened. Even then some mountains were washed away. I used to build extensive models outdoors, using natural materials.

KAHN: One of the ingenious aspects of Cosmic Education is the Story of the Universe in that it

introduces an overview that initiates the first principles of all the sciences. When did you conceive of telling children the story of creation as a means of introducing scientific principles?

MONTESSORI: I would discuss these things with my mother. Of course, we were in a country where the Christian belief was not in the majority. I would argue with my mother that every religion has its version of creation—that it was not fact. But as we studied we saw that there was a connection between the evolution of life and the Book of Genesis. We saw reconciliation. We saw that everything had its cosmic past. Who does it. And everyone says, "God does it." And we used to say, well, God has no hands; we haven't seen God do anything. So that is why we believe that the hands of God were put in this world in the creation, in each substance, in each being. There is a sentiment, or perhaps a thought that keeps all things working together through cohesion of some sort, through existence, through accommodation. The child can experience in nature that there is something eternal, present everywhere and always which seems to have organized the whole universe in such a way that everything in it merely by existing, is of service to the whole.

KAHN: So the beginning of the elementary education that we know today really came from Kodaikanal. Although you had elementary classes before, this was the first exploration of the sciences that was uniquely a Montessori development.

MONTESSORI: Yes. In the olden times, Dr. Montessori had the children up to six, and then from time to time we would keep children whose parents were enthusiastic and who would request more. We had included some advance technique in previous courses. But it was at Kodaikanal where Dr. Montessori developed certain visions and through these visions applied and planned classes for children.

When we came back from India, we came to Holland, and the big surprise was that they said they knew everything already about elementary school, and we had a tremendous difference of opinion.

We had made a new discovery which was special and long-lasting—and it all came about in the hills at Kodaikanal where practice and ideals met—and a better vision emerged.

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*Dr. Mario Montessori (1898-1982), son of Maria Montessori, dedicated his life to the preservation, dissemination and application of Montessori's works.*
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Walking the line carrying various objects including a pink tower, Allahabad, India, 1928

Courtesy of Montessori School of Beaverton, Portland, Oregon

# Sowing the Seeds of the Sciences: Our Gift to the Future

Audrey Sillick

*Audrey Sillick's article, first printed in 1988, provides a theory base for Maria Montessori's foundational emphasis on the biological sciences and the sustainability of a living, organic planet Earth as part of the educational process "of becoming more fully human." Ms. Sillick helps link primary-level biology with the special energy and cohesion of the Montessori view of Cosmic Education, the particular engagement of the senses that nature elicits, along with a celebration of the child's interactive process with nature, which, in fact, is our hope for the future.*

When the explorer, Martin Frobisher, reached the coast of Labrador in 1576 he found the prospect forbidding. "There was," he tells us, "so great a store of ice all the coast along, so thick together, that hardly the boat could pass into the shore. At length, after diverse attempts, the company was commanded, if by any possible means they could get ashore, to bring whatsoever they could first find, whether it were living or dead, rock or stone, in token of Christian possession . . . and some brought flowers."

In many ways the flowers were the true symbol of our continent's wealth. Explorers and pioneers who followed Frobisher learned much from the aboriginal peoples of the land. The journals and diaries they left speak of the Indians' sophisticated knowledge of the use of common plants as food and medicine. These remarkably accurate and detailed records have contributed to the foundation of modern systematic botany, not to mention their importance to plate tectonics theory, which has revolutionized geology. As settlement increased, various gifted amateur botanists, many of them women, delighted in chronicling their novel surroundings, documenting their observations with precise detailed sketches and paintings, collecting and cataloguing seeds and specimens. In addition to providing invaluable historical information, their writing remains a tribute to their ability to transcend the destructive practices and attitudes prevalent in their day, and which unfortunately remain a negative influence into our own times. The ethic of domination remains the shadow side of human relationship with nature.

Viewed from a distance, the astonishing thing about the planet earth is that it is alive. Aloft, floating free, beneath the moist gleaming membrane of bright blue sky, is the rising earth, the only exuberant body in this part of the cosmos. In the organic wholeness of life, humans remain a part of its essence. Our land, yours and mine, is today dangerously close to sundown. Yet, for us, as Montessori educators, there is a choice. We are committed to "experimental science," (to use Montessori's own term). Such a science needs a cosmic vision, a sense of humankind's belonging to the great order of the universe, destined to fulfill a cosmic task. In the evolutionary experiment, living things convert an essentially hostile environment into a life-supporting one, making possible the continuity of life in all its diversity. Created by living organisms, maintained by living organisms, the biosphere forms a breathing interacting sphere of life.

When John Muir suggested that each of us is connected to everything else in the universe, his suggestion was not simply rhetorical. Humankind has made a long journey with worm, fish, and reptile to assume mammalian form before taking the primate path. We humans of enlarged brain, of the long period of infantile dependence, of speech and symbol, of self-consciousness and reflection, cannot be limited by biological concepts. But we cannot ignore them either. Nature is part of our humanity, and the fact of interrelatedness and interdependency is a general principle of life. The reason for studying biology is the old admonition, "know thyself." We cannot, however, really know ourselves if that is all we know. True understanding can come only from knowledge of life in general.

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Biology, set within an ecological framework, includes both human and non-human elements in a reciprocal interplay, every life form and process linked in a dynamic and diverse global community. As Montessori educators we are committed to an experimental science which takes a radically different view of the process and the goal of education – the fostering of the fullest degree of humanness.

Abraham Maslow once wrote, "The function and goal of education, the humanistic goal is ultimately becoming fully human: development to the fullest the human species can attain or that a particular individual can come to: it is helping the person become the best he/she is able to become." That phrase "ultimately becoming more fully human," has echoed down the corridors of the mind since classical times. Montessori's stated aim for education is to further the formation and integration of the human personality from birth to adulthood. The child's creative unconscious guides that formation, and the facilitative environment nurtures it toward consciousness. Inner and outer worlds are always linked, each acting upon the other and coevolving. This is a dynamic process, involving the child in an interior work. To achieve the balance and harmony that has long eluded Western education, we must strive to unite the powers of reason and the rational mind with the empathetic depth of the intuitive mind. Physicist Fritjof Capra puts it this way, "Rational thinking is linear, focused and analytic. It belongs to the realm of the intellect whose function it is to discriminate, measure, and categorize. Intuitive knowledge is based on a direct nonintellectual experience of reality arising in an expanded state of awareness. It tends to be synthesizing, holistic, and nonlinear."

I would suggest that the natural sciences, and biology in particular, are uniquely suited to engage young children on an intuitive receptive level. Children are able to look and to listen in an absorbed and selfless way. We have all witnessed the child's intense attention watching a tiny bug: the insect undisturbed, unchanged, and unintruded upon by the child. Only such a self-effacing observer will be permitted to penetrate its secrets. That ability, to keep hands off and mouth shut, to be patient, to suspect action, to be receptive and watchful could be called a *Taoistic approach*. It is an attitude toward nature rather than a technique in the ordinary sense. Perhaps it should be called an *anti-technique*. When I have described it to people they have usually sniffed and say, "Oh yes, simple descriptive science." Often I am not sure they have taken my meaning. Real receptivity of the Taoistic sort is a different achievement. To be able to listen without presupposing, classifying, improving, evaluating, without dueling with what is said—such anticipatory listening is rare. Children are far better able than adults to look and listen in such an absorbed and selfless manner.

How do we best develop this attitude in the child? For educators two concerns are vital: our own receptive openness to the sensory qualities of the natural world and our desire to give children the special gift of time. For many people the road to the natural world has been through identification, a process that can be sterilizing. There is an ever present temptation to organize, classify, simplify, abstract and label to the point of distraction, when the constructs of the mind itself become the reality. Names are for convenience, for reference, to make ourselves understood. But in themselves they are nothing. Once we label something, there is a temptation to assume we know it.

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For language to be meaningful, it must capture the child's experience. And equally important, children need time. Too many children are being hurried through childhood with little time to be receptive or thoughtful or to integrate their experiences. We must allow a measure of unhurried time to capture the precious ingredients of a special experience. Children's lives are a celebration expressed in activity in which feelings, senses, movement, and thought are fused harmoniously.

We must never forget that whatever certainties science affords, depend in the last analysis on what trained minds can see, hear, taste, touch, and smell. For the young child, the natural environment is a source of delight; the sounds, textures, colors, shapes, patterns and harmonies; the sensate joys, the enchantment and endless surprises engage them on the affective level. The natural environment is both place and teacher, leaving impressions that incubate in the absorbent mind. Those experiences remain even while the conscious attention is directed elsewhere. Montessori speaks of the engagement with the real living world as being nourishment for the imagination that is "a force for the discovery of truth."

She cautioned against intrusive explanations at the moment of wonder and mystery: a pink earthworm disturbed by a probing trowel, scuttling sowbugs beneath a log in damp togetherness, a salamander under a rock on the forest's littered floor. Questions will follow, but for that wondrous moment, silence is golden with feeling. When young children become acquainted with living beings, Rachel Carson tells us, "then we wish for knowledge about the object of our emotional response. Once found it has lasting meaning. It is more important to pave the way for the child to want to know than to put him on a diet of facts he is not ready to assimilate." The value of knowledge is not only in what is known, it is in the change wrought in the knower. Although knowledge and familiarity enhance the appreciation of life, the wide range of feelings, from love and admiration to fear and anger, are strong sources of motivation to appreciate and protect. The natural sciences can be a way of marrying that which is loved with that which fascinates. Such a mystery is the beginning of a special love relationship with life.

A study of over 300 autobiographical recollections of artists and writers from many cultures and eras revealed something they shared in common. These creative persons, from the sixteenth century to the present day, write of returning in memory to their early life, a special period between five and eleven years of age, in order to renew the power and impulse to create at its very source. In their memories, these gifted individuals tell of experiencing the natural world in highly evocative ways, with an awareness of their own unique separateness and identity, but also as a continuity, a renewal of relationship with nature as process. It does appear that adult memories of childhood refer to a deep desire to renew the ability to perceive as a child, and to participate with the whole bodily self in the sights and sounds of the external world of nature.

Contact with the world through the natural sciences evokes a multitude of different responses in each child. It is the "real stuff" of the imagination. Living organisms and processes must be taken on their own terms, not ours. The imagination is the link between the mind and the heart, between intellect and sense, between thought and feeling. It holds the key to human understanding, as so many poets and artists have demonstrated. James Joyce expressed it in *Ulysses*, "I am a part of all that I have

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known." The creative imagination of the child is not the result of an accumulation of information, but of a continued transaction with the mystery and wonder of a living world. The child's infinite curiosity draws him into self-directed activity vital to the process of self-formation and normalization. Sofia Cavalletti has written that wonder is a dynamic value that allows activity and contemplation to be inseparably blended with it.

The facilitative environment is a transactional one which children transform, and by which they are transformed. Young children learn to think with the whole body, and the Montessori environment demonstrates a valuing of the body as the instrument of expression of the self, a thing of beauty, and a rich source of pleasure expressed in coordinated movement.

The cultivation of sensitivity, empathy, respect, and care also resides in a consistently caring environment of trustworthy, but not perfect, human beings. Values and attitudes of caring cannot be implanted, grafted, or legislated; They simply have to be there. Children are born with a sense of wonder, which heightens their awareness of the world about them. They are open and spontaneous, enthusiastic and curious. Every day they awaken to surprise, to discover fresh new things in everyday occurrences. An enthusiastic adult to share their joy is a valuable companion. The natural sciences call the child into a vital relationship with the earth and its family, as a participator in a journey of discovery of the ground under their feet.

In terms of a language environment, could we do more to enhance the gift of speech? Natural science can provide children with an alphabet for their exploration as well as the means of concept formation. Language is the ultimate expression of this elevated consciousness, the final flowering of the growth process linking our human nature with the universe.

It is the gift every newborn brings to humanity. Natural science can be "the poetry of the intellect," since encounter and engagement with living beings can be equally poetic, spiritual, and philosophical. Language reflects our view of the world. And after all is said and done, it is a uniquely human activity, a gift with which the child finds renewed significance. Children, engaged affectively with a

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living world, open their human nature to the full dimension of its being. The love, joy, and stimulation of learning may be the single most important outcome of that relationship.

Children excited about learning are well prepared for the elementary. In the Children's House, knowledge absorbed by "good doing" is multisensory, laying the foundation for research. By moving easily and comfortably between indoor and outdoor environments children are encouraged to go to the source, to always verify. A facilitative environment at this primary level provides the means for a systematic ascent toward knowledge. The order, focus, and sequence in botany and zoology are an important part of a systematic approach, a sound place to begin. Shapes of leaves, parts of plants, and animal classes are the basic ingredients for formal biology. The leaven for research is seeded in the good soil of this primary environment. Only a spark is needed to ignite flammable material at the elementary. The children, when they encoun-

ter their natural environment, grow both outward by exploration and discovery and inward, as they use their senses to learn who they are. Sigmund Olsend wrote,

> While we are born with curiosity and wonder and our early years full of the adventure they bring, I know such inherent joys are often lost. I also know that, being deep within us, their latent glow can be fanned to flame again by awareness and an open mind.

Like the early settlers who collected flowers as a symbol of the continent's wealth, we must rediscover the beauty and integrity of our mother earth and then share these discoveries with our children. We cannot share what we do not possess. Henry Bexton in *The Outermost House,* wrote,

> Nature is part of our humanity, and without some awareness and experience of that divine mystery man ceases to be man. When the Pleiades and the Wind in the Grass are not longer part of the human spirit, a part of every flesh and bone, man becomes, as it were, a kind of cosmic outlaw, having neither the completeness and integrity of the animal, nor the birthright of a true humanity.

Man can husband nature's resources to her own best interests, only if he first loves her for her own sake.

There is no end to the marvels and wonders of our wonderful planet. Before world ectoplasms are changed beyond recall we must bend every effort to allow children to experience the delights, beauty, and wonders of the nature world. Only then can they be a part of a judgment about its future. They will decide if unthinking and irreverent intrusion shall continue and whether the ruthless exploration of the earth is absolutely necessary. As educators, we are aware that never has the time been more urgent, or the message more vital. Ours is the privilege to make the largest single investment in the future of our planet: we serve the child, who is earth's richest resource.

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Courtesy of Montessori School of Beaverton, Portland, Oregon


Learning science through artistic expression by painting the Big Bang, New Zealand

# Maria Montessori's Cosmic Vision, Cosmic Plan and Cosmic Education

by Camillo Grazzini

*This classic position of the breadth of cosmic education begins with a way of seeing the human's interaction with the world, continues on to the grandeur in scale of time and space of that vision, then brings the interdependency of life where each growing human becomes a participating adult. Mr. Grazzini confronts the laws of human nature in looking at the protection of offspring as they grow into the higher purposes of the cosmic plan. The world becomes the house for children or a household where everyone has a cosmic task.*

## Introduction

Some time ago I was saying how much I like the Congress letter paper, with its watermarked background of cities and dates in pale blue. Belonging to three different continents and linked to dates spanning a period of almost seventy years, these cities recall all the congresses held by our Montessori movement and they bear historical testimony to the work carried out on behalf of the child and in favor of peace, a work which began in 1907 with the founding of the very first Casa dei Bambini or Children's House.

Over the last fifty years, this is the third time that we are publicly honoring Maria Montessori in this magnificent city of Paris. In 1953, the 10th International Congress was held here (the first to be held after Maria Montessori's death); then, in 1970. UNESCO celebrated the centenary of Maria Montessori's birth; now, thirty years on, the 24th International Montessori Congress is being held here, the first congress of the new millennium.

The theme of this congress is close to that of the first congress held in Paris: the theme then was "How to Help the Child to Adapt to Our Times"; this time it is "Education as an Aid to Life." The close similarity of theme is significant because it demonstrates the continuity of our work, and the theme itself highlights Maria Montessori's life work for the child, and encapsulates the aims and work of the Association Montessori Internationale, the organization founded by Maria Montessori herself in 1929.

## Cosmic Vision, Plan and Education

By 1935 Maria Montessori's cosmic vision, her thinking in relation to a cosmic plan, her ideas of cosmic education, had all started to take on a definite form, had started to crystallize. But what about these three expressions that all share the great qualifier *cosmic?* In reality they all represent different aspects of a single mode of thinking.

The first aspect, that of "vision," has to do with a way of seeing, a way of understanding the world; and Montessori's own grandeur has to do with her way of looking at the world and at the human being.

The second aspect is that of the "cosmic plan." Looking at the world with grandeur of vision, with a cosmic vision, we find order at the level of nature, at the level of creation. For such a cosmic order to exist, and for the upkeep and continuation of creation in general, we find many agents at work and among them we find human beings. Virtually all of these agents of creation, or cosmic agents, act and work unconsciously: humanity alone has the potential to act consciously.

The third aspect, that of "cosmic education," can be looked on as the operational aspect: becoming aware of the different kinds of cosmic work carried out by the various agents and of the interdependencies and interrelationships involved, and thereby developing one's own cosmic vision; becoming conscious active participants ourselves and thereby

participating more fully in the cosmic plan or cosmic organization of work.

Incidentally, at this point we can understand that, unlike what many people believe, *cosmic* in no way implies contestation or rebellion or breaking free of given patterns of behavior for the purpose of self-expression at all cost. It does not imply adopting transgression as a way of life. On the contrary, cosmic[1] implies order, the world as universe and unity, the beauty of universal order as opposed to the disorder of chaos. This linking of order—unity—beauty lends depth of meaning to the expression chosen and used by Montessori herself.

**Cosmic Vision**

The Montessori vision of the world has a cosmic dimension because it is all-inclusive: Montessori looks at the world, sees the world, on a very grand scale, that is, at the level of the universe with all of its interrelationships. There is the inorganic world which is ecologically linked in innumerable ways with the biosphere which, in turn, is linked with human beings or the psycho-sphere.

Montessori's vision is also cosmic because she looks at the whole of humanity throughout time: she sees human beings as being guided by finality from the time of their appearance; she sees humanity as both adult and child; she sees the individual both in his unity or oneness and in his developmental differences during the diverse stages or "seasons of life."

It is this vision of an indivisible unity made up of energy, of sky, of rocks, of water, of life, of humans as adults and humans as children, that lends a sense of the cosmic to Montessori's thinking.

This cosmic sense pervades all of Montessori's work, both her thinking and her educational approach for all of the different planes or stages of development of the human being: from birth without violence, to the infant community, to the *Casa dei Bambini,* to the elementary school, to the *Erdkinder* community for adolescents.

Quite clearly then, this cosmic vision belongs by right to the whole of the Montessori movement: it is indeed the key which gives us all a shared direction and common goal in our work. In stark contrast to this, there is cosmic education which is for the second plane of education only, destined only for six to twelve-year-old children. Indeed, cosmic education responds to the specific developmental characteristics and needs of the human being during the second plane of development: for example, using the imagination to understand reality, realities beyond the reach of the physical senses; striving for mental and moral independence; exploring the vastness of culture; forming a particular kind of society; and so on.

In her book, *What You Should Know about Your Child* (a book which was first published in Sri Lanka, in 1948), Montessori herself speaks about the cosmic plan as follows:

> There is a plan to which the whole universe is subject. All things, animate and inanimate, are subordinated to that plan. There are also patterns for all species of living and non-living things. These patterns fall in line with the universal plan.
>
> Everything in nature, according to its own laws of development, approximates to the pattern of perfection applicable to itself. There is an urge in every individual of every species to fit into the appropriate pattern. There is also an inevitableness with which all patterns fit into the great plan.
>
> From the seed to the full-grown tree, from the egg to the adult hen, from the embryo to the man of maturity, the striving to embody a pattern is perceptible. It wants a loftier vision to understand and appreciate how all creatures and all things evolve into infinite varieties of patterns with a magnificent impulse to subordinate themselves to the central plan of the universe.
>
> It is certain that the urge to protect the offspring and to conserve the species is among the strongest urges of all nature. But there is a purpose higher than the protection of the offspring or the preservation of the species. This purpose is something beyond mere growing according to a pattern or living according to instincts. This higher purpose is to conform to a master plan towards which all things are moving.[2]

This "higher purpose" can be understood more clearly if we think of the world as a great household, a cosmic household, where all the jobs involved in running the household have been divided up and shared out. Understood in this way, expressed in this way, the cosmic plan actually consists of an integrated structure or cosmic organization where all that exist have tasks to fulfill, their cosmic work to accomplish.

Observing nature is crucial to biology in Montessori Schools. Altona, Germany, around 1928, courtesy of Mueller and Schneider 125:1

Examining the cosmic workers at the very grandest scale, we see inorganic agents such as the Sun (the prime source of energy), the Land (but also the rocks and the earth or soil), the Water and the Air, all of which act and "work" according to the cosmic laws of their being, that is, according to their inherent nature. (Incidentally, in the thinking of Empedocles these would constitute the roots of sources of all and everything.) Then there are the great organic cosmic agents, plants and animals who, with their sensitivities and instincts, also act and "work" according to their cosmic laws or inherent nature. Lastly, there is the human being, always in his two manifestations: the adult and the child, the child and the adult.

**Cosmic Agents**

All around us there are cosmic agents, of whom we also form part, and these constitute the living and non-living world.

There is energy, the Sun's light and heat. There is the lithosphere: the very ground on which we stand and where we build our homes; the earth or soil which we dirty our hands, in which the seeds of plants can take root, and to which, on dying, we return; the land which is also the great vessel or container for the seas and oceans. There is water, the hydrosphere: the great constituent or element of the surface of our planet and also of our own bodies; the very source of life. There is the atmosphere, air: the very breath of life.

Then too, there is the sphere of life: plants, animals and human beings—the cosmic agents in organic form, those that make up the biosphere. Then, with mankind and with mankind alone, do we have the psychosphere, for 'something new came into the world with man, a psychic energy of life, different from any that had yet been expressed,' a "new cosmic energy."[3]

Montessori says all cosmic agents are guided by a universal intelligence which uses the home,[4] that impulse, urge or drive, albeit unconscious, toward evolution, self-functioning, and full self-realization. If this is so, then the Montessori idea of finality and syntropic phenomena (where we see a process leading from what is simple, from the homogenous, to the complex and differentiated and therefore to what is ever more highly ordered) also involves the non-living world. And all this reminds me, in a certain way, of yet another outstanding individual; it reminds me of Teilhard de Chardin's powerful vision of the world.

**Cosmic Task and Cosmic Work**

Each agent, great and small, has its own mandate or mission to carry out. This constitutes its own particular function in the cosmic plan, its specific cosmic task that has to be carried out uninterruptedly and unceasingly. However, the possibility of doing this depends also on the work of other agents. In other words, there is a cosmic organization of work which necessarily involves specialization or division of labor, a collaboration amongst all the workers or agents, and therefore innumerable relationships of interdependency.

With Montessori's cosmic fable, "God Who Has No Hands," we see the coming of the great inorganic, non-living, cosmic agents as well as the laws of their being. In the work and activities that follow on from the fable, we see how these agents interact and function together in all their possible combinations and relationships, from the Sun with its energy and the planet Earth as a whole, to the cycle or game played out by Water with the help of the Sun, Air, and Land. The endless activity and unceasing toil of these agents explain so many of the phenomena with which we are familiar: day and night, summer and winter, rain and wind, snow and ice. But their work and toil also explain the seemingly changeless features of our globe where all, in reality, is endless change: where wind and water and ice constantly carve and sculpt the land; where the land is worn down and built up only to be worn down again, in endless cycles; and where the frontiers of land and water are ever changing. And in all of this unceasing toil, these agents behave, can only behave, according to their nature, according to their cosmic laws, the laws they were given. To express it in terms of Montessori's first cosmic fable, it is as though these agents respond to the call of God, God who has no hands, and each one, Sun, Air, Land, and Water, whispers: "I hear my Lord, Thy will be done. I obey."

Opposite page: Geography lesson, Montessori class, Berlin-Tegel, around 1950, courtesy of Mueller and Schneider 122

With Montessori's second cosmic fable, "The Story of Life," we see the coming of Life which has its own laws. We see how Life appears to save and preserve the order and harmony of the world since, left to themselves, the non-living agents cannot maintain cosmic order and threaten to bring about chaos.

Montessori regards the sphere of life, the biosphere, as an intimate part of the Earth's body; and Life's function is to grow with the Earth, to work not just for itself but also for Earth's upkeep and transformation. Thus Life too is one of the creative forces of the world, an energy with its own special laws.

The great agent of Life includes, of course, many many beings, both plant and animal, and Montessori refers to these living agents as "engines of God," for such they are.

Take for example the *diatoms.* These microscopic (unicellular or colonial) algae extract silica from the water to build their "shells." The layer of glass-like silica deposited on the cell wall forms sculptured designs that vary from one species to another; and there are thousands and thousands of these species! Minute as they are, these shells of silica are found in layers, hundreds of feet thick, on lands formerly covered by shallow seas, and vast deposits from diatom oozes covering large parts of the ocean bed.

Take for example the *corals.* These extract calcium carbonate from the water and, tiny as they are, they build up new land and they also protect mainlands from the sea. How much calcium carbonate was extracted by this army of tiny workers to build the Great Barrier Reef (of Australia) which stretches for about 2000 kilometers (1250 miles)?

And what about the *green* plants that constantly purify the air we breathe through their endless work of photosynthesis?

The *cow,* says Montessori, is one of the most important land animals, for its one duty in the cosmic plan is the maintenance of grasslands and meadows in good condition, and this it does: cutting the grass, pressing down the ground and fertilizing it, all at the same time.

And what about the *vultures?* Faithful to their function of cleaning the Earth of things dangerous to other beings, they eat carrion and corpses in putrefaction.

And what about the earthworm? It sinks into the earth and works away as "God's little plough" (to use Darwin's expression), aerating the soil and also leaving it more fertile.

We could go on, and on, and on. But enough has been said to understand what Montessori means when she says: "all things in nature have a pattern to which they conform and all of them adhere to a plan into which they weave themselves to form a universe in equilibrium. They function for the preservation of the whole according to a plan and for the preservation of the species according to a pattern: thus are brought about order and harmony in nature."[2]

**Cosmic Task of Human Beings**

When it comes to human beings, the prime spiritual agent, and the cosmic task of human beings, Montessori distinguishes between the adult and the child since their tasks are very different and consequently, so is their work.

The child's cosmic task is to construct the human being itself, construct a man who will build peace, a man who is adapted to the world in which he lives. The greatest onus of this task lies on the child of the earliest years; and the greatest work ever accomplished during any lifetime is that which takes the human being from the helpless state of the newborn babe to the child who not only manifests the characteristics of his species but clearly belongs to his own human group, and is also his own individual self.

Such an enormous work of creation and construction, one which is beyond the power of any other age, is only possible with the power of what Montessori call the *absorbent mind;* with the guidance of those irresistible attractions of limited duration, that Montessori calls the *sensitive periods;* and with the drive of incredible creative energy. Using his hands, that marvelous human gift, the child explores his world, develops his mental powers, and constructs his very self and, ultimately, the adult human being. We are each one, as Montessori says, "the child of the child" that we once were; a variation, if you like, of Wordsworth's line of verse: "The child is father of the Man."[5]

The adult, on the other hand, whose cosmic task is one of contributing to the upkeep and development of the Earth, of creation, modifies and transforms the environment, building a new world which is always new, "a supranature, a civilized environment" which goes above and beyond primordial nature. In other words, the adults build a civilization

which is in constant evolution and which involves a continual modification and enrichment of their "spiritual territory."

Thus, in some—as yet unpublished –lectures that Montessori gave in 1950[6] she writes this:

> Man's arrival has created a psychosphere on Earth. What is his task in it? For we must understand that mankind, too, has a task with regard to the Earth on which it lives. The coming of mankind meant a new force, whose function it is to further the progress of evolution. We notice that man possesses certain capacities which may stimulate progress on Earth. His scientific work gradually discloses the secrets of Nature and, moreover, makes use of them, thus creating new possibilities. His technical skill has harnessed the forces of nature in order to build the most complicated machinery. Man's toil has developed agricultural products which were unknown in primitive nature. Obviously, man too has an active task on Earth. . . .

And she continues by saying,

> So far, however, man has failed to see that there is a field to be explored in mankind itself. We have now arrived at a stage where we must cultivate human energy. Until now we have devoted our attention chiefly to the inventions of mankind and their workings.
>
> Now we have once more to connect these things with man, who invented. Man must take a central place in life.

Montessori concludes with the importance of the child and the child's education for the advancement of humanity and the evolution of civilization:

> This we can effect through the child. But the child cannot do it by himself, he can only acquire a higher form of character with adult assistance. The child has no fixed form of behavior, and therefore he needs a guide so that he will not go astray.

But now it is no longer enough to consider the only child of the earliest years, we must also take into consideration the older child, the six to twelve-year-old child who is in the second plan of his development. And this is what Montessori says:

> We can make the human race better by assisting the child in building his character and acquiring his moral freedom.
>
> One of the means to this end is a cosmic education, which gives the child an orientation and guidance in life. For this education wants to prepare the growing child for the task awaiting him in adult life, so that he will feel at ease in his own environment, in which he will later have to live as an independent being.

**Cosmic Education**

All that I have said so far, about a cosmic vision; about the cosmic plan or cosmic organization; about the cosmic agents with their variety and diversity of tasks and work, all of which lead to a cosmic order; and about man's special place and role in the cosmos for creation; all of this is involved in cosmic education. Very gradually, and without any need or direct teaching and preaching, the children are led to see, to understand, and to appreciate much of what I have already discussed, and much more besides.

Cosmic education has many aspects and facets and (also for reasons of time) I shall limit myself to indicating and highlighting some of these.

Cosmic education helps the children to acquire a cosmic vision of the world, a vision of the unity and finality of the world, a vision which gives a sense of meaning and purpose. This vision encompasses both space and time; in other words, the children learn to understand the world both in its evolutionary development and in its ecological functioning.

Cosmic education gives the children the opportunity and the freedom to explore, study and acquire knowledge of the universe not only in its globality, but also in its complexity; and they learn to appreciate how the various cosmic forces, following the laws of nature, work and interact such that our universe is one of structure and order. In other words, the children are helped to become aware of what is only too often taken for granted and not seen: the natural or cosmic laws that bring about the order and harmony in nature, a cosmic order and harmony.

Cosmic education enables the children to discover many kinds of interrelationships that exist in the world and that explain how our world functions. These are sometimes relationships of dependency but, above all, they embody interdependency: be this the interdependency of various cosmic forces or the interdependencies within the context of a single force. With these kinds of discoveries, the children come to understand and appreciate the importance of collaboration at a cosmic level.

Studying the timeline of life on earth, a geological-biological progression of animals, plants, and earth changes, Japan

Cosmic education helps the children to become aware of cosmic tasks and cosmic work, be these carried out consciously or unconsciously (as is usually the case). In this way, the children reach a deeper understanding of the full functioning and role of each of the cosmic agents, living or non-living. Consequently, the children become more and more aware, not only of the importance of work, but also of the importance of work that benefits others, that contributes to the well-being of others, and they come to see how much they too have received and continue to receive. Mario Montessori recounts how, once they became conscious of cosmic work: "the children sought eagerly the cosmic task of whatever came under their observation and, penetrating into these tasks, they came to acquire a feeling of gratitude towards God for the nature he had provided, and towards mankind for having created, starting from natural conditions, a supranatural world in which each individual could perform his own task and provide himself with all he needed from what had been produced by the work of other men."[7]

Cosmic education results in creative attempts to lead a new and different kind of human life, with responsible participation in all natural and human

phenomena. Let me illustrate this with one small but telling example. When Maria and Mario Montessori were in India, some of the children in the school heard about a great problem of adult illiteracy there. Quite spontaneously, they decided to play their part in alleviating this problem and, with permission, they borrowed some materials from the school and taught some such adults in a nearby village, to read and write. What an example for all of us!

Cosmic education also means a very different kind of approach to culture. With this approach, we pass from the whole to the detail; each detail is, or could be, referred to the whole; the whole is made up of ordered parts; and lastly, specialization of knowledge and interdisciplinary, developing simultaneously, integrate and complete one another. "In the cosmic plan of culture," wrote Montessori in 1949,[8] "all sciences (branches of learning) can be linked like rays springing from a single brilliant centre of interest which clarifies, facilitates, and furthers all knowledge." And one year later, she says:

> Thus the way leads from the whole via the parts back to the whole. In this way the child learns to appreciate the unity and regularity of cosmic events. When this vision is opened up he will be fascinated to such an extent that he will value the cosmic laws and their correlation more than any simple fact. Thus the child will develop a kind of philosophy, which teaches him the unity of the universe. This the very thing to organize his intelligence and to give him a better insight into his own place and task in the world, at the same time presenting a chance for the development of his creative energy.[6]

**La Nazione Unica Dell'umanità**

I could stop here for I have examined all the three aspects of Montessori's thinking that I was asked to address. However, I should like to take a little more time to examine further that very special agent of creation, humanity, that has its own glorious, as well as inglorious, history. Throughout their history, human beings have always organized themselves into different human groups, and the contact between groups has varied from peaceful trade and exchange right through to open conflict and warfare. What does Montessori have to say when it comes to the future of humanity?

In her lectures of 1950,[6] she says this:

> Every human group has a form of its own. Now we find that these groups have a tendency to unite; not because the individual members have grown to love each other—for how can one love such a huge number of people that one does not even know—but because obviously the next step in evolution is the unity of mankind. In the psychosphere there should now only be one civilization.

Even earlier, in 1937, Montessori was saying: "All mankind forms a single organism . . . a single, indivisible unit—a single nature."[9] For Montessori, in other words, a single nature of humanity already existed decades and decades ago.

There are others who have expressed similar, though not identical, ideas: for example, Marshall McLuhan with his "global village;" and Gorbachev with his "common home" when speaking of Europe.[10]

In any case, sixty-five years ago, when the League of Nations was still in existence and the United Nations still lay in the future, Maria Montessori had widened the limited concept of a "nation" (meaning, for example, "an ethnic unity conscious of its cultural distinctness and autonomy") and extended it to embrace the whole of humanity. Ethnic unity, then, is determined by all of Earth's human inhabitants belonging equally to the human species and, as for the different human groups, Montessori says: "A single interest unites them and causes them to function as a single living organism. No phenomenon can affect one human group without affecting others as a consequence. To put it a better way, the interest of any one group is the interest of all."[9]

Even the new economic process of globalization, understood as the unifying of world markets and therefore human work, seems to be, at least to my way of thinking, anticipated in Maria Montessori's writings. Montessori, however, always links the international economic reality to human or social solidarity, as we can read in a very well-known lecture she gave in 1949 in San Remo, a lecture which she even called "Human Solidarity in Time and Space."[11]

Universal union, says Montessori, already exists, and therefore all that is needed is that we should become aware of this reality and "replace the idea of the necessity of bringing about union among men, by the recognition of the real and profound existence of these bonds of interdependence and social solidarity among the peoples of the whole world."

And also: "This solidarity between human beings, which projects itself into the future and is sunk in the remotest ages of the past … is a wonderful thing."

"The living idea of the solidarity of all men … closely united by so many bonds, generates a warm feeling of sharing in something great which even surpasses the one's feeling for one's country."

We can note in passing that Montessori's idea of La Nazione Unica, in the guise of world unity, was also shared by H.G. Wells and by Julian Huxley.

This idea of human solidarity throughout time and space, and therefore the concept of a single nation of humanity, also form part of Montessori's cosmic education; and the children come to grasp these ideas, not through mere words and little sermons, but through the exploration and study of humanity, both past and present.

We have seen, however briefly, that Montessori's education is education as a help to life and an education for peace; it is an integral part of an anthropological and sociological vision of the child and of humanity, with its ecological and spiritual role in the context of the Universe with all of its history.

**Conclusion**

During the two years following Montessori's return to Europe after her second Indian sojourn and the San Remo Congress, that is, during the years 1950 and 1951, Maria Montessori became involved with UNESCO.

She was a member of the Italian delegation to the UNESCO General Assembly, held in Florence, in May 1950; during the same month, at UNESCO in Paris, she was welcomed "as one of the founders and inspirers of that revolutionary movement known by the name of the New Education." On this same occasion, when she was asked by UNESCO's Department of Education to give "her vision of how to reach a better international understanding," Dr. Montessori listed six points and one of these centered on cosmic education.

Lastly, in December 1951, on the occasion of the third anniversary of the Universal Declaration of Human Rights, UNESCO invited Montessori "to send a message to the world in order to emphasize the highly idealistic value of the event." This is how Dr. Montessori came to write "The Forgotten Citizen," her last important contribution, for she died four months later.

Relations with UNESCO have been maintained to the present day, since the Association Montessori Internationale, under whose auspices this congress has been organized, is an NGO, or Non-Governmental Organization, in operational relations with UNESCO.

"To contribute to the maintenance of peace by means of education" is the main aim of the organization hosting our congress. Therefore I should like to conclude by recalling how, in 1950 in Florence, the poet Jaime Torres Bodet, who was the Director General of UNESCO at the time, welcomed Maria Montessori by saying: "In our midst we have someone who has become the symbol of our great expectations for education and world peace."

After fifty years, education and world peace still remain humanity's great hope.

I wish to thank Baiba Krumins Grazzini for her help in preparing this contribution.

**Endnotes**

1. Cosmic comes from the Greek *kosmos* meaning order, world, universe; and the etymological meaning has nothing to do with hair, despite what was said by other speakers during the Congress. Comet, on the other hand, comes from the Greek *kometes* meaning long-haired (and this in turn comes from *kome* which is the Greek word for hair). Etymologically speaking, therefore, a comet is a long-haired star. Obviously cosmic or cosmos on the one hand, and comet on the other, are totally different concepts and must not be confused.

2. Montessori, Maria, *What You Should Know about Your Child* (Adyar, Madras: Kalakshetra Publications, 1st edition, 1948).

3. Montessori, Maria, *To Education the Human Potential* (Adyar, Madras: Kalakshetra Publications, 1st edition, 1948).

4. Horme comes from the Greek *horme* meaning impulse, and this is related to the Greek *hormao* which means to excite. The diction-

ary meaning of *horme* is "vital energy as an urge to purposive activity" and this is how Montessori uses the term in *The Absorbent Mind* (Adyar, Madras: The Theosophical Publishing House, 1st edition, 1949). The term was first suggested (though apparently not adopted) by C. G. Jung and developed and used by Sir Percy Nunn, whom Montessori cites in her book. (Nunn, Percy, *Education: Its Data and First Principles* (London: Edward Arnold Publishers Ltd., 3rd edition, 1945, reprinted 1970).

5. Wordsworth, William (English romantic poet, 1770-1850), see 7th line (The Child is father of the Man) in "My Heart Leaps Up When I Behold" in *Poems in Two Volumes*, 1807.

6. International Montessori Conference, Amsterdam, Netherlands, April 1950, unpublished proceedings.

7. Montessori, Mario M., "Keys to the World" in AMI Communications 1998/4.

8. Montessori, Maria, "Educazione cosmica," manuscript published in the form of an anastatic reproduction in *Il quaderno Montessori*, 29, Spring 1991, Castellanza (VA), Italy.

9. This lecture was given on December 29, 1937 at the *Internationale School voor Wijsbegeerte* [International School of Philosophy], Amersfoort, Netherlands and published in Education and Peace, transl. Helen R. Lane (Chicago, IL: Henry Regnery Company, 1st English edition, 1972).

10. McLuhan, Herbert Marshall and Bruce R. Powers, The Global Village (Oxford: Oxford University Press, Inc., 1989) Gorbachev, Mikhail S., *La casa comune europea* (Milano: Mondadori editore, 1989) Also *Perestrojka—Il nuovo pensiero per il nostro Paese e il mondo* (Milano: Mondadori editore, 1987).

11. In *La formazione dell'uomo nella ricostruzione mondiale*, proceedings of the 8th International Montessori Congress, San Remo (IM), Italy, August 1949 (Rome: Ente Opera Montessori, 1950).

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*Camillo Grazzini had a long association with the Montessori movement having worked under the guidance of Mr. Mario Montessori, the director of studies at the Bergamo Centre, from the founding of the centre in 1961 until Mr. Montessori's death in 1982. Mr. Grazzini was one of the original members of the Pedagogical/Material Committee. As a researcher his knowledge of every detail of our work was outstanding, whether it was of the materials, the history of the movement, and of course Cosmic Education. Camillo Grazzini worked for the Bergamo Centre as lecturer, AMI trainer, and director of training, until his death in January 2004. Camillo Grazzini inspired over forty generations of Bergamo students in their Montessori work for and with elementary children.* *Reprinted from* AMI Communications, Special Issue *2010, pages 44-54. Reprinted by permission of Baiba Krummins Grazzini.*

Creative dramatics: reenacting the human invention of pictorial expression in the cave of Lascaux

Dramatic presentation of botany lesson through live specimens in the classroom, Colegio Montessori de Tepoztlán, Mexico

# Cosmic Education

by Margaret E. Stephenson

*Margaret Stephenson begins with the reasoning elementary child as he answers questions about "all things." She centers on the unity of knowledge, leading "from the whole via the parts back to the whole." Imagination is enhanced to bring abstraction to an engaging and lofty motivation, and the elementary self is referred to as the "atom of the spirit." Miss Stephenson moves from the early "sensory" exploration of the 3-6 prepared environment to the language of its parts, flowing through names, then communication of ideas, and finally the languages of world, invention, and human keys to understanding.*

As long ago as January 6th, 1936, in London, Dr. Montessori gave the first lecture of a short series of lectures which were an extension of the 21st International Course. These extension lectures were directed towards the psychological and educational needs of the older elementary-aged child. Dr. Montessori was later to give a lecture on the Four Planes of Education at an International Montessori Congress in Edinburgh, Scotland in 1938.

In the fifth of the 1936 London lectures on the older child, Dr. Montessori said ". . . we have continually repeated that the child has revealed to us in a clear and human way that there exists within human nature an impulse towards work and he has shown that upon the circumstances of this impulse depends normality or the opposite".

We should recall that Dr. Montessori, during her years of work with the younger child, had shown that it was activity in the prepared environment of the Casa dei Bambini that would allow the psychically deviated child of the First Plane to rid himself of his deviations and attain normalization. In 1936, we hear the same but now applied to the older child.

Dr. Montessori's work with the younger child appeared to many to be revolutionary; the children in the Montessori schools had achieved results thought well beyond the capabilities of such young children. Now Dr. Montessori, in this London lecture went on to say that, in traditional education, the whole system was based on two faculties: memory and abstraction. But, she continued, the mind of the child which has already received some culture and absorbed certain elements of knowledge in the Children's House, tends to search out for the interrelation between things at this next age. The child is now able to grasp the interrelations by use of his reason. Dr. Montessori explained: "Reasoning brings things in their relations to one another; compares them; deduces from them; arrives at conclusions and, when the conclusions have been arrived at, there is a state of psychic satisfaction and, with this, a sense of calm and repose". This then is the normality of the elementary-aged child.

Dr. Montessori had more to say on this point of reason which is of such paramount importance to our children and thus to humanity. In a lecture given at the University of Amsterdam in 1950, she illustrated further this idea of the reasoning mind of the elementary child.

> In this intellectual period, the child's questions are innumerable. He wants to know everything. His thirst for knowledge is so insatiable that, generally, people are at their wits' end about it; therefore, they most choose the easiest way and simply force the child to be silent, and to learn only what we grown-ups consider useful for him. But, in doing so, we also destroy his spontaneous interest. Learning then becomes a tedious and tiresome business. The result is all sorts of deviations in the child's personality.
>
> It should be realized that genuine interest cannot be forced. Therefore, all methods of education, based on centres of interest which have been chosen by adults, are wrong. Moreover, these centres of interest are superfluous, for the child is interested in everything. . . . A global vision of cosmic events fascinates the child and his interest will soon remain fixed on one particular part, as a starting point for more intensive studies.

> As all parts are related, they will all be scrutinized sooner or later. Thus the way leads from the whole via the parts back to the whole.
>
> Thus the child will develop a kind of philosophy which teaches him the unity of the universe. This is the very thing to organize his intelligence and to give him a better insight with his own place and task in the world, at the same time presenting a chance for the development of his creative energy.

In 1969, at a study conference in Bergamo, Italy, Mr. Mario Montessori added this explanation:

> The cosmic education, or Montessori approach to the education of the child from 6-12, came to be in the same way as the previous approach had come, by following the psychic needs of the child. He is now insatiable of knowledge, he has a hungry mind. If he is impeded in his research, we create unrest and rebellion.
>
> The older child does not use his senses, but his imagination. Let us give aids to the imagination. The school must prepare the child to go out into the world. If everyone has a task on earth, what is the place of man in it? So we arrive at the history of mankind which, to be understood, must be inserted in the history of the life of the Earth and the Universe.

I am going to be quoting extensively from Dr. Maria Montessori and, as an explanation for this, I want to share with you some words of Mrs. Ada Montessori, the wife of Maria's son, Mario. In her last letter to Mr. Bob Portielje, the chairman of the Association Montessori Internationale, Ada Montessori wrote: "I think that people do not really understand what the AMI, in the sixty years of its existence, has been standing for. They think we are asking for loyalty to the Association - that is not the case. It is loyalty to the Montessori Method, without adding other material, other methods. Why not 'the Maria Montessori approach'?"

So, what is the Maria Montessori approach, which began in January 1907, which continued until her death in 1952, which was carried on by Mario Montessori, her son, unchanged until his death in 1982, which still continued through Ada Montessori until her death in 1988, and which still continues through the Association Montessori Internationale, for whom you have organized this Congress. If we want to know what Maria Montessori meant by Cosmic Education, we must listen to Maria Montessori. This is why I want Dr. Montessori to speak for herself on this subject of such importance, Cosmic Education, and therefore not to have it merely interpreted by me.

There are very few books in existence written by Dr. Maria Montessori. The title of one of them is as significant as the book, it is *To Educate the Human Potential*. If we really reflect upon that title, if we take it in with all the force of our mind and our spirit, we might well be overwhelmed by the magnitude of the vision that Dr. Montessori revealed to us for humanity. She spoke of "the secret of childhood" and Mario Montessori, her son, referred to "the atom of the spirit". What is that "secret of childhood", that "atom of the spirit" but the "human potential".

In her book, *Education and Peace*, Dr. Montessori reminds us that "The child is both a hope and a promise for mankind. . . . What is needed is faith in the grandeur and superiority of man". And in another book, *The Child in the Church* she tells us that her aim is "to influence the whole life of the child . . . a total development of the personality, a harmonious growth of all the potentialities of the child, physical and mental, according to the laws of its being". And in *Education and Peace*, she remarks astringently, "Education today does not take personality into account and does not develop it . . . man today pays no need to human personality and regards human society as a colony without individuals". This was said in 1935. Have we moved far since then, I would ask?

In 1944, in India, Dr. Montessori spoke of Cosmic Education which she had first mentioned in London in 1936. As always, she directed the attention of her audience to the child, giving this time an even greater emphasis to what she thought of as his task and his significance to the future history of humanity. The following passage is from her lecture on that occasion:

> With others, we believe that in the cosmos there is harmony; that everything that is in it, both the animate and the inanimate, have collaborated in the creation of our globe, correlating in doing this their single tasks. But we think that among the innumerable agents which participated in this creation, man has had, and has, a very important task. Also that creation is not finished and that the one agent which as yet has not been taken into consideration has been the child . . . The whole world must become one nation. But for that we are not yet ready. It will come in the

> next generations. It is the question of making use of the last cosmic agent, the child. If we take the child from infancy and allow him to develop his psychological powers and the potentialities within him, place him in relationship with other men and make him realize what mankind has accomplished, then this will form the first step in the formation of the superman toward which humanity tends. . . . To the young child we give guides to the world and the possibility to explore it through his own free activity; to the older child we must give, not the world, but the cosmos and a clear vision of how the cosmic energies act in the creation and maintenance of our globe. This must be accompanied by a clear vision of how–through work–the naked and feeble man he was on his appearance on the earth became the superman who has built our present civilization.

This is the significance of Cosmic Education–work, relationships with the environment and with humanity, not just for the First and Second Planes of Development for the child in the Casa dei Bambini and in the Montessori elementary school, but for the total life of all humanity and for its salvation. The question before us is how do we prepare the child for a cosmic task - not how to teach him to read and write, to learn mathematical formulae, to study geography, history, biology, so that facts can be memorized and then tested, not how to prepare him to gather letters after his name and not even how, perhaps, eventually to see his name in lights.

Dr. Montessori reminds us of what we are to be about in education "not in the service of any political or social creed should the teacher work, but in the service of the complete human being, able to exercise in freedom a self-disciplined will and judgement, unperverted by prejudice and undistorted by fear". That is what Cosmic understanding is about.

Dr. Montessori tells us that this should make it possible for the child to catch a glimpse from time to time of "the cosmic vision of man on earth". In *Education and Peace* she says:

Studying the internal parts of the five classes of vertebrates, Marin Montessori School, Corte Madera, California

> Education cannot be dismissed as an insignificant factor in people's lives, as a means of furnishing a few rudiments of culture to young people. It must be viewed, first of all, from the perspective of the development of human values in the individual, in particular his moral values, and second, from the point of view of organizing the individuals possessed of these enhanced values into a society consciously aware of its destiny. A new form of morality must accompany this new form of civilization. Order and discipline must be aimed at the attainment of human harmony and any act that hinders the establishment of a genuine community of all mankind must be regarded as immoral and a threat to the life of society.
>
> An extremely important social task lies before us; actuating man's value, allowing him to attain the maximum development of his energies, truly preparing him to bring about a different form of human society on a higher plane. . . . We must seek out, we must cultivate, we must enhance the value of man's energies, his intelligence, his creative spirit, his moral powers, so that nothing is lost. Man's moral energies, in particular, must be turned to account. For he is not only a producer - he is also called upon to assume and fulfill a mission in the universe ... Morality must be regarded as the science of organizing a society of men whose highest value is their self-hood and not the efficiency of their machines.

This affords the key to the significance of beginning to understand, or of trying to deepen our present understanding of the idea of Cosmic Education and of its importance to the education of our children. In 1951, in London, at the last International Montessori Congress at which she was present (she died in 1952), Dr. Montessori was praised by ambassadors and other important figures from many nations for her contribution to education. In reply, after thanking them for their kind words, she also scolded them for appearing still to be looking to her and applauding her instead of turning their attention and their efforts to the child in whose direction she had continually pointed them.

Studying the climatic zones using chart insets, Japan

Here once again, in her book *To Educate the Human Potential*, is a clear directive from Dr. Montessori:

> If human unity, which is a fact in nature, is going to last to be organized, it will be done only by an education that will give appreciation of all that has been done by human co-operation and readiness to shed prejudice in the interest of common work for the cosmic plan, which may also be called the Will of God, actively expressed in the whole of His Creation. . . .
>
> (This education) requires the influence of sacred and deep things to move the spirit and the new children of civilized humanity must be given a profound emotion and enthusiasm for the holy cause of humanity.

Dr. Montessori considered that the child exposed to these ideas will eventually be led to ask: "what am I?" "What is the task of man in this wonderful universe?" "Do we merely live here for ourselves or is there something more for us to do?"

We have within our grasp the formula that would allow the child to act as the cosmic agent for the world and its humanity. That formula is our human, universal property but is also unique to each individual. Instead of the study of subject matter and curriculum, Dr. Montessori, from 1907 onwards, demonstrated through the children in her schools that it was the factors of human nature which aided the development of the child. She continued to draw our attention to the psychological characteristics of each successive Plane of Development, to the human tendencies which belonged to the nature of the human being from its first inception on earth and to the need of "liberty in a prepared environment", to allow for any created species to proceed to the attainment of its own proper potential. These, though loosely called Montessori principles are principles of reason which ought to be accepted and applied to any form of education because they are universal principles and, therefore, truth. Traditionally, education has looked at itself as a subject and, therefore, has considered what has to be taught and learned. Instead, Dr. Montessori, from the beginning of her work, pointed us to the child and asked us to consider him.

In order to make use of this cosmic agent, the child, to help bring about that unity which humanity longs for, there has to be a recognition that the child is the common denominator that already unites us. It is the child that all men share, as we have all been the child. To our parents, when we came, came a human being with the same unchanging nature that has been the nature of man since his first arrival on the earth.

The world, the universe, into which we came is the same world, the same universe in its essential nature as when it first came into being.

Human society, man, woman, and the child that was me, that was you, is still with us–coming down through the ages of history, from the very, very first unit of society formed when the first child was born to the first man and woman.

Dr. Montessori, when she recognized the child and spoke of "the secret of childhood" and Mario Montessori when he affirmed the significance of that "atom of the spirit" that is the power of the child, entered into that ageless procession of life and its importance which is humanity and its child.

It is into this continuing drama of the life of man upon earth that we enter too if we join forces with Montessori and engage with her in the work of making the world aware of the task of the child as the cosmic agent for mankind and its future.

What did Dr. Montessori consider the role of the adult to be in this service of the child? How can we ensure that the child is free to operate as the cosmic agent? We have to keep in mind that our service to the child is to enable him to serve in his turn. It is that theme of service that runs throughout Cosmic Education and that we unfold to the child in the elementary class.

We have already mentioned the realization by Dr. Montessori that the adult world would have to take into account the universal human tendencies, the psychological characteristics of the Planes of Development and the need to recognize the importance of freedom, but given within an environment prepared for development.

The universal human tendencies - to explore, to orientate, to order, to communicate, to work, to repeat until relative perfection is reached, to create what is not there, are operative throughout life but take on a different direction at each Plane of Development. The psychological characteristics of the child at the Second Plane of Development are different from those of the child at the First Plane. Then they were operative in order to effect the construction of

the individual human person. At the Second Plane, they are to make possible the construction of the individual as a member of society. And liberty in a prepared environment, which allows the individual to make use of the human tendencies to conquer the environment and to make an abstraction of it, asks for greater and greater responsibility towards that environment and more and fuller understanding of the significance of human freedom within it as the individual proceeds through the Four Planes of Development.

With Dr. Montessori's words to us as a background and recognizing that we have to take the human tendencies and the specific characteristics of the child at the Second Plane of Development into consideration as well as putting the child in touch with a prepared environment and giving him liberty within it, how is the adult to present Cosmic Education?

To the child in the First Plane, the small child in the Casa dei Bambini, Dr. Montessori had said we must give the world. That, to many, appears to be nonsense. How could this be possible? But the world is the qualities of its components and the facts of the lives of the people who live upon it. Dr. Montessori has incarnated those qualities and those facts in the prepared environment of the Casa dei Bambini and its materials.

The world is colour, size, dimension, shape, form, sound, touch, taste, smell. The child comes into contact with all those qualities when he is born and explores them unconsciously in the years from birth to three and takes in impressions of them through the enormous and significant power, the unconscious absorbent mind. But the mind of man functions on order and, for those impressions to be usable, they have to be classified and organized. Here is the work for the conscious absorbent mind.

The sensorial material of the Casa dei Bambini gives the possibility for this classification to be made. It is as if the world's qualities had been reduced so that they could fit into the Casa dei Bambini. There are only three primary colours in the world and there they are in the first colour box, ready for the child to manipulate. There are only three secondary colours and there they are in the second colour box. But there is a huge array of shades of these primary and secondary colours and so, in the third colour box, the child is introduced to a sampling of just a few of these. It is this limitation in the material that allows the child unlimited exploration of the environment of the world in which he finds other shades which were not present in the colour boxes.

The games with the sensorial material ask the child to match the colour of the tablet to something in the environment of the classroom. The sensorial material has thus become a "key to the environment". There is one other match to be made. The child is given the language for the quality after he has gathered experience of it. Now he can carry around in his mind the word blue which matches the colour tablet and which also matches the colour of the sky on a sunny day, and some flowers, and some dresses, and some birds, and this allows the child an immense field of exploration of his environment which is the world; and thus it is for the whole of the sensorial materials.

But the world is also land and water, fishes and birds, plants, trees and flowers, insects and animals. This time, with pictures and names, limited as is the sensorial material, the child can explore the geographical terrain and the biological furnishings of the world that was prepared for his coming.

But men and women and children have lived and still live in this world and the child has need to explore this aspect of the world also. Once again, through limited pictures and names, the child is put in touch with a sampling of the lives of people in his world. We show him houses, clothes, transport, musical instruments, song, art and sculpture, jewellery and design, inventions and science. This is not history, geography or biology, not geometry, zoology or science but the making of the life of the world and the facts of it and its inhabitants accessible to sensorial exploration by the young child through the materials in the Casa dei Bambini and the giving of the names for what is found so that the child may make a vehicle for the transmission of the knowledge of his findings.

But the child has also to explore the language of his world. In the Casa dei Bambini the child must be helped to make the discovery that the language he created earlier, his mother-tongue, can not only be spoken but can also be written and read.

But there is also another language in the world besides that for communication of ideas. There is, too, a language of invention. This language is materialized in the mathematics material of the Casa

dei Bambini. This material gives the small child, who is still a factual explorer, the possibility of the sensorial exploration of quantity, shape, form, dimension–the symbols for these and the language. It allows the child, just as with his mother-tongue, to explore the behaviour of the particles and it gives a formula for this behaviour.

Because, through the prepared environment of the Casa dei Bambini, Dr. Montessori had been able to give the world to the small child, she was able to say: "What is left for the older child but the universe, the cosmos?" "Let us give him a vision of the universe, an imposing reality and an answer to all questions."

The human tendencies turn now towards this imposing reality, the absorbent mind of the child of the First Plane has become the reasoning mind of the elementary child; the imagination is now able to operate with an ability to distinguish between fact and fantasy; the child's intellect is now capable of an immensity of work; he is interested in morality and justice, is compassionate and hero-worshipping. And so the vision of the cosmos can be opened out to him at this Second Plane of Development. The plan of Cosmic Education lays upon the adult a different task than that of the traditional teacher preparing to impart areas of a curriculum. Dr. Montessori has said to us in this regard:

> The secret of good teaching is to regard the child's intelligence as a fertile field in which seeds may be sown to grow under the heat of flaming imagination. Our aim, therefore, is not merely to make the child understand and still less to free him to memorize, but so to touch his imagination and to enthuse him to his inmost core.

The child in the First Plane had been given the world for his senses to explore. At the Second Plane, the elementary child needs to explore, not with his senses, not with the power of the absorbent mind, but with his imagination and his reason and now move out towards the universe in which the world resides.

The universe was the first prepared environment for man and, with the coming into being of the universe, we find directives within the elements of which it was composed and laws being obeyed, though unconsciously, to bring order out of chaos. And so was brought about the fashioning of land and water, the purifying of air, the production of oxygen.

Courtesy of Lynn Jessen, Forest Bluff School, Lake Bluff, Illinois

Then, still guided by directives and law, came the clothing of the land with plants and trees and flowers and grass, the furnishing of the land and water with living creatures, the animals, birds, insects, fishes. All the chemical elements, the plants and the animals, obeyed through their nature and the directives within it. That is marvel and wonder indeed and we still have around us the prepared environment, still the same directives, still the law and order, still the pattern within each of the composing elements.

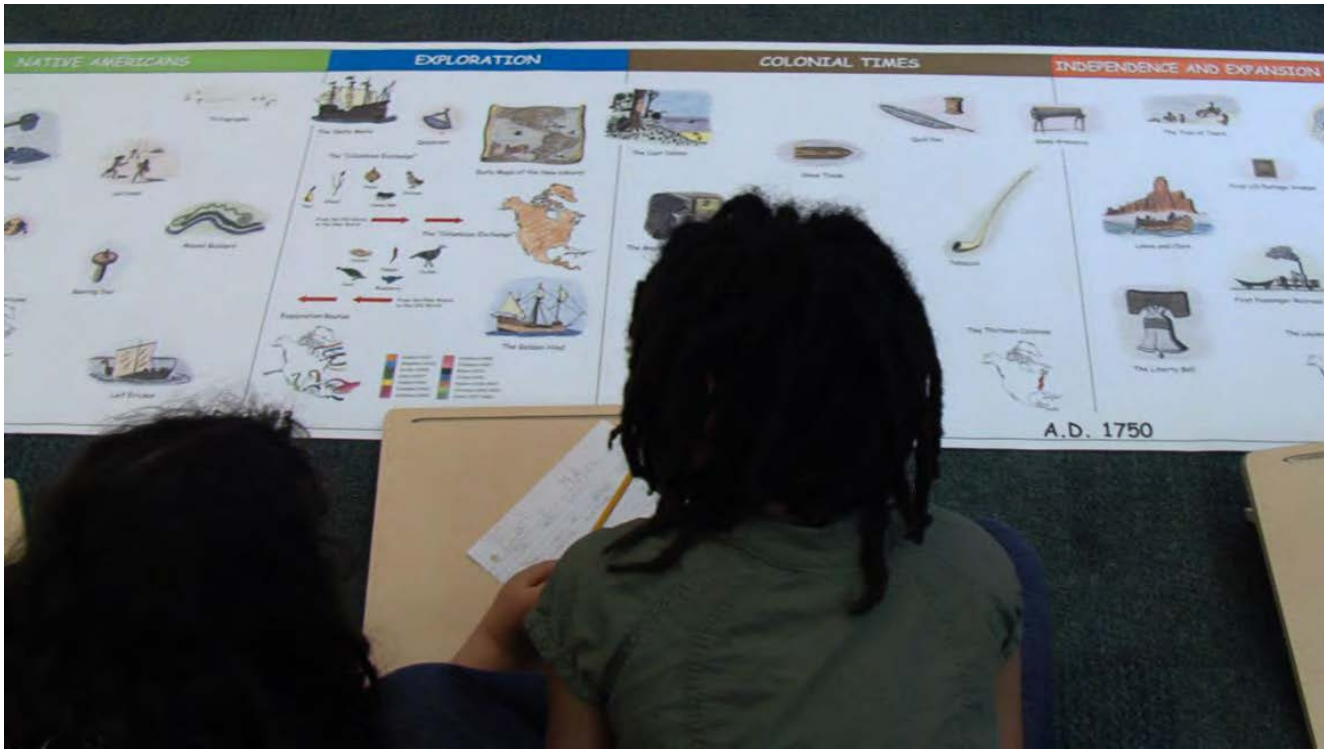
But that prepared environment was to see a still greater marvel as man appeared with his own directives, his own laws for his human nature. Man came to that prepared environment that is our earth, within the universe, and has conquered that environment through the gifts unique to him amongst all other living creatures on earth, the gifts of intellect and will and the special characteristics of his human nature. The child comes with the same gifts, intellect and will and fundamental psychological human characteristics.

With his gifts from his prepared environment man, from his very first beginnings on earth, built up an economy to cater for the satisfaction of his physical needs. As time went on and societies of men developed to share the tasks of life with one another, that material economy proved not enough for the nature of man in its totality. The aspect of the human being that is not purely physical also needed a territory for its expression. And so a science of life was developed by human beings with the growth first of a material territory to cater for physical needs and then a spiritual territory of art, culture and religion to cater for the spiritual needs of man.

These two territories became the properties of the societies and later the nations of man, as time went on and the story of man was written through the ages. When the very first child was born on earth, he entered into the heritage of the prepared environment of the universe and into the material and spiritual territories of his parents. This heritage has continued to be handed on to each child as he is born and it is this heritage that awaits his exploration. Just as the first human being on earth, each child is born with the same human tendencies, the characteristics of his human nature, to use in his exploration. And just as the first human being was the change-agent of his environment, molding it to his needs and building a way of life from it to satisfy those needs more perfectly, so the child, if given freedom and a sense of responsibility, could become the change-agent of society and the cosmic agent for the unity of mankind.

At the Sixth International Montessori Congress held in Copenhagen, Denmark in 1937, Dr. Montessori proposed a solution to the problems which could face humanity and which we seem no nearer solving. We only talk about them–violence, crime, illiteracy, irresponsibility, selfishness, depravity–the list could go on! What if we really listened to Dr. Montessori's ideas of what education should be and what if we really attempted to put those ideas into practice? The following is an extract from that Congress:

> Education must concern itself with the development of individuality and allow the individual child to remain independent not only in the earliest years of childhood but through all stages of his development. Two things are necessary; the development of individuality and the participation of the individual in a truly social life. This development and this participation in social activities will take different forms in the various periods of childhood. But one principle




Courtesy of The Montessori Elementary DVD © NAMTA 2012 and Montessori School at Holy Rosary, Cleveland, Ohio

> will remain unchanged during all the stages: the child must be furnished at all times with the means necessary for him to act and gain experience. His life as a social being will then develop throughout his formative years, becoming more and more complex as he grows older.

The significance of cosmic education is its significance to the development of the individual to responsible action, to responsible relationships, to responsible thought. The child should begin the development of the idea of responsibility within the home environment. The family is a society, the first unit of society. This society, though small, has its laws which are there for the safeguarding of the good and the rights of the members who make up this first small unit of society. The child in his home environment of furnishings, objects, activities of family life and the first unit of society, should have been made ready to take his place in a somewhat larger though still a closed and secure environment, that of the Casa dei Bambini. This again is an environment of furnishings and objects, activities for himself and his companions; another somewhat larger unit of society. This environment allows the child to work independently, to explore the world through the materials of the Casa dei Bambini, to begin to take responsibility for his environment through the Exercises of Practical Life and to relate to more companions than his own family through the Exercises of Grace and Courtesy extended to those companions in his class. The foundations of Cosmic Education are there, in the law and order that govern this small society and in the "keys to the world" that are presented to each small child.

Within the home and within the Casa dei Bambini are the opportunities for the development of individuality and the participation of the individual in a truly social life which Dr. Montessori has said are essential if we are to have a different world.

The child in the Second Plane of Development also needs "liberty in a prepared environment" but the psychological characteristics are different; the human tendencies take a different direction so the environment, the activities and the role of the prepared adult have to change. What does not change is the factor that allows the child to continue his progress towards the realization of his responsibility for his environment, for his conduct and activities for himself and for society. That factor is once again the development of individuality and the participation of the individual in a truly social life. But the opportunities for these have been enlarged at the Second Plane of Development. The individual is now faced with the universe for his exploration and with a wider society than his family and school companions for his social participation.

Through Cosmic Education, which the Second Plane child is enabled to grasp because the Absorbent Mind of the First Plane has become the reasoning mind of the Second, the child is now able to explore and to understand what Dr. Montessori calls "a global vision of cosmic events".

Through this vision, she believed that "the child will develop a kind of philosophy which teaches him the unity of the universe".

For the child to become the cosmic agent for the change in humanity that seems so needed, the formula for the construction of man cannot be tampered with. Whenever and wherever an activity or an end rests upon a formula, the result is only achieved if the formula is adhered to.

The universe came into being following laws for its creation; plant and animal life furnished the land and water following directives for their *lives.* Is it not reasonable to think that man also was *given* a formula for his construction, a plan for his completion of himself, an order for his happiness?

The vision of Cosmic Education draws us into the continuing drama of the life of man upon earth, his task to be the cosmic agent for mankind and its future. From the onset of his life on earth, from his first appearance in the world prepared for his coming, the history of man has been the formation of societies, the foundation 'of an economic science, to be carried out in whatever region of the world he happened to inhabit. That economic science, which came about in the first instance to ensure the survival of the human being, added to itself as time went on through the discovery of ways of bettering human life, of decorating it, of giving it beauty and truth, of realizing its wonder and magic. It is this pageant of glory that we *have* to allow the children to partake of and to offer them opportunities of adding to it through their own *lives* of service and love.

Dr. Montessori speaks of society as "an organization in relation to the *collective* order". Cosmic Education at the Second Plane, and the preparation for it at the First, are the means by which the child can be helped to recognize his social

responsibility. What is the collective order but a realization of the laws which govern the continuing existence of the universe, the world within it, the prepared environment of land and water, air and sky, sun and stars, plants and animals, in all their number and *variety,* and the discipline and order–which when closely united and accepted result in freedom for man.

Cosmic education means that form of relating the child to the universe and to humanity that will enable him to understand the law and the order underlying their existence and to realize in himself all the developmental potential that is his own particular birthright and to accept his personal responsibility.

At the Second Plane, the school must prepare the child to go out into society and into the world. To be secure and to find his own place in the world and society, the child needs to know where he comes into the picture.

Before man came, the universe came, the earth came, life came, and lastly there came man. When man came, the environment had been prepared for him; furnished and decorated, star-hung and jewelled, embellished with every imaginable form of life and colour, of scent and shape, of glory and wonder. It was as if a stage-set was waiting for the appearance of the last great actor to set foot upon it. The drama had begun with the creation of the universe, had been played out for many aeons before life first appeared. The drama had continued through all the manifold manifestations of forms of life, both plant and animal. Man, when he came at last, had his own most special part to play.

All that was there before him had its continuing existence bound up with the type of life it led. The continuance of its life depended on its following a certain cycle of progression, of keeping a certain set of rules and orders. It seems as if only man was given the possibility of making his own way, of falling and rising by his own efforts, because he had been especially gifted.

The environment was there for him as it had been for the other forms of life. Their instincts had forced them to know what to take from it in order to ensure survival. But man had been endowed with two most special gifts, his own uniquely. These were intellect and will. With these, and from the environment specially prepared for him, he had to construct his own pattern of life. He had to experiment with food, invent and make his own clothes, imagine and construct his own shelter. And he had a special instrument to use, his hand, with its opposable thumb and forefinger.

And when the physical means for his continuing existence had been discovered, then man was not satisfied. He could not remain quiescent, accepting comfortably the life he had made, but he extended it in all directions, ever seeking more and better conditions for that life.

So the child must be given the chance to find out how the universe was prepared for him and what exactly is his place in it. This gives to the child's intellect a logical unity. His research develops as he explores all the paths that lead from this centre of unity. All the separate subjects of study are interlinked because they are all branches of culture.

The coming into existence of the universe, the place of earth, the laws governing substances, the necessary means of preparing the earth for man, the function of man, his conquests through the ages and the need for the unity of humanity are the factors of Cosmic Education.

The cosmic task of all the elements of the universe is the service to be rendered by each to the environment. The human being is the Change-agent with regard to the environment. He has the urge not only to adapt but to change the environment according to his needs and imagination. Through the ages the human being has continued to change his environment and to make innovations. Unfortunately, we can see in the society of today the possibility of man's destruction of his environment. This is where the child needs guidance.

In Adyar, India, in 1947, Dr. Montessori spoke of the sensitivity for life in the child in the Second Plane of Development. She said:

> When we educate the children, we must appeal to this sensitivity which forms part of the nature of man. This sensitivity towards nature must be given as something which is useful not as an abstract thing but as a real sentiment. We must cultivate this sense of gratitude and, if developed, it can form a basis–this admiration for nature–this sense of mystery must accompany the study of nature. When having learned of those wonders, the child goes out and sees nature at work. This is a constant exercise and if carried out in calm and tranquility,

> which touches and educates that sentiment, they see it as a reality that happens every day as in the past or future. It is evident that if this sensitivity disappears and is not allowed to develop, the life of man becomes a harsh life. . . . This sensitivity must not be developed for nature and the stars and flowers only but especially for mankind. . . . The importance of education is to use this sensitivity for nature and develop it in the soul of the child at this age, in order to save society.

We have said that Dr. Montessori told us to give the world to the small child and we have discussed how she made that possible with the sensorial materials of the Casa dei Bambini. At the Second Plane of Development she realized that something else was necessary and she told us to give the universe to the elementary child. How did she envisage making this possible? How can we put the universe within the child's grasp, as we had earlier put the world? Cosmic Education was the way in which Dr. Montessori exposed the older child to an imaginative and reasoning exploration of the universe and because it was to be imaginative exploration, it had to be a dramatic one. For this, Mario Montessori has said, Dr. Montessori became "a story teller of the truth".

Through what are known as the Five Great Lessons, she opened doors on to the drama of the universe. First of all, its coming into being. Secondly, its furnishing with plants and animals. And for what? The Third Great Lesson, the coming on earth of human beings who were given two special gifts unique to them: intellect, the power to reason, to think, to know and to understand; and love, the power to will, to choose the good of others, and thus to serve. These same qualities we have to bring to the child's awareness, to awaken his desire to use them.

"The eye that sees and the hand that obeys," South Africa

So it is the immensity of this act of creation that we open up to the elementary children with Cosmic Education. We put before them the pattern of law and order, the reasonableness of rules. At this very earliest stage of the child's time in the elementary class we show him the importance of rules and of keeping them so that the pattern of creation is not disturbed. Rules become understood then as safeguards and not as restrictions to freedom.

And so we have the first three Great Lessons to set this pattern of rule and order.

Firstly, The Story of God Without Hands, the creation of the universe, showing the action of the chemical elements, the substances of matter, liquid, air. Then, secondly, The Coming of Life, the furnishing of the world with plants and animals, a way of life given differently to each and each only able to continue its existence as it followed that way of life. And thirdly, The Coming of Man, the last great actor on the stage of the created world whose environment had been so beautifully prepared for his coming; who had a special part to play and without whom the universe could only have been an unfulfilled promise; the uniqueness of this human being that is you and me and each child.

Then with The Coming of Man we move on to the other two Great Lessons which proceed from the two gifts to the human being, intellect and love. These Great Lessons draw the attention of the child to the two great achievements of man–the language of communication and the language of invention–The Story of Communication in Signs and The Story of Numbers'.

Dr. Montessori asked us to foster in the child (a) a sense of gratitude to God the Creator and this we do with the first three Great Lessons and (b) a sense of gratitude to man and this we do with the other two Great Lessons.

Researching the Timeline of Humans, Japan

History, as the story of man and his achievements, is at the centre of Cosmic Education because of the nature of the being whose story it is. The understanding of our place in the universe depends on the understanding of the law and order which governed the elements of the created universe and our world as part of it, the plants and animals that play their part in conserving that order and then, above all, the recognition of the gifts with which man is endowed, intellect and love, and of the understanding and realization of the reason why those gifts were given–had to be given–if the universe were to be complete.

It is this great drama of human beings, not isolated from the rest of the created universe but part of it and therefore with an important and significant role to play in it, that we need to emphasize for the children at the Second Plane of Development. The universe and its elements and the plants and the animals are not just things and means. They are lovely in themselves. Through the Great Stories of The Coming of Life and The Coming of Man we can help the children realize that all created things are one with us and so they are to be treated with love, that gift to human beings which translates into "the being able to choose the good of others". But we also have to help the children capture an even greater vision. In the words of Gerald Vann, to be able to see "the inward beauty and holiness in the poor things and ugly and the things of mean repute, in the waifs and strays of the world, in the dull and colourless moments as well as in the moments of great joy". He continues:

> We lose the power to love and enjoy things as we should when we lose the power of vision; and we lose the power of vision when we lose the life of the child. When the visionary gleam fades into the light of common day we go on using things because we understand their utility but more and more we forget that they are things in themselves, things of beauty; we forget to stop and look.

Through the eyes of the children to whom we unfold Cosmic Education we adults can have our own eyes opened again to see the grandeur and the majesty, the pageantry and the glory, of this Cosmic Plan in which we are all called to participate. We can begin to realize the interconnectedness of all elements, the interrelatedness of stars and planets, of matter and liquid and air, of plants and animals, of spiders and butterflies, of men and women and children. It is through these Great Stories of the Truth, which relate the Cosmic Plan, that we introduce the children to the idea of respect of all of us for one another.

This message has to go out to all the children in our schools and to all the world–to the poor who are often not respected, not loved; to the rich who are also poor because they have been given so much but which, so often, has not included love and care; to the middle class who, perhaps, are the least recognized because they are middle, like the middle child in the family.

Unless we can get this message across to the children in the elementary classes of Montessori schools it will not matter and will make no difference and whatever other messages we give them will have no value. To stretch their intellects, to make them classicists, to form budding scientists and mathematicians, to give them academic excellence, will have no worth unless they are also integrated, committed, respecting, loving and caring individuals. This is the theme of Cosmic Education.

What we call subjects of the traditional curriculum enter into this theme because they are to do with the totality of the Cosmos, not because they are the subjects that the teacher should teach and the children should learn. The curriculum is to be the universe, its furnishings, its inhabitants, their stories; not lessons in books to be listened to in sequence, memorized, tested and graded. The question underlying Cosmic Education is how to present it to the children and how to introduce them to work with it.

What is geography but the story of the earth and its coming into being through the following of the laws given to the substances of which it is formed?

What is biology but the story of the coming of life on earth, to preserve the harmony of the world and to furnish it with beauty and colour and scent and form and variety of life?

What is history but the story of the human beings who came to fulfill the Cosmic Plan, set in motion at the time of creation and without whom that Plan could never be completed?

What is language but one of the stories human beings have written themselves, the achievement of the discovery of the power residing in the mind of man, to have ideas and to communicate them to others?

What is mathematics but that other language created by man to have a way through formulae–some arithmetical, some geometrical, some algebraic–to transmit his inventions?

What is science but an invention of man to perfect his material territory, the economy he developed as a way to satisfy his material needs?

What is music but another language to set beside the language of letters and which has led to song and symphony, to opera, concerto, to blues and jazz and rock, to folk-song and dance?

What is art but still another language, a creation in paint and colour, in sculpture, in gold and silver and precious stones of ideas of the mind of man, an expression of his spirit?

And religion "not", as Dr. Montessori said, "a lesson to be learnt, but a life to be lived".

To understand the Cosmic Plan and how we introduce the elementary child to Cosmic Education is to understand what Dr. Montessori meant when she said of her work that it was not to be thought of as a method of education but as an "aid to life". The adult at the elementary level has a grave responsibility not to teach academic subjects but to prepare the child for recognition of his responsibility as a human being towards the environment and human society. We can only do that if we understand the responsibility ourselves; if we appreciate the great drama that is the Cosmic Plan; if we can enthuse and intrigue the children and excite them about this dramatic act that is creation in all its manifestations.

Cosmic Education is a vision and, like all visions, difficult to implement if tied down in rigid bands. It has its boundaries of law and order; it has its responsibilities; it has its patterns; its sequences. It is like a fugue with its ever-recurring motif. It is a partaking in the vision of the Creator who set in motion the elements of the prepared environment which was destined to be the environment of humanity. The motif is that of service–the service of the corals cleaning the seas of poisons: of the lichens and the mosses preparing the soil for grander plants; of the plants making the air safe for human beings to breathe; and each being able to continue its own existence because it was offering this service. For human beings in our present society of "me first", of "fulfilling myself", of the "haves and the have-nots", of the loss of the sense of the dignity of work and of service, only a vision alive and beyond the individual's rights will be able to bring about the idea of service of one another being the only way to true happiness and peace. The children at the Second Plane of Development are characterized by their interest in morality, in justice, in heroes and heroines; they are compassionate and loving. These children are ready to take part in a life of service, to explore the drama of the universe and human beings as part of it if we open the doors to the Cosmos and invite them to enter in.

I would like to end with words from Dr. Montessori, spoken in Rome in 1946.

> Cosmic clarity is universal. It requires the life-long dedication of each to all mankind . . . It lifts up the hearts of all men and helps civilization rise to a higher level as it ensures the existence of all. The depths of this goodness and dedication are thus boundless . . . If we educate children to see this they will be ready themselves to feel gratitude toward all mankind. This is an effective aspect of our cosmic education . . . The aim of such an education indicates the desire to contribute to the good of all, to share in this cosmic goodness and to offer God the obedient service that unites us with Him in this work of creation.

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Courtesy of Brad Bachulis

Leaf forms provide the basis for classification of plants, the Montessori Centre, near Johannesburg, South Africa

# Deepening Cosmic Education

by Gerard Leonard

*This article is a special blend of research, theory, and practice, with clear insight into the origins of Cosmic Education and Cosmic Task, while recalling memories of student explorations in botany, in particular, episodes from Mr. Leonard's teaching. Mr. Leonard speaks of a storytelling curriculum that eloquently puts perspective into dimensions of Cosmic Education as philosophy, human unity, heroes of history, invention, gratitude, connections with nature, and much more.*

It is 1946 in Karachi, and a simple but profound story is being told. A little child did not have a pencil to write with, so his teacher sent him to the store to buy a pencil. When he got there he had to wait a long time in line before he could purchase his new pencil. When he arrived back at school he complained about having to wait so long. A wise elder lady happened to be nearby and heard this. She beckoned him to her and told him a story—the fascinating journey of this pencil and the many, many people who had taken part in the pencil's trip and had worked to bring it to him. She spoke of the graphite and the wood and how they had been formed and where they came from. She spoke of the miners, woodworkers, transporters, and many others who had been part of making this pencil.

She also spoke of the lady shopkeeper and of how hard she worked to make a living and serve the people by selling the items they needed. She strove to awaken compassion, to open up the child's imagination and inspire his intelligence to see farther and deeper, one could even say to see through the surface of things, in order to perceive in this simple tool—the pencil—a sense of the whole and the interconnections between things and people. The elder hoped to awaken gratitude and invoke patience as a respectful response to another's noble labor.

That wise elder was Dr. Maria Montessori. She told this story to her trainees in Karachi.[1] She was illustrating how a Montessori teacher whose mind and heart were prepared could take a small detail and open up the Cosmic Vision to a child.

Vladimir Nabokov speaks of the nature of this kind of "act of attention" in his book *Transparent Things.* One object of attention he speaks of is "a very plain, round, technically faceless old pencil of cheap pine. . . . When we concentrate on a material object, whatever its situation," he says, "the very act of attention may lead to our involuntarily sinking into the history of that object. Transparent things, through which the past shines!" (1, 6).

For Dr. Maria Montessori the sinking into the deep history and cosmic function of the object was not quite so involuntary. She had been practicing this mode of thinking for some time and had been presenting her ideas on Cosmic Education since the mid-1930s. Her years in India (since 1939) had enlarged her understanding of the Cosmic Theory she had first encountered in the brilliant writings of her famous Italian forebear, the geologist Antonio Stoppani. Stoppani's book *Acqua ed aria* was the major influence on her expansive and deep understanding of the idea of Cosmic Task.[2] She developed this concept of the Cosmic Task of living creatures and elements and its role in the education of young people in her lectures throughout the 1940s and particularly in her books *To Educate the Human Potential* and *From Childhood to Adolescence* and in several lectures and articles, including "The Unconscious in History." In a 1940 lecture she quotes the following key statement from Stoppani's book *Acqua ed aria:* "To the animals which live on the globe, a task has been given from the very beginning of the world, to maintain this world. And that organization, which ensures the purity of the sea-water and the purity of the air during the many millions of years is called

[1] Ms. Lakshmi Kripalani, one of those Karachi trainees in 1946, told the story to me in the spring of 2005.

life" (from the chapter "Life as a Telluric Force," page 75, cited in Montessori, Maria, Unpublished lecture, January 29, 1940).

She was convinced that the geological interpretation of Stoppani was an advance on the biological interpretation of evolution, in that the former saw life as part of an evolving earth and in fact essential to earth's equilibrium rather than seeing life as simply adapting to a changing environment. By the 1940s this perspective on geological evolution had received new vigor through the work of the Russian geochemist Vladimir Vernadsky. The conception of the biosphere as mentioned in Dr. Montessori's writings is certainly understood by her as what Vernadsky would term "the global dynamic system transforming our planet since the beginning of geological time" (25).

Montessori describes the biosphere as "part of the earth's body [and] like an animal's fur [it] is essentially one with it, its function is to grow with it, not only for itself, but for earth's upkeep and transformation" (*To Educate the Human Potential* 29).

If we are to deeply understand Maria Montessori's Cosmic Education, we have to return to its roots in Stoppani's work. She saw in his vision an enormously all-encompassing way of looking at our earth's history and our human place as part of the biosphere. She also saw that this approach opened up the intriguing question of the significance of human activity on the earth.

Antonio Stoppani looked at the earth from the perspective of what would now be called biogeochemical cycles. He described how life organized the elements and recycled them in a way that actually created the biosphere and in doing so modified the hydrosphere, lithosphere, and atmosphere in order to maintain equilibrium and keep these spheres as media for the transmission of the precious life-supporting elements. These are principally, he says, hydrogen, oxygen, carbon, and nitrogen, in addition to some others.[3] His was a vast geological perspective on evolution and planetary equilibrium. It was Stoppani's writings that opened Montessori's mind to the enormous work of the corals and shelled creatures, to the work of water on a grand scale and to the function of tiny bacteria such as "the ferruginous microbe," *Gallionella ferruginea*, and its amazing role in oxidizing and fixing iron deposits. Dr. Montessori respectfully calls this bacterium "a humble worker in earth's laboratory" (*To Educate the Human Potential* 31; see also Stoppani, *Acqua ed aria* 519).

Elementary students sketching from nature, Amsterdamsche Montessori School, 1930s

Stoppani described human energy as "a new telluric force on the planet," such is the power of the human to transform the environment (*Corso di geologica,* cited in Clark, Crutzen, & Schellnhuber 2). This human power to transform the planet geologically in terms of her biogeochemical cycles has escalated enormously over the past 130 years. For example, "more nitrogen is now fixed synthetically and applied as fertilizers in agriculture than is fixed naturally in all terrestrial ecosystems . . . and the release of sulfur dioxide to the atmosphere by coal and oil burning is at least two times larger than the sum of all natural emissions" (Clark, Crutzen, & Schellnhuber 4).

In 2001, delegates from over one hundred countries formed "The Earth System Partnership" and inaugurated what some scientists are now calling "The Second Copernican Revolution." It is the revolu-

2 Dr. Montessori notes in a lecture given in India that what she came to call "Cosmic Task" should more accurately be called "The Telluric Economy," from the Latin tellus, "earth" (Creative Development in the Child 177).

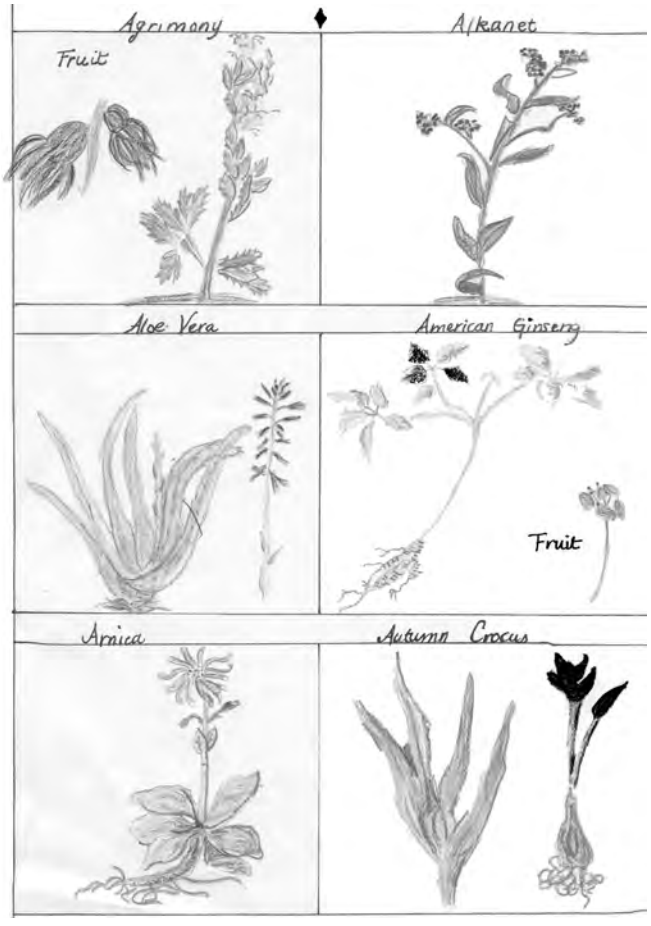
[3] In fact, in *From Childhood to Adolescence*, Montessori calls these four elements "The Key to the Universe" (68).

tion in thinking that both Stoppani and Montessori would have wished for, that humans would develop a thorough and continuing scientific understanding of the complex planetary systems. In 2004, the world scientific community completed an extraordinary decade-long research titled "Global Environmental Change and the Earth System." Hundreds of researchers collaborated and there is no question in their minds that humans are now a powerful new geological force transforming the planet rapidly (See Clark, Crutzen, & Schellnhuber).

Dr. Montessori's many decades traveling all over the globe deepened her conviction that all life was passionate for work—each to do its specific work—driven to do that work ceaselessly, and if viewed from the vast perspective of geological time, could be understood as contributing to the maintenance of the whole of the biosphere. Observing normal children at work only solidified this conviction. She saw that children given the liberty to follow natural urges wanted to work tirelessly. Seen in the context of the Cosmic Theory this made absolute sense to Montessori. She observed: "The 'work' goes beyond all needs of the child himself, and it reminds us of these other creatures we have already mentioned whose 'work' exceeds their needs [i.e., the corals]. This need for a similar reorientation with regard to 'work' has been pointed out to us by the child," Montessori says, "so he has indeed taught us some fundamental secret which concerns humanity.... it is then clear that the child—the creature from which we have sprung—contains intact the directive principles of human life which we have lost" ("The Child's Place in Society" 17).

While working with elementary children of different ages from various countries in Kodaikanal, India, during World War II, Dr. Montessori and her son Mario began to see how truly appealing this concept of creatures working for the universal good was to them. They observed that elementary-aged children took a great interest in going out into nature, delving into the worlds of plants and animals, the ecology of terraria they had created, and the geological processes of earth-building and decomposition, including the awesome work of water. They saw that the child of six to twelve years could enter in his imagination the world of the very small (the atomic world) and the world of the very large (the galactic world), with the help of his reasoning mind and a mathematical propensity to enjoy "big" numbers. One could say, for example, that 710 million atoms of hydrogen could fit on the head of a pin to a child of this age, and the reaction was one of wonder and awe, and often a desire to research more about such a fact. This exploration of the Cosmos was found to be the perfect match for the intelligence of this aged child (Montessori, Maria, Unpublished lecture, January 29, 1940).

If we return to the story of the pencil for a moment we can see that not only does the teacher have to deepen her own knowledge of the origins and interconnections of things but she has to "expand her vision and be prepared to take immediate and spontaneous advantage of the situation" (Lakshmi Kripalani, conversation, October, 2005). The teacher has to deeply grasp this Cosmic Theory; has to embody, so to speak, the Cosmic Vision. She has to carry this deep sense of the "Transparency of Things" and grow her understanding of the unity or wholeness of Nature. She has to keep alive her own sense of wonder and excitement and be a parallel researcher with the children.



Upper elementary botanical drawings courtesy of Gerard Leonard

I would like to paint a picture of an example of the process of Cosmic Education as it deepens over time. The scenario takes place in an upper elementary classroom. A group of children became very passionate about plants and the study of botany—a passion that lasted all three years and I have no doubt will continue in some way into their future. This work not only fed some deep need of the age, but formed them as research workers. I reflected recently on the vast scope of what they did and its effect on the class, on the teachers, and on themselves, the intrepid and tireless workers. These students, principally a boy and two girls, including several others who also worked with them periodically, came to the class with the seeds of an interest in plants, real contact with nature from toddler age, and some essential botanical nomenclature. They entered a prepared environment where there were lots of plants both large and small and many varieties from cacti to palms to horsetails and cycads, and a broad span of monocots and dicots. There were examples from the Timeline of Life in the environment. Each child in the class also brought a small plant of their own choosing to the classroom, researched its needs, and had to care for it. The "Plant Lovers," or "Botany Club" as they came to be called, began to care for our indoor plants, at first one or two that they noticed needed some affection and attention, and then, soon enough, all the plants. They were given the time, the place, the respect, and the validation to be able to proceed and follow their interest.

Courtesy of The Cobb School, Montessori, Simsbury, Connecticut

Soon they were repotting plants, nursing plants back to health, asking questions, and researching what to do for certain blights and so on. The classroom, in addition to having all the Montessori botany materials, had a botany library specially designed to support research, with botany guides and other useful, hard-to-find books. Soon we had a plant hospital where plants needing care from around the school were brought and nursed back to health.

Parallel to this work, the children were receiving presentations on botanical illustration, hearing inspiring nature poetry, and experiencing great natural history writing read to them from famous authors, such as Annie Dillard, Edward Abbey, and Henry David Thoreau. In addition, they were engaged in their own nature writing, often outside, sitting on the grass or on a rock, or in the quiet of the woods. As they built their beloved forts in the woods, tended our gardens, and cared for the classroom plants, they began to notice more details and wanted to research even more. This is when they delved deeply into the botany nomenclature, illustrating and writing and then researching further and making their own extensions of the nomenclature, such as other seed types, extensions of monocots and dicots, and so on. They also began to research medicinal plants and began what was to become a huge compendium, alphabetized, with beautiful and carefully executed botanical illustrations and descriptions gleaned from various books and other sources. This study was to last all three years, and ultimately was to inspire a study of natural medicines from various cultures and a survey of the wildflowers in our woodlands. They discovered we had six endangered species of wildflowers growing in our woodlands. These flowers were tended by them daily and protected; trails were rerouted, and a map was made of the locations of the flowers so that they could be protected now and later once the students graduated.

The excitement with which I was informed of the next blooming Lady Slipper and of the discovery of its interesting method of pollination was humbling. They were captivated not only by the beauty of the plant world, but by its science and by the realization that they were needed and could be of service. All of this was an extraordinary experience for me. Something ignites in the adult heart in the face of such glorious love and passionate work. They visited the local garden club and arranged for an expert in conservation to visit the class and broaden our horizons even more. Throughout this time, the Botany Charts were re-examined, discussed, and our understanding deepened; certain botany experiments were done; the Chinese Box of Botany was mined for classification information on divisions and families, and fabulous websites were discovered such as the *Cornell Herbaceous Perennial Plant Database,* the *Harvard University Herbaria,* and the *Linnean Herbarium in Sweden.* It is important to say that this work was freely chosen and totally interest-driven. As Dr. Montessori so astutely observed: "Everything depends on being able to see and on taking an interest. It matters much more to have a prepared mind than to have a good teacher" (*The Absorbent Mind* 183).

Such study and attention to the small details of living things in an environment and with adult teachers infused with "a sense of Cosmos," with "the interconnections of things," will inevitably lead the child to the big picture. As Dr. Montessori so eloquently said,

> If we study, for example, the life of plants or insects in nature, we more or less get the idea of the life of all plants or insects in the world. There is no one person who knows all the plants; it is enough to see one pine to be able to imagine how all the other pines live. (*From Childhood to Adolescence* 35)

I have always been a great lover of trees, ever since I was a small child. I was fortunate to have been able to play freely in beautiful mixed woodlands with old oaks, ashes, and horse chestnuts, and occasional trees from afar that stirred one's imagination I recall a great monkey puzzle tree and unusually tall pines. When the swallows flew in from the south or the geese from the north I wondered if they had seen these trees in their lands. And there were also the sacred trees of my people, among them the hazel with its nuts of wisdom eaten by the storied salmon of knowledge, in turn eaten by our great hero Cúchulainn; and the fairy tree, the hawthorn, that no one would cut down for fear of fairy retribution. I remember learning to identify all the trees in my locality. In an old estate where I liked to walk there were great lines of ilex or holm oak an unusual non-native tree. I remember how excited I was when I read in some old book that the monks in medieval times had imported these trees from the eastern Mediterranean because their leaves were good for making mattresses for the poor.

I still love trees; I find solace and inspiration in the two huge gingko trees in the park across the street from my home in Connecticut, the first trees to evolve and remain remarkably unmodified for the last 200 million years. I celebrate when I remember that they did not go extinct but were saved in ancient Chinese, Japanese, and Korean temple gardens. In the same park there is a great copper beech visited so often to play in its branches when my daughter was small, and only a mile away an eight-hundred-year-old sycamore, old already when the first settlers came here in the late 1600s.

"A great tree infuses empty space with memory and turns it into a place. . . ." (Balog 54).

Trees nourish my spirit when I spend time with them. These beautiful poetic words by Maria Montessori invite us out into the woodlands and further—for her vision extends from tree to Cosmos:

> There is no description, no image in any book that is capable of replacing the sight of real trees, and all the life to be found around them, in a real forest. Something emanates from those trees which speaks to the soul, something no book, no museum is capable of giving. The wood reveals that it is not only the trees that exist, but a whole, inter-related collection of lives. And this earth, this climate, this cosmic power, are necessary for the development of all these lives. The myriads of lives around the trees, the majesty, the variety are things one must hunt for, and which no one can bring into the school…. How often is the soul of man—especially that of the child—deprived because one does not put him in contact with nature. (*From Childhood to Adolescence* 35)

I share these very personal experiences and sentiments about trees out of a desire to stress the vital importance of the teacher in a classroom prepared for Cosmic Education being him- or herself deeply connected to nature in some rather profound way,

such that not only the marvelous science makes you leap for joy, but the beauty, the poetry of the trees, the ocean, the peeper frogs, whatever calls to you can literally can make you weep. In *The Dream of the Earth,* Thomas Berry puts it this way:

> The fruitful interaction between the scientific and the religious-humanist vision is our greatest promise for the future as well as the great task of the educator, both in comprehending for oneself and in communicating this vision to future generations of students. (101)

The vision he speaks of is the new scientific vision of the Universe integrating the intellectual, the imaginative, and the spiritual.

I recall my first reading of Mario Montessori, Sr.'s article "Plants' Work." This opened up a whole new world for me at the time—the tree, the plant as an important contributor to the maintenance of the earth. The trees and the grasses held precious soil together, mined for minerals and water with their roots, harbored and supported much other life; plants were photosynthesizers, capturers of solar energy and, with their moneran friends, nitrogen fixers. This scientific knowledge did not dampen my more poetic sense of trees and the world of plants, but rather began the process of opening my mind to look more deeply at these extraordinary beings.

Such is the ongoing "preparation of the teacher" in a Cosmic Educational setting. It is the essential other half of the preparation of the environment. For each of us, Cosmic Education has to be not only known but felt in some fashion in order that this understanding can permeate the psychic space and the work of the classroom. No doubt we must work at acquiring and updating our knowledge of multiple subjects (particularly natural sciences and history according to Dr. Montessori; see *Creative Development in the Child* 133) and become more cognizant of the keys in our timelines, charts, and tales—but this is not nearly enough.

To deepen this work we each have to find our way to making a heart and mind connection—for some of us it may be through poetry, art, or music—for others it is fortunately often through contact with indigenous traditional wisdom with its profound sense of interrelatedness with the earth. For many of us today this connection happens through our growing acquaintance with the Great Epic of Evolution and the new discoveries of science—more awesome and wonderful all the time. This needed nourishment is also always available through spending time walking and sitting in natural settings, in the fields, the woods, the mountains, the desert. Thoreau advocated being a "saunterer" in the natural world. "In wildness is the preservation of the world," he said (paragraph 18).

"The child should love everything that he learns, for his mental and emotional growths are linked" so speaks Maria Montessori in *To Educate the Human Potential* (26). She goes on to quote Dante as saying: "The greatest wisdom is first to love." She lived this maxim herself. Dr. Maria Montessori understood that love and knowledge are intimately bound together. For example, her various writings on the Cosmic Task of "the cow" strike one in this way. She wants to communicate the important cosmic function of the cow in earth's ecological economy and also her clear affection for this animal. Speaking in 1940 in India, a land where the cow is sacred, she describes the cow as an animal she "'loves very much,' as a friend." She goes on to describe how the cow has developed her four stomachs to digest the grass and "keeps on doing the work which was necessary for the formation of the earth, so that the earth can be ready to receive other forms of plant life" (Unpublished lecture, January 15, 1940).

We are reminded by Montessori that the cow's arrival was synchronized with the appearance of grasslands all over the earth (*What You Should Know About Your Child* 123). "The obedience of the cow to this great cosmic mandate [i.e. the maintenance of the grasslands and meadows in good condition] is wonderful," she declares (123). If one enlarges this picture to the great array of grazing and browsing animals all over the planet—the deer, the antelope, the bison, the moose, the zebras and so on, one encounters a world of not only great beauty but of great service.[4] "When an animal [such as the cow] acquires a function and becomes perfect," said Dr. Montessori, "a work of artistic beauty is carried out" (*Creative Development* 249).

And so our work as teachers is to create a "wonder-filled" learning laboratory and a large open door to the natural world so that children, according to

[4] In his book *The Grass Eaters,* Gary Paulsen calls them "the biggest, the most graceful, the most complicated" of all animals (vii).

Courtesy of The Cobb School, Montessori, Simsbury, Connecticut

their particular interests and via various details of study and observation, may begin to understand, and marvel at the "Cosmic Task" or "Telluric Economy" of everything from a tiny molecule of glucose to the work of bacteria, bats, oak trees, and the great biogeochemical cycles such as the carbon cycle. "Can children [of seven to eight years] understand the philosophy?" asks Maria Montessori. "Consciously perhaps not," she says, "but its impact at this age is a preparation for understanding later" ("The Meaning of Adaptation" 6).

In Mario M. Montessori's *The Human Tendencies and Montessori Education,* two factors are indicated in order that the child should "incarnate" his world: The first is to give the children keys as to understanding how the earth functions and in addition how mankind is affected by how the earth functions. Beyond this, another depth we have to explore with children through story and research is "the contribution that Man gives to his fellowmen" (2).

Dr. Montessori asks us to help the child to see that mankind is already united; she called humanity a "United Nation." In the words of Mario M. Montessori, "Mankind depends entirely on man. . . . All countries on earth are joined by every sort of relationship; they are so dependent on one another that they do form a whole" (*The Human Tendencies* 5).

We tell many stories of the great and famous inventions and discoverers of history from Archimedes to the present, and other great heroic men and women. However, Montessori would also have us celebrate in story the unsung heroes of history, the unknown person who domesticated the first dog, the inventor of the needle and thread, and also the modern workers of all kinds who labor namelessly so that we might live. For example, as many as three hundred of *il populo minuto* or "the little people" worked carrying lime and bricks for Brunelleschi's famous Dome in Florence. They were actually known as *uomini senza nome e famiglia,* "men without name or family." Their awesome work remains for us all to enjoy (King).

Gratitude is the feeling evoked when we understand how many people indirectly work to aid

our survival. Maria Montessori challenges us to substantially change our outlook on these relations. Rather than simply seeing each worker as self-serving only, we can help the child see how each contributes an essential part in the process.

Let us trace an ordinary Number 2 Eberhard Faber Mongol pencil's journey in the year 2005 (Wolken). We begin with cedar trees grown in California and the lumberjacks that cut them down. The logs are loaded onto trucks and delivered to a mill in San Leandro, California. Trucks run on diesel fuel. The diesel is derived from crude oil from OPEC countries like Saudi Arabia. At the mill the logs are cut into slats and the slats are shipped by rail to a factory in Wilkes-Barre, Pennsylvania. At the factory, grooves are cut in the slats and resources from around the world are combined to make the pencil. The "lead" is a mixture of graphite, clay, and gums. The graphite is mined in Sri Lanka and shipped to the United States in a Japanese-built ship. Candelilla wax from Mexico is added to make the lead smooth and strong. The graphite and wax are then mixed with clay from Mississippi. This mixture is put into the grooves in the slats and two slats are glued together. Nine pencils are carved from each sandwich. Each pencil receives several coats of lacquer—made from castor oil grown by farmers from tropical Africa.

The piece of metal that holds the eraser is called the *ferrule* and is made of brass (a combination of zinc and copper). Zinc is mostly found in North America (USA and Canada), Russia, Australia, and Ireland. Copper comes from South America and Africa (Bolivia, Chile, and Zambia). The eraser uses many ingredients including pumice from Italy and oil from a seed grown in Indonesia.

Think of how many thousands of people from many, many countries have interacted indirectly to make this humble pencil. Montessori calls this phenomenon a Universal or Cosmic Charity at work. "It requires the lifelong dedication of each man to all



Botanical drawings by 9- to 12-year-olds from The Amsterdamsche Montessori school courtesy of Leonard/Allen collection

mankind, the rich man and the poor man alike," she says (*Education and Peace* 139). This perspective can be awakened by looking at all kinds of production and economic exchange, by looking at the migrations of peoples and the particular gifts or contributions brought to their newly settled areas of the world. Elementary children love this work, it is so right for them—it ignites their minds.

Beyond this, it is fascinating to ponder and explore the Cosmic Tasks of particular cultures and civilizations. Dr. Montessori points to the progress of Hellenic civilization and its great contributions via the Roman world to our present global civilization. We owe everything to our fellows past and present and their heroic strivings and sacrifices.

Dr. Montessori elaborated on this essentially religious sentiment of gratitude for the goodness and charity of human beings in an address to The World Fellowship of Faiths in London in 1939. She believed that despite our wars, our prejudices, and our blindness we were as a human race gradually working towards building a world of peace. She said, "If we educate children to see this [that is, "the disinterested goodness and self-sacrifice of his fellows"], they will ready themselves to feel gratitude toward all mankind. This is the affective aspect of our cosmic education" (*Education and Peace* 141).

We have a great challenge during these times of much international anxiety, strife, hatred, and environmental distress in our world, to hold in our hearts and minds the big picture, and for the love of our children and the future, to keep our own fire of hope and enthusiasm alight. We are among the first educators in history to be vouchsafed by our scientific community the Great Story of our Evolution and the first glimmerings of a time when we as a species may, in the words of Buckminster Fuller, write the manual for operating Spaceship Earth, and so inaugurate a "sustainable" future, a future in which the enormous developmental potential of the child will guide us toward a peaceful global society.

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Courtesy of The Cobb School, Montessori, Simsbury, Connecticut

Courtesy of Annie Fisher Montessori Magnet School, Hartford, Connecticut

# The Elementary Child's Place in the Natural World

by Phoebe Allen

*Phoebe Allen's article speaks for the early bonding of children to the natural world prior to the elementary class. She also suggests the continuing exploration of children at elementary age in the outdoors in order to build the necessary sense of wonder and love of the environment to overcome anxiety over the negative realities of the planet's future. The message is emphatic: Nature teaches best of all; inspire hope, not despair.*

Connected through television and other media with endangered animals and remote ecosystems around the world, many children worry about the disappearance of nature in a global sense, yet have little or no personal connection with the natural world around them. They have heard about endangered African elephants and tropical rainforests, but children are not visiting their own backyard woodlots or the overgrown meadow down the street. They're not turning over the woodpile to catch worms and bugs, or watching butterflies, tadpoles, mushrooms, and other organisms right at their feet.

Instead of math phobia, children are developing *eco-phobia*—the fear of rainforest destruction, the hole in the ozone, pollution in rivers, acid rain, and the extinction of cuddly-looking panda bears and seals. As teachers, we must guard against the move toward "environmental education" that leaves children with a sense of hopelessness and distances them from the natural world.

The children of yesterday spent hours in the pastures and barnyards of their parents' or grandparents' farms and roamed freely and safely in the woods near their neighborhoods. But today's child spends little time in natural surroundings and is disconnected from the outdoor world. In addition to loss of available wild or rural spaces for play and increased safety concerns, today's child is faced with mounds of homework, frenetic scheduling, and less overall free time. According to a recent study by the University of Michigan, the average American child spends just 50 minutes per week in outdoor activities, half as much as twenty years ago (U.S. Children and Teens). It is no wonder that our culture is at the same time dealing with an epidemic of "overweight proportions"—the result of inactive pursuits involving boxes that plug into electrical sockets.

Arguably the most important aspect of our work as Montessori guides is providing the children opportunities to bond with the natural world and fall in love with the Earth before we ask them to save it. Naturalist John Burroughs advises us that "Knowledge without love will not stick. But if love comes first, knowledge is sure to follow" (cited in Sobel 14).

Ecologist David Orr cautions us: "Ecological literacy is driven by the sense of wonder, the sheer delight in being alive in a beautiful, mysterious, bountiful world" (86).

Most adult environmentalists attribute their commitment to the planet to two things: significant periods of time spent outdoors in wild or semi-wild places during childhood and/or adolescence, and an adult who showed respect for nature and served as a role model. "To keep alive his inborn sense of wonder," a child, in Rachel Carson's words, "needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in" (65).

### Primary Work Is Primary: Initiating Biophilia

Research indicates that certain brain patterns are developed only if the child is interacting with the environment, and the earlier the better. Early childhood is obviously the most critical period for bonding with the earth and initiating what entomologist E.O. Wilson calls *biophilia*—an affinity for the living world. Before age six or seven, our main objective should be to cultivate empathy between the child and the

natural world, to nourish his or her sense of kinship with life with stories, songs, seasonal celebrations, and, most importantly, direct experience—close-up encounters with plants and animals.

### Elementary Work: Exploration

Since exploration is a characteristic of the child aged six to twelve, activities in the elementary years should naturally include collecting rocks and seashells, hunting and gathering mushrooms and wild foods, going on treasure hunts, building clubhouses, exploring streams and wading in creeks, searching for amphibians and insects, making maps and following trails and animal tracks, hiking and campouts, and studying local geological features through personal observation. Active vegetable and flower gardening, taking care of farm animals, and connecting to gardens and animals through the compost cycle is also very appropriate for the elementary child, bearing in mind John Muir's words, "When we try to pick out anything by itself, we find it hitched to everything else in the universe" (157).

Dr. Montessori agrees: "…all things are part of the universe, and are connected with each other to form one whole unity" (*To Educate the Human Potential* 8). She clearly encourages us to offer the child opportunities to get in touch with the natural world:

> It is self-evident that the possession of and contact with real things brings with them, above all, a real quantity of knowledge. The inspiration engendered by it revitalizes the intelligence that was interested and wished to know. From all these things new intellectual interests arise (climates, winds, et cetera). Instruction becomes a living thing. Instead of being illustrated, it is brought to life. In a word, the outing is a new key for the intensification of instruction ordinarily given in the school.
>
> There is no description, no image in any book that is capable of replacing the sight of real trees, and all the life to be found around them, in a real forest. Something emanates from those trees which speaks to the soul, something no book, no museum is capable of giving. The wood reveals that it is not only the trees that exist, but a collection of lives. And this earth, this climate, this cosmic power are necessary for the development of these lives. The myriads of lives around the trees, the majesty, the variety are things one must hunt for, and which no one can bring into the school.
>
> How often is the soul of man—especially that of the child—deprived because one does not put him into contact with nature. (*From Childhood to Adolescence* 18-19)

Addressing environmental problems that call for social action, however, begins more appropriately around age eleven and, hopefully, extends beyond adolescence, giving students plenty of time to study the challenges of tropical rainforest ecosystems and save the whales, as well as opportunities to manage schoolwide recycling programs, for example, or take action on local or global issues.

### Nature-Based Schoolyards

A potential bridge between the indoor environment and "the wild" lies right outside our schools' back doors—in an area the children can safely frequent on a daily basis. Native plant habitats are perfect alternative planting grounds for our young Montessori seedlings, provided we create green, inviting spaces, not just asphalt-paved playgrounds with boring jungle gyms and blah shrubbery. Native plant habitats in nature-based schoolyards can offer a laboratory for encouraging curiosity, observation, critical thinking, and intellectual growth. These outdoor spaces invite participation and engage children in unstructured physical activity, providing a hidden curriculum that children will discover on their own.

Native plants move beyond "landscape" plants to stimulate the senses and promote inquiry. Edibles and ornamentals create a dynamic, exciting place to be. Flower and vegetable gardens, farm animals, and compost piles create myriad opportunities for work with the botany and zoology nomenclature and with the whole cosmic curriculum. Nature-based schoolyards help transform children from casual observers to stewards of our planet, creating environmentally and ecologically literate children with an understanding of the interrelationships between organisms and their habitats, and an emotional attachment to the Earth.

### Into the Wild

As Montessori teachers, we have carefully prepared our indoor environments, and some schools have already begun work to prepare native plant habitats in their outdoor spaces, but it is important to remember that we are not the only species that

Courtesy of Marin Montessori, Corte Madera, California

prepares its environment. A marvelous, mysterious, and wonder-filled world awaits us in the meticulously "prepared" environment of wild, unmanicured spaces. Nothing more is required of the guide than to lead the children into these wild, outdoor spaces, where they will make their own discoveries.

"When the child goes out," writes Maria Montessori, "it is the world itself that offers itself to him. Let us take the child out to show him real things instead of making objects which represent ideas and closing them in cupboards" (*From Childhood to Adolescence* 18). "The foot is noble," she adds. "To walk is noble. Thanks to the feet, the child who already walks can expect of the outdoors certain answers to his secret questions" (*From Childhood to Adolescence* 12).

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Courtesy of Annie Fisher Montessori Magnet School, Hartford, Connecticut

Courtesy of Steve Maas, Montessori Children's House, Traverse City, Michigan

# Experiences in Nature: Resolute Second-Plane Directions Toward Erdkinder

Gerard Leonard and Kathleen Allen

*Gerard Leonard and Kathleen Allen describe a variety of nature experiences as a part of the Montessori elementary tradition, beginning with a warning about the way contemporary life constrains children's experience of nature. Through a lyrical rendering of the nature-based expressions of children, Leonard and Allen look at a variety of approaches to nature study through the senses, the enrichment of gardening, daily journals of nature observations, poetry writing, bird watching, biographies of natural scientists, drawing, use of the microscope, classification, etc. Finally, they present a list of curriculum inclusions for the elementary, with concluding remarks summarizing the role and uniqueness of studying the "book of nature."*

> *No matter what we touch, an atom or a cell, we cannot explain it without knowledge of the wide universe. (Maria Montessori,* To Educate the Human Potential *6)*

And for this knowledge of the wide universe to take root the child needs, in addition to hearing the inspiring great story of our cosmos and exposure to all the scientific disciplines, the experience of simple natural and timeless acts such as sowing seed, gathering the crops, and celebrating the bounty with friends.

> In Spring we planted seed,
> And by degrees the plants
> Grew, flowered, and transformed
> The light to food, which we
> Brought in, and ate, and lived.
> The year grown old, we gathered
> All that remained. We broke,
> Manured, prepared the ground
> For overwintering,
> And thus at last made clear
> Our little plot of time,
> Tropical for a while,
> Then temperate, then cold. (Berry 203)

How children love to experience "the little plot of time," the round of the year, the seasonal growth and decay. But more than just experience, they want to really feel part of nature's great circling. Maria Montessori's vision was that the children should "live in Nature."[1] She saw that children naturally revel in forest and field and stream, and want to be intimate with their kin, the earth's creatures. And she came to believe more and more strongly, especially after the experiences she and her son Mario had with children living in nature in India, that a deep intimacy with the natural world was not only very healing for the child but prepared him well for the next plane of development, for his relationship to society, to the human family.

"Actually, nature frightens most people," wrote Maria Montessori in 1948, just a few years before her death and after some forty years of observing children and families worldwide. She continued: "They fear the air and the sun as if they were mortal enemies. They fear the frost at night as if it were a snake hidden in the grass. They fear the rain as if it were a fire" (*The Discovery of the Child* 70). This has certainly not changed in the sixty years since these words were written; rather, the fear has been compounded over the last several generations to where we can easily accept Richard Louv's portrayal in *Last Child in the Woods* as a most believable warning of where we are heading.

[1]In *The Discovery of the Child,* a brilliant chapter titled "Nature in Education," Maria Montessori elaborates on this idea beautifully and with a practicality clearly based on lived experience with children.


Art from De Natuur in de Amsterdamsche Montessori schoo, A.F.J. Portielje and R. Joosten-Chotzen, Amersterdam, 1932, courtesy of Leonard/Allen collection

Renilde Montessori is very direct when it comes to this question of our fears. She says in her book *Educateurs sans Frontières*: "Where our children are concerned, it is our bounded duty to corral our fears, look at them dispassionately, sort and classify them and use them as the guiding element they are rather than letting them stampede and overrun us" (47). The elementary years are a time of boundless energy, strength, and, yes, fearlessness. This we know from observations all over the world, and this we know from memories of our own childhoods.

Listen for a moment to just a taste of what we are missing if we continue to wall off ourselves and our children from nature. Being in nature, observing closely and patiently, invariably elicits a special kind of writing, and this seems to be particularly accessible to children. Here are a few pieces to ponder, all deriving from being in nature and simply looking:

> The monarch sits quietly, perched upon a nearby flower. He is probably the last of his kind before the incoming frost. The wind blows cool in my face. I know it's coming … fall.
>
> He opens his colorful wings and leaps gracefully from one flower to the next. His wings glint against the sun and he flies away. He soars elegantly in the September wind, lands and finishes up with a flutter of his delicate wings. He is beautiful, his warm colors make me want to smile … a warm hug, a toasty fire, a soft blanket and a hot piping cup of hot chocolate with marshmallows…… mmmm! He flies away … never to be seen again by my eye. (Julia, age eleven)

> "The Crows!"
> The crows, here they come, darting to the ground.
> The crows, the crows, they're everywhere,
> The crows, on the ground, walking all around,
> The crows, the crows, they're everywhere.
> Here more come, in the air,
> The crows, the crows, they're everywhere. (Zeke, age eight)

The following writing is excerpted from a longer piece where the girl observes a tree she had previously observed and written about in a different season:

> I smooth out my page. I only have so much time, but I don't want to rush. I just want to enjoy my beautiful friend and its surroundings. My tree shades me with its winding trunk, stretching into branches with leaves, a juicy-green sparkle. My tree's roots pop out of the ground just like a mole popping out of a certain hole in a million. Birds are chirping sweetly in my wonderland. Pine needles scatter the ground at my motionless feet. I hug my warm chunky textured tree, I feel moved, well, wouldn't you hugging one of your best friends? I love my tree and always will forever. (Emma, age nine)

In our work with elementary-aged children we never cease to be amazed by how much they absolutely love animals and plants. Their thirst for both knowledge of and real connection to every kind of animal and plant is pretty inexhaustible. One could create an entire curriculum around nature study, and the children would be endlessly fully engaged. In fact that's what our Cosmic Plan is, deeply connecting with mind and heart to our world and its life. We just have to work hard against the pervasive

cultural pathology that disconnects children from nature. We must not simply stay indoors with our timelines and classified nomenclature, as wonderful and attractive as they are to the children.

A child can enter the disciplines of botany and entomology with vigor and great intelligence, but first he must be familiar with one particular tree and with the ways of one tiny "six-footed" little ant: "If we study, for example, the life of plants or insects in nature, we more or less get the idea of the life of all plants or insects in the world. There is no one person who knows all the plants; it is enough to see one pine to be able to imagine how all the other pines live" (Montessori, *From Childhood to Adolescence* 35).

For this epiphany of connecting the one to the many, the child needs to be often in the garden, feeding the domestic animals, assiduously caring for the wild birds in winter, exploring in the woods, fishing with a net in a vernal pool, climbing a hill or even a mountain, lying on the grass under the stars watching the Perseids shooting across the sky every August. "How often is the soul of man—especially that of the child—deprived because one does not put him in contact with nature" (35).

Our children have to encounter nature on multiple levels. First of all and most importantly, the encounter is through the senses, by sight, by touch, via sound, and kinesthetically. This begins with great intensity before age six but the immersion in the colors, tastes, songs, and exploration of the natural world must continue to be deepened during the elementary years. Emotional experiences are essential. Feelings of real affection, of caring for other living beings, emotions of tenderness, gratitude, and wonder in the face of nature's ways are a treasure house not to be missed during childhood. And lastly, and most powerfully during the elementary years, the encounter is via the intellectual disciplines, through biology, biogeochemistry, taxonomy. All of these disciplines are woven through the elementary years such that earth's history and the interconnections of geology and biology are unveiled, and the wonderful tapestry of living forms is presented as an intelligible system of classification.

Courtesy of Vanessa Toinet, Ecole Montessori du Morvan, Bard-le-Regulier, Burgundy, France

So first of all it is essential that our children get their hands in the soil, in the "good clean dirt," as grandmother used to say. Our children have to learn gardening, the whole of gardening, from preparing the ground for the seed, to harvest and the further preparations for the next cycle. This is so vitally important because this experience is the most direct way for a child to access the laws of nature, to participate in nature's mysteries, and to make both a heart connection and a nascent scientific observer's awakening to plants, insects, animals, fungi, water, sunlight, and so on. We have watched children keeping a daily nature journal of their observations of different seeds as they sprout and grow. A deep kinship with the plants being studied and cared for is developed, not to mention the incredible refinement of the powers of observation and the patient waiting that is fostered. Children are born naturalists, and not surprisingly the lives, diaries, and drawings of the great historical and contemporary naturalists are a real inspiration and source of much interest for them as they pursue this work.

There is so much to see in a well cultivated garden. J. Henri Fabre, the great French entomologist so admired by Maria Montessori, did most of his classic observations of spiders, caterpillars, bees, and other insects in field and garden. Unbroken time, patience, a writing journal, a sketchpad, and a hand lens are the indispensable tools. Daily access is also vitally important. For in Fabre's own words regarding his observations of garden spiders, "What I did not see very plainly yesterday I can see the next day, under better conditions, and so on any of the following days, until the phenomenon under observation is revealed in all its clearness" (231).

And "the child, who more than anyone else is a spontaneous observer of nature, certainly needs to have at his disposal material upon which he can

Courtesy of Mr. Katsuhiko Yorita, Information Center, Okinawa, Japan, submitted by Takako Fukatsu

work" (Montessori, *The Discovery of the Child* 73). These materials are plants, flowers, herbs, and domestic animals to care for.

Maria Montessori's very first Casa in Rome (1907) had a cultivated garden in the adjoining courtyard and little plots for each child to grow and care for plants. The first Casa in Milan (1908) had little houses for animals in the courtyard. In *The Montessori Method* (1912) she wrote of how the keeping of the little gardens was not only a part of the transformation of the children but also of the social reform of the surrounding community of adults. She mentions Lucy Latter, the British educator and horticulturalist, whose book *School Gardening for Little Children* had such a wide influence. Nature in education and its wider social ramifications was very much in the forefront of her mind.

Think of all the wonderful experiences that come from "living" in the garden over many months and years: preparing for planting, planting the seeds or seedlings, weeding, fertilizing, composting, watering, protecting the plants, cultivating, propagating, harvesting, learning preservation and storage methods, putting the garden to rest for winter. And think of how the disciplines of botany and soil science are experienced in such a deeper way when the garden (or greenhouse in a cold climate) is an integral part of the daily prepared environment of the Montessori classroom.

"The most pleasant work for children is not sowing, but reaping, a work, we all know, that is no less exacting than the former. It may even be said that it is the harvest which intensifies an interest in sowing" (Montessori, *The Discovery of the Child* 75). We have often seen the great joy when children, for example, harvest all the lettuces in the garden and create wonderful salads for themselves and their families. They love to celebrate their work and nature's bounty.

Maria Montessori considered the garden so important that she wrote: "plans for a garden run parallel with those for the building of a Children's House" (*The Discovery of the Child* 78). It was really inconceivable to her that a prepared environment for children could exist without a garden.

We also have to remember that the sensorial encounter, the "living in nature" must occur in non-

Courtesy of Mi Casita Montessori, Quetzaltenango, Guatemala

cultivated environments, especially in woodland, field, and stream. Free play outdoors is so essential and the precious time to build forts, dams, miniature villages, and so on. Every six- to twelve-year-old thirsts to do these things. Unfortunately, more and more children in the "developed" world are not being given the time, freedom, or environments where they can do these things. The tendency to " improve" or "landscape" every inch of school properties and in so doing eliminate any spot of wasteland or semi-wild woodland is something to be monitored if we are to be advocates for the child's right to explore the natural world. Of the forest Dr. Montessori eloquently wrote:

> There is no description, no image in any book that is capable of replacing the sight of real trees, and the life to be found around them, in a real forest. Something emanates from those trees which speaks to the soul, something no book, no museum is capable of giving. The wood reveals that it is not only the trees that exist, but a whole, inter-related collection of lives. (*From Childhood to Adolescence* 35)

Certainly, here is poetry and truth, and we might say an admonition to us: Can we say that the child at age twelve has really "lived in nature" during the

critical first- and second-plane years? If the answer is yes, one can then begin to imagine how this child, grounded in his natural world, is prepared to be the "Erdkind" of the third plane of development, eager to work out the societal adaptations needed for his time, place, and circumstances.

In order to more fully embody nature and the biological sciences, children also need to see and hear of examples of people throughout history who were inspired by nature. They need to know of the writers, artists, and composers who drew upon the natural world for their work. It is important to read to them examples from writers such as Wendell Berry, Annie Dillard, Mary Oliver, and Edwin Way Teale.

To glimpse the intensity of this relationship to nature and to inspire creativity in composing nature poetry, read this poem by Mary Oliver to your children:

> "Of What Surrounds Me"
> Whatever it is I am saying, I always
> need a leaf or a flower, if not an
> entire field. As for the sky, I am so wildly
> in love with each day's inventions, cool blue
> or cat gray or full
> of the ships of clouds, I simply can't
> say whatever it is I am saying without
> at least one skyful. That leaves water, a
> creek or a well, river or ocean, it has to be
> there. For the heart to be there. For the pen
> to be poised. For the idea to come. (32)

These words are simple and deep, but clear enough for an older elementary child to grasp.

Other areas of creative endeavor in which one can explore nature themes include art, music, dance, and drama. Study the nature-based art of Jean-François Millet, John Constable, Claude Monet, and Georgia O Keeffe. Listen to nature-related music by composers such as Antonio Vivaldi in the visually descriptive piece *The Goldfinch*; and Georg Frideric Handel's *The Cuckoo and the Nightingale*. An interesting footnote to this would be the work of Dr. Tony Phillips at State University of New York at Stony Brook. Dr. Phillips, a professor of mathematics, has been analyzing native bird songs, slowing down the sound, playing these pieces on the piano, and notating the songs. These are fascinating pieces to play on the tone bars.[2]

Elementary children need to hear the stories of the natural scientists throughout history, both the well-known and lesser known. Figures such as Charles Darwin, Jane Goodall, Carolus Linnaeus, Rachel Carson, George Washington Carver, Gregor Mendel, and Anton van Leeuwenhoek are definitely on the list. There are many others, especially those that inspired Dr. Montessori, such as J. Henri Fabre and Ernst Haeckel, or those of the American nature-study and conservation movements of the late nineteenth and early twentieth centuries, such as John Muir, Liberty Hyde Bailey, and Anna Botsford Comstock. During this time period there was written a wealth of literature for children and teachers. Notable examples include *Life and Her Children* by Arabella Buckley (1840-1929), published in 1880. Buckley was the secretary of Sir Charles Lyell, geologist, and a friend of Charles Darwin. Her many books for children are deeply grounded in evolutionary theory and portray the classification of animals as understood at the time. It is important to have had exposure to these heroes of biology and nature study, to have heard of their particular life-changing experiences, and to experience their original words and feel how the soul is stirred, nourished, and inspired by such writing.

Drawing is an essential experience that supports children in their developing powers of observation. Children must record what they see in the natural world by illustration (and composition). Dr. Montessori identified this need for children to experience themselves as observer/illustrators. After the beginning work with geometry, she experimented with having the children draw geometric designs, using rulers, compasses, protractors, squares, and pen and ink. All the geometric figures were reproduced as designs and gathered into a portfolio. Thus, not only did the children acquire a deep understanding of the geometric forms, they developed coordination and hand-eye skills that laid the foundation for further work in drawing. "To confer the gift of drawing we must create an eye that sees, a hand that obeys, a soul that feels; and on this task the whole life must cooperate. In this sense life itself is the only preparation for drawing. Once we have lived, the inner spark of vision does the rest" (Montessori,

[2]See http://www.math.sunysb.edu/~tony/birds/music/index.html. Children can listen to bird songs and begin to train their ears in this way, as well as with the Montessori bells.

Courtesy of Annie Fisher Montessori School, Hartford, Connecticut

*The Advanced Montessori Method—The Montessori Elementary Material* 309).

When the children had practiced these geometric exercises for while, she then introduced opportunities for observation in nature:

> The observation of nature (flowers and their different parts—pollen, leaves, a section of some part observed under the microscope, plant seeds, shells, etc.) serves to nourish the child's aesthetic imagination. The children also have access to artistic designs, collections of photographs reproducing the great masterpieces, and Haeckel's famous work *Nature's Artistic Forms*, all of which equipment is so interesting and delightful to a child. (303)

The work with natural objects was a perfect next step for the drawing experience, and the children began to enjoy simple botanical dissections and working with microscopes: After carefully dissecting and identifying the parts of a violet, "with great joy they began to draw them; and they were accurate, skilled, tireless, and patient, as they are in everything else" (313-314).

This type of work is the same done by great researchers and naturalists in the field. Jane Goodall has kept meticulous notes and sketches as she studied the chimpanzees in Gombe Stream National Park in Tanzania over a period of forty-five years.[3]

Children are innately drawn to illustrate what they see in nature. They employ pen and ink and watercolors with ease, if the environment is prepared for this. These exercises have to be offered as a regular work in the class, just like grammar and multiplication, not as a specialty that occurs periodically.

There must be time, especially quiet, reflective time, in nature, in the garden, or studying the

[3]See an image of Dr. Goodall and a sample page from her notebooks at this site: http://bio1151.nicerweb.com/Locked/media/ch01/inductive.html.

Courtesy of Brad Bachulis

aquarium. This sacred time in the natural world to draw what is seen, as well as to write about it, leads to the "eye that sees … a soul that feels."

Our approach to the discipline of biology is based on the child's psychology, on his growing interests throughout the first and second planes of development. There is a building up of substantive knowledge of the discipline in a systematic way. Knowledge of the anatomy and physiology of the major phyla is gradually acquired together with a comprehensive taxonomic scheme. The scientific nomenclature is introduced over a nine-year period. The understanding of biology is, in the Montessori elementary classroom, always related to the timeline of life and the emerging story of the evolution of life on earth. The maintenance and history of the earth's atmosphere, hydrosphere, and lithosphere through the work of earth's living creatures is a unique aspect of our elementary science. In addition, the elementary child is offered a fundamental understanding of the nature and role of the key elements of carbon, hydrogen, oxygen, nitrogen, and a vision of the great global cycling of water, carbon, and nitrogen.

As Montessori educators, we must stay current in our knowledge of the sciences. We must read, discuss with colleagues, and support our classroom environments as lively, stimulating laboratories. For example, Richard Dawkins' *The Ancestor's Tale* takes a different look at the evolution of life. Dawkins moves from the present back into the past, noting each important event of evolution along the way. He calls these "rendezvous points," where we meet a "concestor," our most recent common ancestor. He tells the tale in the spirit of Chaucer's *Canterbury Tales*. Many of these stories are perfect little fables to inspire thought and further research among elementary students. For example, "The Hippo's Tale," which is also "The Whale's Tale," tells how we now know that both hippopotami and cetaceans, closely related, are descendants of land mammals. In classification, the super-order Cetartiodactyla includes cetaceans (whales, dolphins, etc.) and the artiodactyls (even-toed ungulates: hippos, deer, etc.). Every tale in this book can become a point of interest for the Timeline of Life.

In order to be ready for the third-plane life sciences, Montessori elementary students need the following real experiences and knowledge base:

- Experiences in the field with real nature
- Ability to identify the common native plants and animals of their region
- Familiarity with domesticated plants and animals
- Ecology and relationships among the organic and inorganic
- Taxonomy and its current nomenclature (e.g. Cnidaria in place of the old term Coelenterata)
- All current organizing principles, such as Domains and Kingdoms, not a simple plant/animal dichotomy
- The anatomy, physiology, and main characteristics of the Domains and Kingdoms
- Deep understanding of the Timeline of Life, including the life forms of the Pre-Cambrian
- A clear introduction to the Bacteria and Protists in the later years of the elementary—we must move from the seen to the unseen (microscope work is essential here, as is a real laboratory experience)

- The study of cells—Prokaryotes and Eukaryotes, animal and plant, basic knowledge of organelles and cellular processes

- A simple understanding of biochemistry

Biology must be intimately connected with history and geography. We are fortunate as Montessori educators that we are shown a systematic plan for biology as part of our training. Look through any commonly used high school biology text, such as Campbell and Reese's *Biology: AP Edition*. Here you will note the main unit headings:

- The Chemistry of Life
- The Cell
- Genetics
- Mechanics of Evolution
- The Evolutionary History of Biological Diversity
- Plant Form and Function
- Animal Form and Function
- Ecology

These are the worlds to open to the elementary student, not a detailed study, but an introduction to these concepts, planting the seed. All of these topics should be introduced during the elementary years and most are already represented in our classroom materials. One large area of biology study that may not be as developed is the study of the cell. Just as we present the golden bead unit as basic building block of mathematics and the letters as the basic unit of language, so we must present the cell as life's fundamental unit of structure and function.

Now let us return to experiences in nature, for these are the bedrock upon which the aesthetic and intellectual work is founded. Dr. Montessori writes of five gradations of ascent in the study of nature. It starts out with the child's being initiated into the world of just observing the phenomena of life. Next, he is initiated into foresight—he knows that the life of the plants and animals he cares for depend on his diligence. Third, patience and "confident expectation" awaken, a form of faith or philosophy of life. Fourth, a feeling for nature's marvels develops, and finally, she notes: "The child follows the natural way of development of the human race" (*The Montessori Method* 156).

We can understand her words well if we put them in the context of the nature-study movement of the time. The nature-study movement began in the United States in the late nineteenth century and continued into the early twentieth century. Its purpose was to introduce children to the natural world in a way that was practical, spiritual, aesthetic, and scientific. The movement was closely linked to the budding conservation movement. Its roots lay in the philosophy of Jean-Jacques Rousseau and Louis Agassiz. Cornell University became the center of nature-study with professors Liberty Hyde Bailey (1858-1954) and Anna Botsford Comstock (1854-1930) as prominent leaders.

The following words of Professor Bailey echo Dr. Montessori's faith in nature as central in education: "The light, the dark, the moon, the cloud, the rain, the wind, the falling leaf, the fly, the bouquet, the bird, the cockroach—they are all ours. If one is to be happy, he must be in sympathy with common things. He must live in harmony with his environment" (31).

Anna Botsford Comstock, the author of the *Cornell Nature Study Leaflets*, was a scientist-illustrator of renown. Her famous book *Handbook of Nature Study* (1911) is still in print today and is a great resource for teachers.[4] Both Professor Bailey's and Professor Comstock's desire was to cultivate in the child a love of the outdoor environment, a love of beauty in nature, and an ability to observe simple, common natural things. Such experiences would, they believed, truly develop the child. Their approach was to follow the child's interests, not the subject matter. Dr. Montessori combined this approach with a parallel intellectual study and presented them as complementary and as both necessary for a deep understanding of our natural world.

[4]Anna Botsford Comstock was the first college professor to actually take her students outside to study nature. Her scientific illustrations, particularly wood-engravings of insects, were exhibited nationally. In 1894 she established the nature study curriculum in New York public schools. She was also elected to the National Wildlife Federation's Conservation Hall of Fame in 1988. Both her life story and her beautiful drawings are worth sharing with children.

What we elementary Montessori teachers have to remember is that the real experiences in nature come first, and not only that, but they must continue to be the centerpiece of what we call "cosmic education" as we gradually grow the intellectual disciplines and introduce the scientific materials for exploration and development.

Lena Wikramaratne relates that in India, where the "cosmic plan" for the elementary years was fleshed out, that the guide indicated by Dr. Montessori was *The Book of Nature:*

> Thus, with the guidance of Mario Montessori, there were rambles every day in the woods and meadows, up and down the rocks and slopes of waterfalls, crossing the brooks and fishing in the ponds, rowing to and fro in the lake, collecting beetles, butterflies and frogs eggs, baby lizards, etc. Each time was a lesson in geography, geology, biology ... every ramble became an "intellectual walk." (30)

This constant grounding in nature is also for the teachers, not only for the children. In her Kodaikanal interview with David Kahn, Miss Wikramaratne said that the trainees "must go out into the natural world or else they won't be able to show anything to the child" (50).

And Dr. Montessori would have us prepare thus:

> I would therefore initiate teachers into the observation of the most simple forms of living things, with all those aids which science gives; I would make them microscopists; I would give them a knowledge of the cultivation of plants and train them to observe their physiology; I would direct their observation to insects, and would make them study the general laws of biology. And I would not have them concerned with theory alone, but would encourage them to work independently in laboratories and in the bosom of free Nature. (*The Advanced Montessori Method – Spontaneous Activity in Education* 138)

So let us corral our own fears and feel comfortable in the bosom of nature. Let us become naturalists with our own journals and sketchpads and enjoy sauntering forth in nature, and exploring with our own hand lenses and microscopes. Let us grow herbs, plant fruit trees, and keep chickens or bees so that we may offer the children their birthright, the chance to deeply know and love their natural environment during the years before adolescence.

Courtesy of Rusty Keeler, www.earthplay.net


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Courtesy of Vanessa Toinet, Ecole Montessori du Morvan, Bard-le-Regulier, Burgundy, France

# The Resurgence of Cosmic Storytellers

by Brian Swimme

*Brian Swimme's insights about the Story of the Universe look to the unifying impact of a "cosmic story" that speaks to all cultures and nations. Swimme suggests that humans are now able, through science and narrative, to present a story which will make us all a "cohesive tribe" while answering the universal questions of developing humans, such as "Where does everything come from?" "What makes things die?" and "What is my place in the universe?" Swimme's work is aligned with Thomas Berry's, and both have been influenced by Montessori's book* To Educate the Human Potential.

We find ourselves in a world with 50,000 nuclear warheads, with ecocide underway on every continent, with massive starvation and torture and cruelty. How do we get out of this? How do we make our way into health and vitality? My proposal is that we tell stories. In particular, we must tell the many stories that make up the *great cosmic story.* This storytelling activity may be the most important political and economic act of our time.

I understand how superficial such a remark might seem. Stories are told to children to put them to sleep. Stories are what we put on TV to help us forget our harried day at the office. Stories are make-believe, whereas the *Wall Street Journal* is what the world is really about. But there is a different and deeper story, one we rarely encounter in our mechanistic, patriarchal, materialistic, consumer-oriented culture.

A *cosmic creation story* answers the questions asked by children. Where does everything come from? Why do things die? Children want to understand their place in the universe. They wonder about their roles. They have an inherent need for a cosmic story.

There are many creation stories; they have been told around evening fires for most of the last 50,000 years. These cosmic stories were the way humans chose to initiate their children into understanding the universe and their place in this world. The rituals, the traditions, the taboos, the ethics, the techniques, the customs, and the values all had as their core a cosmic story. The story provided a central cohesion for each society, a "world-interpretation," a likely account of the development and nature of things in this world. "Story" is the fundamental answer we give when we are asked what really matters in this world.

Why a story? Why should a story be fundamental? I don't know why. But I have come to agree with those who regard it as the fundamental unit of intelligibility for advanced hominid intelligence. We can certainly note its pervasive presence. Margaret Mead once remarked that she had never come across a primal people who lacked a cosmic story. Humans will have their cosmic stories as surely as they will have their food and drink. My own position is that the universe, at its most basic level, is not only matter, energy, and information. The universe is story. Each creature is a story. Each human enters this world and awakens to a simple truth: "I must find my own story within this great epic of being."

What about the present? Do we still tell stories? We most certainly do, even if we do not call them stories. I remember the history texts we used in grade school and high school. I learned that history began with impoverished primitives, continued with the technical inventions of the scientific period, and culminated—not openly, but there was never any doubt—in the United States of America, with its luxuriant natural resources, its political freedom, its superior modes of production. For proof, there were the graphs of industrial production comparing the United States with other countries, all indicating that we were the peak of this long line of development.

Throughout my educational experiences, I was told stories that evoked an emotional bonding with this society, so that it was only natural I would want to support, defend, and extend this society's values and accomplishments. Of course none of this was considered story; we were learning the *facts* of the matter. Obviously, the people of China or India or Turkey or Brazil, reflecting on their educational process, would recall a different story.

Though all civilizations and cultures told themselves stories, none of the industrial countries taught cosmic stories. They focused entirely on the human world. The universe and the Earth were only backdrops. The oceans were large, the species many, but these immensities were just sets on the human stage. All our disasters today are directly related to the fact that these cultures ignored the cosmos to focus on the human. Our use of land, our use of technology, our uses of each other are flawed in a million ways, but all are fundamentally due to the same mistake made at the start of things. We have failed because we were never initiated into nature's sacred activities. We have failed because we have no cosmic story.

How could this have happened? How could modern Western culture have escaped a 50,000-year-old tradition of telling cosmic stories? The stories of the tribes and the ancient religions were thrown out for the superior knowledge that the sciences provided. Why tell the story of the Sun as a god when we knew the sun was a locus of thermonuclear reactions? We attached ourselves to scientific law and relegated story and myth to the nurseries, tribes, and asylums.

What a shock it has been to have *story* reappear, and this time right in the very center of the mathematical sciences. Someday someone will tell the story of how *story* forced its way into the most anti-story domain of modern science—mathematical physics.

For physicists, during this modern age, "reality" has meant the fundamental interactions of the universe. In a sense, the contemporary physicist has regarded the world's essence as captured by the right group of mathematical equations. The second law of thermodynamics or the strong nuclear interaction are the real forces in the universe. Reality's quintessence is seen to be these underlying dynamics, these deep structures of the physical universe. Though our focus is on physics, this orientation has held for the Western intellectual tradition overall. We can see this with linguists who focus attention on the deep structure of a language, or with the cultural anthropologists who attend to the underlying structures of tribal myths and customs.

In each case the "surface" details are of secondary importance, for they are simply particular ways in which the deeper structure manifests itself. The denigration of details comes from the conviction that once we know the deep structure—the mathematical equations, the linguistic/cerebral patterns—we simultaneously control the surface manifestations, for the surface is determined by the underlying dynamics.

For most physicists, then, the universe has been seen as an explication of the underlying physical laws. Time and the story of Time were regarded as secondary, even illusory. Time was simply a parameter that appeared in the equations; there was nothing special about this time today as opposed to some time a billion years from now. The equations remained the same.

The best story I know concerning the dismissal of time concerns Albert Einstein. Out of his own amazing genius, he arrived at his famous field equations, the mathematical laws governing the universe in its physical macrodimensions. What most alarmed Einstein—and we must remember that here was a man who had the courage to stick to his mathematical insights no matter how shocking they might seem to the world—what most disturbed Einstein about his own equations was their implication that the universe was expanding. Such a notion made no sense in Einstein's static worldview, which held that the universe today is essentially the same as the universe at any other time.

To avoid these alarming implications, Einstein altered his equations to eliminate their prediction of an expanding universe. And only when Edwin Hubble later showed him the empirical evidence that the universe was indeed expanding did Einstein realize his failure of nerve. He later came to regard his doctoring of the field equations as the fundamental blunder of his scientific career. Following on the work of Einstein and Hubble and others, we realize now that this is not a static universe; we live in a universe that had a beginning and has been developing over 15 billion years. That is, we now realize that we live in a story.

Courtesy of Montessori High School at University Circle, Cleveland, Ohio

Story forced its way still further into physics when, in recent decades, scientists discovered that even the fundamental interactions of the universe have *evolved* into their present form. The laws that govern the physical universe today and that were thought to be immutable are themselves the results of developments over time. The cosmic story, rather than being governed by underlying laws, draws these laws into itself.

Story asserts itself still further into the consciousness of contemporary physicists when the very nature of physical law is thrown into question. Where once we listed a set of laws we were certain held everywhere and at all times, we now discover violations of each of these laws. A preeminent physicist of our time, J. A. Wheeler, concludes that in nature "there is no law except the law that there is no law."

It is important to understand the connection between this weakening of our belief in a "physical law" and the emerging value given to the cosmic story. Precisely because we lose confidence in ever nailing nature down do we simultaneously come to respect her infinite and astonishing creativity.

The story of the three centuries of modern science is similar to the story of a young male who has had astonishing success with capturing the affection and favor of young females. Though gifted, he is also young. He brags to his buddies that he has things under control and begins to take the female world for granted, lost in the arrogance that he knows women. Finally he meets a female who breaks beyond his carefully constructed theories, who refuses to allow him to reduce her to his formulas. Shattered, he enters a deepened awe at the very nature and mystery of what he has been taking for granted. And

Courtesy of Montessori de la Condesa, Mexico City, Mexico

suddenly every detail of every encounter becomes an invitation into astonishment and delight.

Only when we are surprised in the presence of a person or a thing are we truly in love. And no matter how intimate we become, our surprise continues. Without question we come to know the beloved better and are able to speak central truths about her or him or it; but never do we arrive at a statement that is the final word. There are always further surprises, for to be in love is to be in awe of the infinite depths of things.

The central desire of scientists in the future will be to explore and celebrate an ever-deepening intimacy with the story of the universe, of the galaxies, of the planet Earth, of the life forms, of the human journey. I am suggesting that the theories will be seen not simply as objective laws but as central articulations that evoke an enhanced intimacy with the nature of things. The value of the strong nuclear interaction as objectively true will be deepened by our awareness that study and contemplation of the strong nuclear interaction evokes a rich intimate presence of stars.

Of course, these are my speculations. I may be wrong. Instead of scientists devoting themselves to a further exploration and celebration of the cosmic story, they may be entirely captured by the militaries of the planet. But I don't think so, and for a number of reasons. Two reasons have to do with the planetary implications of the cosmic creation story. Einstein's resistance underlines one of the most significant facts of the cosmic creation story: its power of persuasion. Einstein did not want to discover a universe that began in time. Another famous physicist, Arthur Eddington, found the whole notion "abhorrent." But the story is convincing. It has the potency to offset and even to displace every previous worldview. This displacing of traditional stories has often resulted in a cultural tragedy, a fact that needs to be understood. What I want to bring to our attention here is that the contemporary human being finds the cosmic story undeniably tied to the truth, and this is great news indeed.

For suddenly the human species as a whole has a common cosmic story. Islamic people, Dineh people, Christian people, Marxist people, Hindu people can all agree in a basic sense on the birth of the sun, on the development of the earth, on the complex history of human cultures. For the first time in human existence, we have a cosmic story that is not tied to a cultural tradition or to a political ideology but that gathers every human group into its meanings. Certainly we must not be naive about this claim of universality. Every statement of the cosmic story will be placed in its own cultural context, each, to varying degrees, expressive of political, religious, and racial perspectives. But even so, we have broken through to a story that is pan-human, a story that is already taught and developed on every continent and within every major cultural setting.

What does this mean? Every tribal person knows the central value of the tribe's cosmic story in uniting the people. We are now creating the common story that will enable *Homo sapiens* to become a cohesive tribe. Instead of structuring American society on its own human story and Chinese society on its own human story and so on, we have the opportunity to tell the cosmic story, the mammalian story, the ocean story. Instead of building our lives and our society's meaning around the various human stories

alone, we can build our lives and societies around the Earth story.

This is a good place to make my final comment on the meaning of the *cosmic creation story.* For though I refer in general to the account of our emergence out of the fireball and into galaxies and stars and Earth's life, I also think of the cosmic story as something that has not yet emerged. I think we will only have a common story for the human community when poets tell us the story. For until artists, poets, mystics, and nature lovers tell the story, we have only facts and theories.

Most tribal communities understand the necessity of developing storytellers—people who spend their lives learning the cosmic story and celebrating it in poetry, chant, dance, painting, and music. The life of the tribe is woven around such celebrations. The telling of the story is understood as that which both initiates the young and regenerates the universe. The ritual of telling the story is understood as a cosmic event. For unless the story is sung and danced, the universe suffers from decay and fatigue. Everything depends on telling the story—the health of the people, the health of the soil, the health of the sun, the health of the soul, the health of the sky.

We need to keep the tribal perspective in mind when we examine our situation in the modern period. Instead of poets, we have had one-eyed scientists and theologians. Neither of these high priests nor any of the rest of us has been capable of celebrating the cosmic story. It is no wonder, then, that all of us are sick and disabled, that the soils have gone bad, that the sky is covered with soot, that the waters are filled with evil. Because we had no celebrations inaugurating us into the universe, the whole world has become diseased.

But what will happen when the storytellers emerge? What will happen when "the primal mind," to use Jamake Highwater's phrase, sings of our common origin, our stupendous journey, our immense good fortune? We will become real members of the Earth community. We will have evoked out of the depths of the human psyche those qualities enabling our transformation from disease to health. We must encourage cosmic storytellers because our dominant culture is blind to their value. Isn't it remarkable that we can obtain several hundred books on how to get a divorce, how to invest money, how to lose fat, and yet there is nothing available to assist those destined to sing about the great epic of being?

I suggest that when the artists of the cosmic story arrive, our monoindustrial assault will end and the new beginnings of the Earth will be ignited. Our situation is similar to that of the early Christians. They had nothing—nothing but a profound revelatory experience. They did nothing—nothing but wander about telling a new story. And yet the Western world entered a transformation from which it has never recovered.

So too with our moment. We have nothing to compare with the massive accumulation of hate and fear and arrogance that the ICBMs and the Third World debt and the chemical toxins represent. But we are in the midst of a revelatory experience of the universe that must be compared in its magnitude with those of the great religious revelations. And we need only wander about telling this new story to ignite a transformation of humanity. For this story has the power to undo the mighty and the arrogant and to ignite the creativity of the oppressed and forgotten. As the Great Journey of the universe breaks in human self-awareness, nothing can dam up our desire to shake off the suffocation of nationalism and anthropocentricism and to plunge instead into adventures of the cosmos.

* * *

Let me end with an imaginary event—a moment in the future when children are taught by a cosmic storyteller. We can imagine a small group gathered around a fire in a hillside meadow. The woman in the middle is the oldest, a grandmother to some of the children present. If we can imagine such an event today, we can be assured that tomorrow someone will begin the journey of bringing such dreams into reality.

The old woman might begin by picking up a chunk of granite. "At one time, at the beginning of the Earth, the whole planet was a boiling sea of molten rock. We revere rocks because everything has come from them—not just the continents and the mountains, but the trees and the oceans and your bodies. The rocks are your grandmother and your grandfather. When you remember all those who have helped you in this life, you begin with the rocks, for if not for them, you would not be." She holds the rock before them in silence, showing each person in turn. "Do you hear the rock sing-

ing? In the last era, people thought there was no music in rocks. But we know that is not true. After all, some rocks became Mozart and revealed their music through Mozart."

Now she slowly sinks her hands into the ground and holds the rich, loamy soil before her. "Every rock is a symphony, but the music of soil soars beyond capture in human language. We had to go into outer space to realize how rare and unique soil is. Only the Earth created soil. There is no soil on the moon. There are minerals on the moon, but no soil. There is no soil on Mars. There is no soil on Venus, or on the Sun, or on Jupiter, or anywhere else in the surrounding trillion miles. Even the Earth, the most extraordinary creative being of the solar system, required 4 billion years to create soil. We worship and nurture and protect the soils of the Earth because all music and all life and all happiness comes from the soil. The soils are the matrix of human joy."

She points now to a low-hanging star in the great bowl of the night sky. "Right now that star is at work creating the elements that will one day live as sentient beings. All the matter of the Earth was created by the Grandmother Star that preceded our Sun. She fashioned the carbon and nitrogen and all the elements that would later become all the bodies and things on Earth. And when she was done with her immense creativity, she exploded in celebration of her achievement, sharing her riches with the universe and enabling our birth.

"Her destiny is your destiny. In the center of your being you too will create, and you too will shower the world with your creativity. Your lives will be filled with both suffering and joy; you too will often be faced with death and hardship. But all of this finds its meaning in your participation in the great life of Earth. It is because of your creativity that the cosmic journey deepens."

She stares into the distance. In the long silence, she hears the thundering breakers on the ocean shore, just visible in the evening's light. They listen as the vast tonnage of saltwater is lifted up in silence, then again pounds up the sand. "Think of how tired we were when we arrived here, and all we had to do was carry our little bodies up the hills! Now think of the work that is being done ceaselessly as all the oceans of the world curl into breakers against the shores. And think of all the work that is done ceaselessly as the Earth is pulled around the Sun. Think of all the work that is done ceaselessly as all the hundred billion stars of the Milky Way are pulled around the center of the galaxy.

"And yet the stars don't think of this as work. Nor do the oceans think of their ceaseless tides as work. They are drawn irresistibly into their activities, moment after moment. The Earth finds itself drawn irresistibly to the Sun, and would find any other path in life utterly intolerable. What amazing work the stars and the planets accomplish, and never do we hear them complain!

"We humans and we animals are no different at all. For we find ourselves just as irresistibly drawn to follow certain paths in life. And if we pursue these paths, our lives—even should they become filled with suffering and hardship—are filled with the quality of effortlessness. Once we respond to our deepest allurements in the universe, we find ourselves carried away, we find ourselves on the edge of a wave passing through the cosmos that had its beginning 15 billion years ago in the fiery explosion of the beginning of time. The great joy of the human being is to enter this allurement that pervades everything, and to empower others—including the soil and the grasses and all the forgotten—so that they might enter their own path into their deepest allurement."

The light of the dusk has gone. She sits with the children in the deepening silence of the dark. The fire has died down to become a series of glowing points, mirroring the ocean of starlight above them. "You will be tempted at times to abandon your dreams, to settle for cynicism or greed, so great will your anxieties and fears appear to you. But no matter what, remember that our universe is a universe of surprise. We put our confidence not in our human egos but in that power that gathered the stars and knit the first living cells together. Remember that you are here through the creativity of others. You have awakened in a great epic of being, a drama that is 15 billion years in the making. The intelligence that ignited the first minds, the care that spaced the notes of the nightingale, the power that heaved all hundred billion galaxies across the sky now awakens you too and permeates your life no less thoroughly.

"We do not know what mystery awaits us in the very next moment. But we can be sure we will be astonished and enchanted. This entire universe

Courtesy of Brad Bachulis

sprang into existence from a single numinous speck. Our origin is mystery, our destiny is intimate communion with all that is, and our common species aim is to celebrate the Great Joy that has drawn us into itself."

Rocks, soils, waves, stars—as they tell their story in 10,000 languages and 2,000 cultures, they bind us to them in our emotions and our spirits and our minds and our bodies. It is the Earth who speaks in all this. It is the Earth who tells her story. It is the Earth who persuades us to switch our allegiance from the partial to the whole. It is the Earth who carries out the transformation from terror to a celebration of life, and her only power is the magnificence of her story.

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Courtesy of Montessori School of Lake Forest, Lake Forest, Illinois

# Part III

## Montessori Pedagogy and Place: Joining Humanity

Montessorians are not alone as they strive to embody curricula with ecological systems or working on farms as academic life lessons in social and historical human endeavors. What is shared here are the environmental scientists, creationists, poets, and landscape architects who are seeing the "systems" aspects of nature and teaching. These writers are speaking for the pronounced activism necessary to Montessori's wise dictum to live in nature, not just study it, and to embark on the real work of blending into future adult society.

The Erdkinder treatment of the adolescent reminds us that hands-on farm work shapes a student's deep understanding of human history and science and demonstrates that all of Montessori education culminates in this deep biological bond that is discovered between ourselves and our interdependent roles on the land. The adolescent is born again this time as a "social newborn" finding herself on the border of adulthood, flanked by a chorus of interested adults. These adults look to the promised restoration of a life-giving future of the nature's healing. The spaceship earth continues to fly with all kinds of people, international viewpoints, and nature's biodiversity on board; steady as she goes, towards the worthy goals of balance and human productivity in harmony with all that is around us and within us.

Courtesy of Sara Guren © MDP, Hershey Montessori School, Huntsburg, Ohio

# The Adolescent: Taking on the Task of Humanity—Conducting the Dialogue Between Nature and Supranature

by Laurie Ewert-Krocker

*Defining what it means to be in the "bosom of nature," to use Montessori's words, Laurie Ewert-Krocker points out that the adolescent period of storm and stress is quelled by the natural world. But most important, when socialization is the essential developmental focus of the young adolescent, positive social organization is fostered by nature. The dialogue between nature and the human-built world is a conversation well worth having, leading to a profound understanding of what it means to use both the imagination and sensorial understanding to contribute to the world's safekeeping.*

> *Until he is twelve years old, nature ought to constitute the child's primary interest. After twelve years we must develop in the child the feeling of society, which ought to contribute to more understanding among men and, as a result, more love. Let us develop admiration and understanding for work and for the life of man to this end (*From Childhood to Adolescence *96).*

The role of man in society—this is the work of the adolescent. To come to an understanding of how human beings organize themselves, work together, move forward in history. This is what the adolescent must experience and absorb: division of labor, the experience of production and exchange, economic independence, care for self and others on a nearly adult level—running a "residence-hotel," cooking, cleaning, doing laundry, and designing for the aesthetics of domestic life. Running a store or a market; learning the "control of finances" (108), providing service to the community. These are the experiences that Maria Montessori prescribes for the adolescent, the "social newborn," whose developmental task it is to enter adulthood and, in doing so, to inherit the best of human accomplishment and civilization.

But *where* should this prepared environment be? Where does she suggest that this introduction to adult social organization be located?

> During the difficult period of adolescence it is desirable to have the child live outside his habitual surroundings, outside the family, in the country, in a peaceful place, in the bosom of nature. There, an existence in the open air, individual treatment, a sound diet, ought to be the first conditions for the organization of a center of studies and of work. (105)

"In the bosom of nature . . . the first conditions," in the protective, nurturing embrace of nature. It seems a bit of a contradiction. One would think that the logical center of work and study when one's task is to inherit the best of civilization would be in the city where the social organization is most refined, most complex, most well-developed, and apparent. When we speak of great civilizations in history, do we not usually refer to the most advanced urban centers, cities, and city-states, such as Catal-Hayuk, Mohenjo-Daro, Athens, Rome, Alexandria, Constantinople, Mexico City, Chichen Itza, Florence, Prague, Paris, London, Moscow? Given the obvious advance of civilization in urban centers—why the "bosom of nature"?

There is, of course, the obvious, although not necessarily researched and documented, notion that it is healing to be in natural surroundings, and adolescence is a turbulent time of life, in need of healing support. Montessori herself calls it "an age of doubts and hesitations, of violent emotions, of discouragements" (100). Those of us who work with

adolescents can attest to the truth of that observation. Although not every adolescent is dysfunctional, rebellious, or difficult; although the glimpses of potential we see in them are awe-inspiring and limitless; and although sometimes the work they accomplish is monumental—both physical and intellectual—even the healthiest adolescents have periods of emotional insecurity, days of self-doubt, moments of vulnerability in the face of peer and adult judgment. It is not an easy time of life. No adult remembers it as an easy time. So much transition, so much growth, so much developing brain ability that's not yet refined, so much of a black void ahead in the future, so many decisions to make.

So Montessori tells us what the prepared environment should be like:

> Life in the open air, in the sun, a diet rich in vitamins furnished by the nearby fields are the auxiliaries so precious to the body of the adolescent; while the calm environment, the silence, the marvels of nature satisfy the mind and are conducive to its functions of reflection and meditation. (106)

The psychological life of adolescents is truly intense. They are naturally focused on themselves and their own inner lives—searching for clarity in values, forming a comfortable identity. They have lots of questions and lots of doubts about who they are or who they should be, about what they can accomplish or what they will be good at. They are also remarkably driven to stay networked to their peers in a constant stream of exchanges and interactions—afraid that they will miss a significant moment of membership in the group, afraid that if they are not omnipresent, someone else may jockey them out of position in the complicated fabric of relationship. It is absolutely essential—in the mind of the adolescent—to establish and maintain acceptance and membership in the group. It is the primary drive of their existence. They are extraordinary social beings in the making. They actively pursue understanding of social organization.

Montessori recognized a similar need for socialization in the elementary child—*gregario,* "the herd instinct"—and established the importance of honoring that need in the second-plane environment, by encouraging work in small groups and in going-out experiences, and in the opportunities to work through issues of justice in the community.

Socialization is even more intense in the third plane, presumably to guide the adolescent in practice and conscious learning about the human social organization and, hopefully, social harmony that is necessary for humanity to function productively, to make progress.


Courtesy of Sara Guren © MDP, Hershey Montessori School, Huntsburg, Ohio

But socialization is an exhausting aspect of their work. (It is an exhausting aspect of *our* work.) Coupled with the strains of rapid physical growth and the misfirings of a brain in the process of rewiring itself, a calm natural environment makes sense, an environment with less stimulation than that of a typical urban/suburban one.

In *Last Child in the Woods,* Richard Louv points to similar suggestions that the effect of nature can be therapeutic. He notes the observations of Sebastiano Santostefano, director of the Institute for Child and Adolescent Development, who comments that "nature has the power to shape the psyche, and that it can play a significant role in helping traumatized children" by providing a personally malleable landscape for each individual to interpret. In nature, individuals find a unique path of self-expression (cited in Louv 51), helpful in processing inner struggle. Not that all adolescents are traumatized. Most adolescents do, however, struggle emotionally and psychologically at some point, on some days, for some periods of

time. I am sure we will hear a great deal more about the healing and restorative aspects of nature tomorrow from Mr. Louv, and we anxiously wait for more researchers to document and validate the evidence of nature's healing power, but until then, as Montessorians, we have our own observations and intuitions to go on, and Montessori's general guidelines.

However, even if you provide access to the natural world in the adolescent environment, it's not a guarantee that the adolescents will immerse themselves in it. Adults working with adolescents on a daily basis must structure the environment so that it invites the adolescent to *be* out in nature. Adolescents do not necessarily choose to go outside on their own—even if it's right outside their door and they are *free* to go out. I often think of adolescents in terms similar to Montessori's observation of the zero- to six-year-olds as the "furniture children." Adolescents are like the "cave children" or the "womb children." Walk into their bedrooms and tell me that they aren't re-creating womb space. It's dark. They never open the curtains. There's lots of undulating, crumpled up fabric lying around—clothing, sheets, and blankets. There is a chaotic collection (some would say "suffocating" collection) of very personal items closing the room in, drawing all energy inward. They often prefer basements to hang out in. Are they not awaiting rebirth?

Outside of their cave-wombs, they will choose their location based on where their peers are. So in an adolescent community, we must navigate life so peers are frequently outside working on activities that engage the body and employ the senses. Our programs, our curriculum, must make it meaningful for them to actively engage the natural world. The key with adolescents is to offer them work and study that feels genuinely purposeful to their own community, but is actually really good for them individually. The beauty of the farm or the land-based environment for adolescents is that it truly can be a "limitless field for scientific and historical studies" (*From Childhood to Adolescence* 106) and provide a wealth of opportunities for contributions to the community that valorize an individual, and, at the

Courtesy of Sara Guren © MDP, Hershey Montessori School, Huntsburg, Ohio

Courtesy of Sara Guren © MDP, Hershey Montessori School, Huntsburg, Ohio

same time, provide moments of calm and healing. Once outside, they are usually happy to be there and may choose to find reflective time for themselves beyond the peer group.

So opportunities for engagement in nature need to be right outside the door and continue beyond the building. Here are some that we are fortunate enough to have at the Hershey Farm School:

- An herb garden for the kitchen right outside the kitchen door. It requires redesigning every year based on an analysis of what herbs and spices we use the most, as well as soil analysis, replanting, pruning and weeding, harvesting and drying in the fall. It can lead to historical studies of indigenous and exotic herbs, uses of herbs and recipes from different cultures, cost analysis of saving money by not buying herbs and spices, the microbiology of food preservation.

- An animal barn with sheep, pigs, cows, goats, and horses. They require feeding twice a day, milking once or twice a day, depending on the seasonal cycle, cleaning of stalls, repair of stall doors, windows, and hardware, medical attention, habitat analysis, birthing assistance. Projects that revolve around these animals can lead to studies of animal science, classification, evolution, domestication, the cycles of insemination, pregnancy, and birth, analysis of meat production, nutritional requirements for humans and animals, issues of vegetarianism versus meat production and consumption, the history of domesticated animals and their relationships to humans in different cultures and throughout history.

- Organic vegetable and flower gardens. They require yearly designing, decision-making about methods of organic production, soil analysis, seed ordering, planting, watering, weeding, harvesting, decisions about how much to preserve for our consumption and how much to sell to the public, cost analysis of market sales, cost analysis of the kitchen budget, picking, arranging, selling at the market, consideration of growing heritage species, cooking for our own community. The gardens invite plant science, soil science, water study, the science of nutrition and food, the science of interdependent and symbiotic biological relationships, erosion, compost and manure applications, and the history of agriculture and agricultural methods.

- A bioshelter/greenhouse. It requires an ongoing supply of firewood and a twice daily feeding of the furnace to keep it warm in winter, as well as daily/weekly care of plants that are currently growing in it—either lettuce and microgreens in the winter or seedlings for vegetables and flowers for spring planting. It has fans, thermostats, watering equipment, heating tubes, a living systems model, and an aquaponics setup—all of which can be extensions of biology study and also ongoing facility maintenance tasks.

- The maple/ash/beech climax forest. Some of the forest we are leaving untouched to regain its wildness; some of it we must manage for firewood supply and as a maple sugar stand.

Decisions about which trees to thin and which to leave lead us to studies of species interdependency, forest succession, erosion and soil analysis, and water quality testing. Decisions about which trees to tap for maple syrup lead us to studies of tree and plant structure and processes, measurement of circumferences, and analysis of species density.

- The beaver-made marsh at the back of our property, home to wildlife—deer, muskrat, herons, beaver, snakes, small mammals, great horned owls, many species of birds, and now maybe a return of coyotes and otter—leads us to studies of biodiversity, local ecology, and the history of habitat change in our region.

Ponds, creeks, valleys, canyons, woods, watershed regions—all of these can be the focus and impetus for stewardship, study, and practical work. The value of a land-based environment, whether a farm or another environment that affords exposure to nature, begins to make itself clear: It provides purposeful work linked to key studies of science and history with the added therapeutic value of exposure to the fundamental elements of nature.

And let's not forget the wealth of sensorial experiences in and of themselves: hands in dirt and water, handling vegetables; handling tools like saws, trowels, shovels, pruners, wire cutters, motors, wheelbarrows; the cold of snow and ice on face and hands while collecting maple syrup, shoveling snow, repairing frozen pipes to the barn, breaking the ice off of the chickens' water; the warm breath of sheep eating hay, the smell of a billy goat's romantic scent; the slippery mucus wiped off a newborn lamb; the smell of locust trees in the spring and clover in the summer, and the deafening sound of tree frogs near the pond at night in April. The trail of stars on a clear night when Orion points to a visible Milky Way.

The work of the hands inevitably accompanies the work of science and history when you live and study on the land. Cultures around the globe throughout human history have performed these same fundamental acts: chopping wood, digging trenches, putting seeds into the ground, using pitchforks to clean stalls, hammering nails, birthing lambs and calves, milking cows, collecting honey, carting manure in wheelbarrows. And through these fundamental acts, basic scientific concepts were realized: the forces of simple machines, genetic manipulation of plants, the physics of structures, the energy of water, the chemistry of soil.

Given all of this experiential learning, where is the introduction to society that Montessori suggested should be the primary developmental task of the adolescent? It occurs on two levels. One is in the experience of division of labor that is required for a community to operate on the land. It becomes profoundly obvious why it takes many hands to make work light, and one comes to appreciate the social order established by cultures of long ago who were faced with similar challenges—so much work to do, so many possibilities for improvement and expansion if someone stays focused on one area of the work. Oh, how we need experts in every field, how we don't all want to have to be responsible for everything—we would never get anything done. Experience of social organization also occurs in the experience of commerce—of production and exchange—when the community can grow, harvest, and sell its own produce and sell its own wood products, maple syrup, Christmas wreaths, beeswax candles. The land and its resources make that commerce and exchange possible for adolescents.

Courtesy of Marin Montessori School, Corte Madera, California

But even more important, from a Montessori perspective, the adolescent, who is charged with taking on the task of humanity in the big picture, in the cosmos—our cosmic task—must be placed in a concrete environment that reveals the interface of the natural world and human action in it. The adolescent must come to understand on a very fundamental level how the dialogue between nature and human-designed supranature is conducted, the dialogue between nature and human society, between nature and human civilization. This dialogue, this interaction, between nature and the human re-structuring of nature, is what they will inherit. They need to understand it as much as possible, in their hands as much as in their heads—and to see that fundamentally, it is not an evil. It is what humans do. It is what humans have always done. It is, in fact, what makes us human.

Human beings are not out of nature, above nature, in charge of nature, on top of nature, at the edge of nature—we are *part* of nature. We are a living organ in a larger organism. Our interdependence with all other aspects of the planetary organism is fundamental and now—with the wealth of evidence from the emerging studies of biodiversity, ecology, and even global environmental change science—appears irrefutable.

As human beings, we are fundamentally programmed to adapt to our environment and adapt our environment to our needs. What we change, what we construct, what we control, alter, synthesize, and mold out of nature—that is what Montessori called "supranature." The message to our young people should not be that we should stop acting on our environment. How can we? It is what humans do. The message should be that something has kept us out of balance with the natural world, out of balance within the larger organism. What leaves us at risk is our inability to act with moral or ethical guidance. According to Montessori, we must change the basic moral quality of individual human beings in order to change the collective work (and damage) of unguided humanity. And we must start with the child.

In working with adolescents, what becomes clear to us is a profound awareness of what must ultimately be understood by the "New Children" of this age: that the interaction between nature and supranature must happen with the most sophisticated consciousness and conscience possible. And, as with all Montessori learning experiences, one must absorb the truth of the generality by entering the sensorial. You come to know the truth of interdependence by experiencing it firsthand through the senses, through the body, through the work of the hands with the work of the head.

Courtesy of Colegio Montessori de Tepoztlán, Mexico

One risk of not learning sensorially is a risk that Richard Louv points out—that teaching children about environmental degradation in the abstract (the tragic loss of the Amazonian rainforest, for example) can result in ecophobia, a fear of ecological deterioration, which can then lead to a disassociation from nature (133). This is especially risky for adolescents, who are sensitive to doomsday projections and need to have faith in the future cultivated by everyone around them.

But another equally important reason for the adolescent to experience the interrelationships between the natural world and the human alterations of the natural world is that a genuine ability to perceive global relationships can occur only when one is first able to perceive the finely detailed relationships that occur in one's own ecological niche. In his book *Bringing the Biosphere Home,* Mitchell Tomashow points out that scientists who study the uncertainties of environmental change

> share similar approaches to perceiving the natural world. In almost every case, they participate in ongoing research about a local place, a specific habitat or species, or a series of questions about a population, community, or landscape. While engaged in research, they learn how to investigate that place in fine detail, using the best of their scientific expertise as well as whatever their five senses can observe. (2)

Tomashow asserts that to have the ability to conceptualize environmental issues on a global scale,

one must first have the trained skills to observe the details of local interrelationships, relationships that one can actually perceive with one's own senses. Global warming as a concept has to be imagined, but the observer who has perceived both the simplicity and the complexity of relationships at the ground level, with her own eyes, ears, nose, and hands, will be in a better position to truly understand a global relationship through the imagination. This is a remarkably Montessorian concept: to work from the sensorial to the abstract, from the concrete details to the generalization. Says Tomashow:

> Global environmental change is simultaneously ubiquitous and invisible. Without sophisticated instruments, you can't actually see the ozone hole…. Biodiversity is a theoretical concept reflecting the rich fabric of life that sustains any ecosystem. It takes an experienced observer to assess various biodiversity indicators. (36)

Global change is too elusive to grasp, yet too profound to ignore. Becoming good observers of interdependent relationships is one of the important tasks our next generation must take on. They must have the sensorial experience of those relationships in nature and in supranature. So it follows logically that they must be in an environment that is a point of interface between nature and humanity.

In the "bosom of nature" to heal and reflect, with fundamental experiences of how humans have organized themselves and constructed civilizations out of nature's bounty, and with sensorial training in perceiving the subtle interdependencies of nature and humans: Adolescents must learn to engage in the dialogue between the living organism that is the planet and its most interactive creatures—themselves. It is our hope and our investment that they learn to conduct the dialogue with a higher level of consciousness and conscience than we have.

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Courtesy of Sunstone Montessori School, Portland, Oregon

# Place and Pedagogy

by David Orr

*David Orr's classic article links education to living in the outdoors and studying all disciplines through the unifying lens of place. Pedagogy of place counters abstraction, it is the natural world embodying principles of learning that involve direct observation, investigation, experimentation, and manual skills. Place is the laboratory providing the hands-on materials through the diversity of the habitat and its messages through a community experience. Emphasis is placed on human history, social science, political science, geology, biology, etc. as creating a "complex mosaic" that widens perceptions about applications of the disciplines and deepens the perception of time. Mr.Orr's article ties into Montessori education and the role of nature in the development of the older elementary child and adolescent.*

Thoreau went to live by an ordinary pond on the outskirts of an unremarkable New England village, "to drive life into a corner, and reduce it to its lowest terms." Thoreau did not "research" Walden Pond, rather, he went to live, as he put it, "deliberately." Nor did he seek the far-off and the exotic, but the ordinary, "the essential facts of life." He produced no particularly usable data, but he did live his subject carefully, observing Walden, its environs, and himself. In the process he revealed something of the potential lying untapped in the commonplace, in our own places, in ourselves, and the relation between all three.

In contemporary jargon, Thoreau's excursion was "interdisciplinary." *Walden* is a mosaic of philosophy, natural history, geology, folklore, archeology, economics, politics, education, and more. He did not restrict himself to any academic pigeonhole. His "discipline" was as broad as his imagination and as specific as the $28.12 he spent for his house. Thoreau lived his subject. *Walden* is more than a diary of what he thought; it is a record of what he did and what he experienced. If, as Whitehead put it, "The learned world . . . is tame because it has never been scared by the facts," one finds little that is tame in *Walden.* For Thoreau, philosophy was important enough "to live according to its dictates . . . to solve some of the problems of life, not only theoretically, but practically." Ultimately, Thoreau's subject matter was Thoreau: his goal, wholeness; his tool, Walden Pond; and his methodology, simplification.

Aside from its merits as literature or philosophy, *Walden* is an antidote to the idea that education is a passive, indoor activity occurring between the ages of six and twenty-one. In contrast to the tendencies to segregate disciplines, and to segregate intellect from its surroundings, Walden is a model of the possible unity between personhood, pedagogy, and place. For Thoreau, *Walden* was more than his location. It was a laboratory for observation and experimentation; a library of data about geology, history, flora, and fauna; a source of inspiration and renewal, and a testing ground for the man. *Walden* is no monologue; it is a dialogue between a man and a place. In a sense, *Walden* wrote Thoreau. His genius, I think, was to allow himself to be shaped by his place, to allow it to speak with his voice.

Other than as a collection of buildings where learning is supposed to occur, place has not particular standing in contemporary education. The typical college or university is organized around bodies of knowledge coalesced into disciplines. Sorting through a college catalogue you are not likely to find many courses dealing with ecology, hydrology, geology, history, economics, politics, energy use, food policy, waste disposal, and architecture of the campus or its community. Nor are you likely to find many courses offering enlightenment to modern scholars in the art of living well in a place. The typical curriculum is reminiscent of Kierkegaard's comment after reading the vast, weighty corpus of Hegel's philosophy, that Hegel had "taken care of

everything, except perhaps for the question of how one was to live one's life." Similarly, a great deal of what passes for knowledge is little more than abstraction piled on top of abstraction, disconnected from tangible experience, real problems, and the places where we live and work. In this sense it is utopian, which literally means "nowhere."

The importance of place in education has been overlooked for a variety of reasons. One is the ease with which we miss the immediate and mundane. Those things nearest at hand are often the most difficult to see. Second, for purists, place itself is a nebulous concept. Yet Thoreau understandably spent little time trying to define the precise boundaries of his place, nor was it necessary to do so. *Walden* is a study of an area small enough to be easily walked over in a day and still observed carefully. Place is defined by its human scale: a household, neighborhood, community, forty acres, one thousand acres.

Place is nebulous to educators because to a great extent we are a deplaced people for whom our immediate places are no longer sources of food, water, livelihood, energy, materials, friends, recreation, or sacred inspiration. We are, as Raymond Dasmann once noted, "biosphere people," supplied with all these and more from places around the world that are largely unknown to us, as are those to which we consign our toxic and radioactive wastes, garbage, sewage, and industrial trash. We consume a great deal of time and energy going somewhere else. The average American moves ten times in a lifetime, and spends countless hours at airports and on highways going to places that look a great deal like those just left behind. Our lives are lived amidst the architectural expressions of deplacement: the shopping mall, apartment, neon strip, freeway, glass office tower, and homogenized development—none of which encourage much sense of rootedness, responsibility, and belonging.

Courtesy of Beautiful Sun Montessori School, Aruba

Third, place definition is specific, yet our mode of thought is increasingly abstract. The danger of abstraction lies partly in what Whitehead described as the "fallacy of misplaced concreteness": the confusion of our symbols with reality. The results are comparable, as someone put it, to eating the menu instead of the meal. Words and theories take on a life of their own, independent of the reality they purport to mirror, often with tragic results. At its worst, as Lewis Mumford describes it:

> The abstract intelligence, operating with its own conceptual apparatus, in its own self-restricted field is actually a coercive instrument: an arrogant fragment of the full human personality, determined to make the world over in its own oversimplified terms, willfully rejecting interests and values incompatible with its own assumptions, and thereby depriving itself of any of the cooperative and generative functions of life—feeling, emotion, playfulness, exuberance, free fantasy—in short, the liberating sources of unpredictable and uncontrollable creativity.[1]

By capturing only a fragment of reality, unrelieved abstraction inevitably distorts perception. By denying genuine emotion, it distorts and diminishes human potentials. For the fully abstracted mind, all places become "real estate" or mere natural resources, their larger economic, ecological, social, political, and spiritual possibilities lost to the purely and narrowly utilitarian.

The idea that place could be a significant educational tool was proposed by John Dewey in an

Courtesy of Sunstone Montessori School, Portland, Oregon

1897 essay. Dewey proposed that we "make each of our schools an embryonic community . . . with types of occupations that reflect the life of the larger society." He intended to broaden the focus of education, which he regarded as too "highly specialized, one-sided, and narrow." The school, its relations with the larger community and all of its internal functions, Dewey proposed to remake into curriculum.

The regional survey, which reflected a broader conception of the role of place in education, was developed by Lewis Mumford in the 1940s. In Mumford's words, the regional survey was

> Not something to be added to an already crowded curriculum. It is rather (potentially) the backbone of a drastically revised method of study, in which every aspect of the sciences and the arts is ecologically related from the bottom up, in which they connect directly and constantly in the student's experience of his region and his community. Regional survey must begin with the infant's first exploration of his dooryard and his neighborhood; it must continue to expand and deepen, at every successive stage of growth until the student is capable of seeing and experiencing above all, of relating and integrating and directing the separate parts of his environment, hitherto unnoticed or dispersed.[2]

The regional survey (Mumford cites *Walden* as a classic example) involved the intensive study of the local environment by specialists and every member of the community, including school children. As the focal point for education, the regional survey was intended to create habits of thinking across disciplines, promote cooperation, and dissolve distinctions between facts and values, the past and the future, and nature and human society. Beyond education, Mumford regarded the regional survey as the basis for rational coordination and planning and as a vehicle for widespread public participation.

The integration of place into education is important for four reasons. First, it requires the combination of intellect with experience. The typical classroom is an arena for lecture and discussion,

both of which are important to intellectual growth. The study of place involves complementary dimensions of intellect: direct observation, investigation, experimentation, and skill in the application of knowledge. The latter is regarded merely as "vocational education." But for Mumford and Dewey, practical and manual skills were an essential aspect of experience, good thinking, and to the development of the whole person. Both regarded the acquisition of manual skills as vitally important in sharpening the intellect. Dewey again:

> We cannot overlook the importance for educational purposes of the close and intimate acquaintance got with nature at first hand, with real things and materials, with the actual processes of their manipulation, and the knowledge of their special necessities and use. In all this there (is) continual training of observation, of ingenuity, constructive imagination, of logical thought, and of the sense of reality acquired through firsthand contact with actualities. The educative forces of the domestic spinning and weaving, of the sawmill, the gristmill, the cooper ship, and the blacksmith forge were continuously operative.[3]

Similarly, Whitehead states that:

> There is a coordination of senses and thought, and also a reciprocal influence between brain activity and material creative activity. In this reaction the hands are peculiarly important. It is a moot point whether the human hand created the human brain, or the brain created the hand. Certainly, the connection is intimate and reciprocal.[4]

In the reciprocity between thinking and doing, knowledge loses much of its abstractness, becoming in the application to specific places and problems tangible and direct.

Second, the study of place is relevant to the problems of overspecialization, which has been called a terminal disease of contemporary civilization. It is surely debilitating to the individual intellect. Mumford's remedy for the narrow, underdimensioned mind is the requirement to balance analysis with synthesis. This cannot be accomplished by adding courses to an already overextended curriculum, or by fine-tuning a system designed to produce specialists. It can be done only by reconceptualizing the purposes of education in order to promote diversity of thought and a wider understanding of interrelatedness. Places are laboratories of diversity and complexity, mixing social functions and natural processes. A place has a human history and a geologic past: it is a part of an ecosystem with a variety of microsystems, it is a social, economic, and political order: they import or export energy, materials, water, and wastes, they are linked by innumerable bonds to other places. A place cannot be understood from the vantage point of a single discipline or specialization. It can be understood only on its terms as a complex mosaic of phenomena and problems. The classroom and indoor laboratory are ideal environments in which to narrow reality in order to focus on bits and pieces. The study of place, by contrast, enables us to widen the focus to examine the interrelationships between disciplines and to lengthen our perception of time.

It is important not to stop learning at the point of mere intellectual comprehension. Students should be encouraged to act on the basis of information from the survey to identify a series of projects to promote greater self-reliance, interdisciplinary learning, and physical competence, such as policies for food, energy, architecture, and waste. These provide opportunities for intellectual and experiential learning involving many different disciplines working on tangible problems. If the place also includes natural areas, forests, streams, and agricultural lands, the opportunities for environmental learning multiply accordingly.

Finally, for Mumford and Dewey, much of the pathology of contemporary civilization was related to the disintegration of the small community. Dewey wrote in 1927: "The invasion and partial destruction of the life of the (local community) by outside uncontrolled agencies is the immediate source of the instability, disintegration and restlessness which characterize the present epoch." The study of place, then, has a third significance in reeducating people in the art of living well where they are. The distinction between inhabiting and residing drawn in chapter 6 is important here. A resident is a temporary occupant, putting down few roots and investing little, knowing little, and perhaps caring little for the immediate locale beyond its ability to gratify. As both a cause and effect of displacement, the resident lives in an indoor world of office building, shopping mall, automobile, apartment, and suburban house, and watches television an average of four hours each day. The inhabitant, in contrast, "dwells," as Illich puts it in an intimate, organic, and

mutually nurturing relationship with a place.[5] Good inhabitance is an art requiring detailed knowledge of a place, the capacity for observation, and a sense of care and rootedness. Residence requires cash and a map. A resident can reside almost anywhere that provides an income. Inhabitants bear the marks of their places, whether rural or urban, in patterns of speech, through dress and behavior. Uprooted, they get homesick. Historically, inhabitants are less likely to vandalize their's or others' places. They also tend to make good neighbors and honest citizens. They are, in shore, the bedrock of the stable community and neighborhood that Mumford, Dewey, and Jefferson regarded as the essential ingredient of democracy.

Paul Shepard explains the stability of inhabitants as a consequence of the interplay between the psyche and a particular land form. "Terrain structure," he argues, "is the model for patterns of congnition."[6] The physical and biological patterns of a place are imprinted on the mind so the "cognition, personality, creativity, and maturity—all are in some way tied to particular gestalts of space." Accordingly, the child must have an opportunity to "soak in a place, and the adolescent and adult must be able to return to that place to ponder the visible substrate of his own personality." Hence, knowledge of a place—where you are and where you come from—is intertwined with knowledge of who you are. Landscape, in other words, shapes mindscape. Since it diminishes the potential for maturation and inhabitance, the ravagement of places is psychologically ravaging as well. If Shepard is right, and I believe that he is, we are paying a high price for the massive rearrangement of the North American landscape of the past fifty years.

For deplaced people, education in the arts of inhabitation is partly remedial learning: the unlearning of old habits of waste and dependency. It requires, first, the ability to perceive and utilize the potentials of a place. One of the major accomplishments of the past several decades has been the rediscovery of how much ordinary people can do for themselves in small places. The significance of this fact coincides with the growing recognition of the ecological, political, and economic costs, and the vulnerability of large-scale centralized systems, whether publically or privately controlled. Smaller-scale technologies are often cheaper and more resilient, and they do not undermine democratic institutions by requiring the centralization of capital, expertise, and political authority. Taken together, they vastly expand the potential of ecologically designed, intensively developed places to meet human needs on a sustained basis.

Education for reinhabitation must also instill an applied ethical sense toward habitat. Again Leopold's standard—"A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."—is on balance a clear standard for most decisions about the use we make of our places. From the standpoint of education, the stumbling block to development of an ethic of place is not the complexity of the subject; it is the fact, as Leopold put it, "that our educational system is headed away from . .. an intense consciousness of land."

Critics might argue that the study of place would be inherently parochial and narrowing. If place were the entire focus of education, it certainly could be. But the study of place would be only a part of a

Courtesy of Beautiful Sun Montessori School, Aruba

larger curriculum which would include the study of relationships between places as well. For Mumford, place was simply the most immediate of a series of layers leading to the entire region as a system of small places. But parochialism is not the result of what is studied as much as how it is studied. Lewis Thomas, after all, was able to observe the planet in the workings of a single cell.[7]

At issue is our relationship to our own places. What is the proper balance between mobility and rootedness? Indeed, are rootedness and immobility synonymous? How long does it take for one to learn enough about a place to become an inhabitant and not merely a resident? However one chooses to answer these questions, the lack of a sense of place, our "cult of homelessness," is endemic, and its price is the destruction of the small community and the resulting social and ecological degeneracy.[8] We are not the first footloose wanderers of our species. Our nomadism, however, is on a larger and more destructive scale.

We cannot solve such deep problems quickly, but we can begin learning how to reinhabit our places, as Wendell Berry says, "lovingly, knowingly, skillfully, reverently," restoring context to our lives in the process.[9] For a world growing short of many things, the next sensible frontiers to explore are those of the places where we live and work.

**Endnotes**


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4. Alfred North Whitehead, *The Aims of Education* (New York: Free Press, 1967/1929), 50.
5. Ivan Illich, "Dwelling," *Co-Evolution Quarterly* 41 (Spring 1984).
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7. Lewis Thomas, *The Lives of a Cell* (New York: Viking Press, 1974).
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Courtesy of Beautiful Sun Montessori School, Aruba

Courtesy of Prairie Hill Learning Center, Roca, Nebraska

# Teaching Nature: From Philosophy to Practice

by David Hutchison

*David Hutchison is an educator and ecologists. In this paper he suggests how ecological vision can be translated into five aspects of educational practice: the interdisciplinary emphasis, eco-orientation to citizenship, inquiry learning, outdoors acclimatization, and social activism. These five levels of training constitute the holistic preparation for forging new levels of responsibility and sensibility for the natural world in the self-actualized adult.*

The basic question I have is this: Given all of the research that is out there on children's experience with nature and the contribution of nature to children's healthy development, learning, and self-esteem, why *is it not* happening in schools? It may be happening in some Montessori schools, but it's not happening overall in education, and earth-centered Montessori schools are a minority player out there in terms of the vast schooling that children receive. And so today what I'm going to do is offer you five different philosophies of nature education, all of which emerge in contrast to Montessori's developmentally congruent view of the importance of contact with nature in childhood.

### Problematizing Nature Education

One of the things that I want to do before I actually talk about the five traditions is talk a little bit about nature education in general. In some ways the things that Louise Chawla was talking about just do not reach—they're not heard—by the typical teacher in public school. Many teachers are dealing with things that are very far removed from the developmental need to experience nature. They're busy coping with a core curriculum, the never-ending testing of students, fewer resources in the name of educational efficiency, and the need to cram as much curriculum into students' heads as possible. So the things that we're talking about in this conference represent something that's unique, that's far flung from what most educational conferences are about.

There are criticisms and ignorances that are directed to teachers of nature education as a whole. I call them ways of problematizing nature education. And here are several of them. The first one is actually a quotation attributed to President Ronald Reagan. Did he actually say it? I don't know for sure, but this statement is now folklore in the environmental movement. When asked about his environmental philosophy, he replied, "If you've seen one redwood tree, you've seen them all."

There is an impatience attached to this notion. This statement is basically the view that there is no value to nature education because we live in a cultural, man-made, and physically constructed universe. We're separate from nature—we don't need to acknowledge nature, we don't need to build a relationship with nature. It is something that is out there, that we dominate over and can exploit for our own purposes. This thinking is the basis of the industrial revolution, and it continues today, even in this information society. This sentiment has contributed much to modern life. So, too, it represents one of the pillars of anti-environmentalism that we are working against as nature educators.

A second way nature education is problematized is through the sentiment that we should avoid nature at all costs. Many children do not leave the classroom to do nature study. They study worksheets. Or they watch a video. And that's it. That's the be-all and end-all of nature studies in many schools. We know that for rich, dynamic learning to occur, children need to have an experience in nature, to build a relationship with nature. The aim of nurturing an aesthetic appreciation of nature can't be achieved by watching a video. This is one of the other things that nature educators need to work against, and it is perhaps rooted in a deep-seated fear of nature, a

fear of taking children outside—a concern for the wildness of nature (and children) on the part of teachers. So we just limit nature education to what we can do inside the classroom.

We also need to challenge the apologists. There is a huge anti-environmental education lobby in the United States. It is not as huge in Canada, where I live, or most other places in the world. These are the folks who challenge any type of environmental curriculum, no matter how innocuous. They often represent the interests of corporations and big business—oil companies and the like. Sometimes the interests of these companies are hidden in the text of the environmental curriculum they produce, but they nevertheless challenge basically any kind of teaching of environmental values that would work against the interests of most environmentally problematic industries.

The next way to problematize nature education is to fail to move from *ownership* to *stewardship* to *relationship.* We live in a world where all of us own things. Property is a major theme of our lives. We go and buy stuff, we know that we have this house, this car that's ours. Even our relationships with our children come under this umbrella. We have a sense of ownership over that relationship and we don't want schools to be teaching certain things to them—for example, values that, while socially progressive, may offend our personal sensibilities. So pride in ownership is an undercurrent of living in a consumer society. And it carries over to the way environmental education is taught. Take a look at this example of a nature activity called *Staking a Claim:*

> Divide the group into teams of four or five each. Each team stakes out a claim of a natural space using a piece of string about six yards long with both ends joined. The object is to see how many different things students can find in the claim. Members of the team report each find to an appointed secretary who writes it down. Each team *owns* everything over its claim, the branch of a tree, the blue sky. If a cloud passes over the claim, it may be counted. If a fly goes over it, a bird or even a beetle walks in, these may be written down. The team also owns the ground under the claim and they can dig in it with their hands or sticks if they like. After time is called, the teams visit each other's claims and hear the secretary's report. (Scarborough Board of Education 79, italics added)

The activity itself is not a poor one. It's a good activity. It's focused on studying microspaces, which is a laudable teaching goal. Yet embedded in this activity—indeed all curriculum—is a certain set of values. And in this case the values speak of property and ownership. And as such, as an environmental education activity, it sends the wrong message. And children do get that message. It's part of the implicit curriculum that underlies this activity. And so I would conclude that this activity is wasted on students because the value that they glean from it is "I own nature."

Louise [Chawla] responded to a question that came up at the very end of her talk: the notion of how we start small in teaching children about the local environment, and then get bigger as we gradually move outwards to teach about the whole global environment. And she had some suggestions on how we can do that. I also want to offer a suggestion that extends from my reading of Montessori. Although Dr. Montessori would certainly support a focus on the local, her writings reveal a strong, if not even stronger, focus on the global.

Montessori has this wonderful notion of the universe story as a curricular framework for the middle years, and this story operates at the core of Cosmic Education. Montessori argues that we should start with all those things we have in common with one another—not just with people but with animal and plant species too. The universe story does not both begin and end with human civilizations, as do traditional history programs in public schools; rather, it finds its origins in the primordial geological tales of the Earth before life and, even before that, the formation of the universe. There is recognition here that the child has a relationship with all of nature, not just the human part of nature. I want to remind you that you don't have to start small, with a school garden. You don't even have to start slightly bigger by studying the local community; rather, teachers can start by situating the earth within the solar system. And from here they can move to situate our continent, North America, within the globe in order to help children gradually develop a sense of place in space by carefully studying where they're situated within these large-scale environments. And then you can take this whole notion of large-scale environments and really work with it in terms of children's studies in geography and the sciences, among other subjects.

This is another kind of approach to nature education. The study of the local community moves from the intimacy of children's immediate experience of their neighborhood to an understanding of large-scale environments—settings we can comprehend only on an abstract level. But you can also start large and go small, and one of the reasons Montessori has for starting large is to help children to focus on those things that we hold in common with other people and other species. And, of course, as a way of addressing some of the environmental and other challenges we face in the world today, this might well be one of the antidotes—start with the things that we hold in common and gradually work our way through the differences and celebrate those differences once those things that we have in common have been established.

So there are numerous prescriptions for how we should teach about nature. Should we start with what's called global education, really looking for the connections between people and places around the world, or should we start with the immediacy of the local environment—the school playground, the neighborhood, a child's route to school, for example?

### Philosophies of Nature Education

Let's return to the question that opened this presentation: Given all of the research that is out there on children's experience with nature and the contribution of nature to children's healthy development, learning, and self-esteem, why is it not happening in schools? Thus far, I have offered a number of explanations, but one of the basic answers to this question may also be that many educators simply don't start with where children are at. They start instead with a prescribed curriculum that is handed down to them "from on high" or with a set of learning that extends from something other than

Courtesy of Marin Montessori School, Corte Madera, California

children's developmental experience of the world. The educational philosophies that underlie these realities are certainly valid approaches to teaching and learning, and I think it's important to be aware of them if we want to carve out a different space for nature education—a space that is more intimate, more responsive to children's developmental experience and connected to the natural world.

**Disciplinary Initiation**

A very important philosophy in schools today is disciplinary initiation. This is the view that we have, in our world, throughout human history, established a set of definable disciplines that scientists, artists, poets, writers, musicians, historians, geographers, and others have slowly established over the course of several centuries by carving out specific methodologies, reworking the evidence, and building a clear sense of how we can look at the world from the differing perspectives of the geographer, historian, artist, etc. Each discipline represents a particular way of looking at the world. Significantly, disciplinary advocates argue that these disciplines look at the world in such different ways that one cannot reduce them into any one way of looking at the world. Each discipline is unique and should be respected as such. So these folks fight against thematic approaches to educational reform, in which a topic is placed at the center of students' inquiries and any number of disciplines are melded together to enrich the study of this topic from a variety of perspectives.

Many of you may be familiar with the public system's habit of beginning a rotary system of instruction at about grade seven. From this point forward, students study subjects separately in schools. They rotate from classroom to classroom, and they go from specialist teacher to specialist teacher. Such a strategy goes hand in hand with the disciplinary orientation. The aim here is to induct students into disciplinary thinking. There is this body of tested knowledge and skills that has been strategically built up over time by scientists and artists, for example, and the main purpose of education is to induct children into thinking about the world from the perspective of a geographer, chemist, or musician. The ultimate

Courtesy of Brad Bachulis

aim is to help children go confidently into the real world, solving problems they encounter using the disciplinary tools they have built up throughout their education.

Disciplinary initiation adheres to the structure, methodology, and root metaphor of distinct subject areas. For example, the root metaphor of geography is *place.* The root metaphor of history is *time.* Disciplinary advocates want students to have an in-depth understanding of how the concept of place is reflected in the discipline of geography, how it's been built up, challenged, and built up again over time. They want students to be familiar with the tools that geographers use so that they can employ them in their daily life. Disciplinary initiation promotes, as I mentioned earlier, the sovereignty of segregated subjects. It argues against the teaching of subjects in an interdisciplinary, thematic way.

Disciplinary initiation also avoids nonscholarly value judgments. A lot of the things that Louise was talking about are cultural, holistic, or even naturalistic values that fly in the face of disciplinary thinking. Science, geography, history, and other subject areas have each built up their own conceptions of nature. Nature education as envisioned at this conference does not conform to any one of the above, but rather celebrates a holistic and transdisciplinary conception that endeavors to bring a diversity of ideas about nature together. Advocates of disciplinary initiation would prefer to keep things, in terms of nature study, compartmentalized into disciplinary areas.

So, from a disciplinary initiation perspective, what subject area is most closely associated with nature study? I would say *environmental science.* Such a course is available to students in some—but not all—high schools as a disciplinary area they can choose to study. (As it is a specialized area of biology, it is not a mandatory course in most school districts.) It's likely to be taught from a scientific vantage point, which means students study nature from the perspective of scientists, rather than as participatory members of the natural world. No doubt environmental science has an awful lot of value—after all, it provides much of the data to support conclusions related to global warming, for example—but it misses out on the cultural roots of the ecological crisis, as well as the intersection of ecology and economy, political science, popular culture, and other themes. Disciplinary initiation offers an important, if restricted, perspective from which to build a nature education program, but it is perhaps not the be-all and end-all of education for environmental action.

**Citizenship Education**

Here is another contrasting orientation for nature education: *citizenship education.* This is the educational ideology that seeks to imbue in children a strong sense of nationhood, feelings of patriotism, and a strong sense of character. American history and geography are important subject foci within this orientation, but for an environmental perspective we need to look elsewhere—to *natural history* as a pivotal American tradition envisioned by environmental writers such Thoreau and Muir, as well as artists such as Ansel Adams. There are many other examples of strong American environmentalists who were natural historians. And, in many ways, their arguments and place perspectives emerge within a citizenship education orientation which does not forsake nature but rather celebrates the American landscape as part and parcel of our natural heritage.

Where do we live? Well, I live in Canada. You folks, most of you I expect, live in the United States. And so, although the citizenship orientation normally excludes nature completely, there is an opportunity within this tradition to be a proud American within the context of celebrating the continuity of the human and natural worlds as exemplified through the American landscape, a study of painting and photographs, field trips, studies in geology and ecology, and the reading of historical texts that foreground the natural amenities of the United States. From an environmental perspective, a proud citizen of the United States should have a strong sense of one's natural heritage.

Both of the traditions that we have just looked at—disciplinary initiation and citizenship education—can likely delineate a core curriculum, which can then be transmitted to students over time. In the disciplinary initiation and citizenship education traditions, students may be involved in all kinds of participatory and interactive activities, but at the end of the day there is a certain set of knowledge and values that need to be transmitted to students.

**Inquiry Learning**

Here we switch to a new perspective on learning that's more common in elementary schools, as well as Montessori, and this is the *inquiry learning* perspective, which foregrounds the *act* of learning over a prescribed *set* of learnings that need to be transmitted to students. This tradition emerges out of the Deweyan notion of community participation and problem solving within an experiential/reflective context. The aim is to nurture children who possess advanced inquiry, problem solving, and group work skills and who grow up to be rational and community-minded decision makers.

Learning follows a transactional path in this tradition because student and curriculum are interacting with one another in an intimate way. I think this really resonates with the Montessori notion of the prepared environment. Many people who teach outside of the Montessori tradition believe that you folks just have children work with some interactive materials and that does the teaching. But as we know, it's the working with the materials within the context of the mind/brain/hand connection that gradually builds up a child's cognitive powers. We are talking here about a transactional perspective. Just as the child works on the materials, so too the materials also work on the child, and so it is a sort of give and take between child and world that moves learning to new levels. The same can be said of children's interaction with nature. When we take children into the out-of-doors and do the kinds of things that Louise was talking about in terms of play, learning, and gardening in nature, we don't simply have an experience in nature, but rather we engage ourselves in a kind of dialectic with the natural world, allowing nature to inform us just as we inform nature. I talk about this interaction in relation to both Montessori and Froebel in my book, *Growing Up Green.* It follows from this that the approach to nature education favored by advocates of inquiry learning is *discovery learning.* Children interact with, play in, learn via, and study nature. They directly experience the out-of-doors.

**Personal Growth**

Here's the second-to-last orientation I wish to discuss. It's called the *personal growth* orientation. The personal growth orientation aims to nurture self-actualized individuals who have a strong sense of self-esteem, are self-assured in who they are as individuals, and have a clear sense of their individual life goals. I emphasize the word *individual* repeatedly because this philosophy is very much an individualistic one. Indeed, strident individualism is one of the environmentally problematic elements of the personal growth orientation as it tends to ignore the natural world as well as the cultural dimensions of our lived lives—the very interconnections that bind us to each other and to nature.

Courtesy of David Kahn, Hershey Montessori School, Huntsburg, Ohio

Courtesy of Colegio Montessori de Tepoztlán, Mexico

There's a strong focus on self-esteem and personal identity in this orientation. It promotes individual self-development. Values are judged to be relative and individually constructed and so some of the key questions that teachers in this tradition ask of students are What do you want to be when you grow up? What kind of person do you want to be? What values will you hold?

The nature education approach that most closely conforms to the personal growth philosophy (with its strong affective focus) is *acclimatization*. The acclimatization approach to nature education takes students into the out-of-doors, where they experience nature in the most intimate of ways, on an aesthetic level by incorporating it into their artwork, by actually getting into the muck and doing pond studies *in* the pond rather than on the periphery, by experiencing nature using all the five senses—hearing, smell, taste, and touch, as well as sight. It aims to build a bond between child and nature, not so much at a cognitive level in terms of studying the names of things or the properties of natural species, but in terms of actually connecting with nature on an aesthetic, kinesthetic level, if you will, through the five senses. So this brings a very different perspective to nature education than the philosophies explored above.

**Social Action**

We have one more perspective to look at, and it is the one that Louise referenced towards the end of her talk. This is the *social action* perspective, which aims to empower students to change the world. The word *empower* is an important word in this tradition. Focused in part on social criticism, teachers working with this tradition will often involve students in a study of current events, media literacy, social

activism, social justice, the developing world, and other topics not traditionally addressed by the orientations reviewed thus far.

Students within this tradition might take on a local business that is importing goods made with slave labor in the developing world, or they might conduct a river study of a watershed or stream near the school. In some cases, presentations on polluted water bodies in a neighborhood have been made by children to the local city council, who have in turn acted on such information. And so the social action philosophy aims to teach children that they can transform the world, make it into a better place. And it aims to empower students to believe that they can make a difference.

## Conclusion

These five educational traditions—disciplinary initiation, citizenship education, inquiry learning, personal growth, and social action—are each represented at various levels of schooling in the United States today. So too each forwards a contrasting view of what nature education should comprise. In thinking about a holistic approach to nature education, I think it is important to be aware of these traditions. Even better, as Montessori educators, we should attempt to forge links between the Montessori approach to nature study and, for example, an acclimatization approach to experiencing nature on an immediate sensorial, kinesthetic level. Or perhaps there are ways of combining the strictly academic pursuit of environmental science in the disciplinary initiation tradition with Montessori's advice to us to teach the story of the universe. Finally, most importantly, given the sharp decline in natural spaces in the United States, we need to forge a new sensibility for citizenship education, one that foregrounds nature and celebrates the wondrous heritage of the American landscape that so many writers and artists have lauded throughout the last few centuries.

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Courtesy of Mr. Katsuhiko Yorita, Information Center, Okinawa, Japan, submitted by Takako Fukatsu

Courtesy of Farmhouse Montessori, Australia

# Deep Ecology: Educational Possibilities for the Twenty-First Century

by Fritjof Capra

*Fritjof Capra's two-part lecture presents the fundamentals of systems thinking and sustainability along with the power of an ecologically comprehensive theory to shape education to fit the needs of human development in relation to the environment. Dr. Capra aims for the big picture emphasizing that effective learning is a system embedded in the web of life, which is yet another system. It gives us the ability to see the interconnectedness of the environment, of the community, of the natural world all at once—"a network of phenomena that are fundamentally interconnected." Capra maintains that systems theory, including systems learning, is a new way of seeing the world as living connections in which humans are playing their part in finding a real sense of belonging by working in direct contact with the natural world and all of its facets.*

## Part 1

Good morning. It's a pleasure to be here and to have this opportunity of an exchange of ideas with you. What I'm going to say will be based on my last two books, *The Web of Life* and the just recently published book *The Hidden Connections.*

In the last chapter of *The Hidden Connections* I talk about what political scientists now are beginning to call a global civil society—that is, a global network of nongovernmental organizations that opposes the current form of economic globalization and has alternative ideas of how to build a global economy with humane values and ecological sustainability integrated into it. This is a vast movement, and they have organized not only numerous protest actions, beginning with Seattle in 1999, but also what they call a World Social Forum in Brazil every year. This January will be the third World Social Forum, and I'm very honored to have been invited to speak there. It will involve fifty thousand people who are activists—peace activists, environmental activists, people concerned with the shape of globalization, representatives from the labor movement, many representatives from the Southern Hemisphere, and so on.

This is a huge worldwide movement, of which I have been part, now, you know, for the last few years. When I go to discussion groups or when we have strategy sessions, again and again I meet people who say that they went to either a Montessori school or a Waldorf school, about in equal proportions. So what you're doing, indeed, has a huge influence, and it is in the character of non-linear systems (about which I've written a great deal lately) that we cannot predict consequences of our actions because things travel around and there are feedback loops and there are all kinds of non-linear pathways. That's why I chose this title *The Hidden Connections,* because we don't know all the connections. But you can rest assured that what you're doing is extremely valuable and will have these larger social and political effects.

With that, let me begin to talk about the topic "Deep Ecology: Educational Possibilities for the Twenty-First Century." This presentation will be structured in two parts: In the first part I will speak about various facets of ecology and sustainability, and then in the second part about implications for education.

Now when we talk about educational possibilities for the twenty-first century we are looking at the big picture, at years and decades ahead. This means that we have to look beyond current policies, beyond the current state of the economy, current problems of schools, professional development, college admission policies, and so on—all the things that we deal with in our day-to-day work as educators. But let's look beyond all that and

let's look at the big picture. As our new century unfolds, one of the greatest challenges that we are facing is to build and nurture sustainable communities. I want to begin by discussing the concept of ecological sustainability because there has been a lot of confusion around this concept, even within the environmental movement.

The idea of sustainability was introduced in the early 1980s by Lester Brown, the founder of the Worldwatch Institute, who defined a sustainable society or community as one that is able to satisfy its needs without diminishing the chances of future generations. In 1987, the Brundtland Report of the United Nations used the same definition to present the notion of sustainable development, which since then has been very widely used. In the Brundtland Report we read, "Humankind has the ability to achieve sustainable development to meet the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 2). It's the same idea that Lester Brown introduced. These definitions of sustainability are important moral exhortations. They remind us of our responsibility to pass on to our children and grandchildren a world with as many opportunities as the ones we inherited.

However, when you look at it, this definition of sustainability does not tell us anything about how to go about it. How do we actually build a sustainable world? How do we build a sustainable community? So I think what we need is an operational definition of ecological sustainability, one that gives us a clue of what it's all about and how we go about it. The key to such an operational definition is the realization that we do not need to invent sustainable human communities from scratch but can model them after nature's ecosystems because nature's ecosystems are in fact sustainable communities. Ecologists use the term *community* as a technical term. In scientific ecology, ecosystems are communities. They are communities of plants, animals, and microorganisms, and their outstanding characteristic—in fact, the outstanding characteristic of the whole biosphere—is their inherent ability to sustain life.

Therefore a sustainable human community must be designed in such a way that its ways of life, its businesses, its economy, its physical structures, its social institutions do not interfere with this ability of nature to sustain life. This is the key point: We should not interfere with nature's inherent ability to sustain life. This definition of sustainability is operational because it implies that the first step in our endeavor to build sustainable communities naturally must be to understand how nature does it, that is, to understand the principles of organization that ecosystems have developed to sustain the web of life. This understanding is what I call *ecological literacy.*

In the coming decades, the survival of humanity will depend on our ecological literacy, on our ability to understand the basic principles of ecology and to live accordingly. So this is the main theme that I'm going to explore with you here. Ecology has many facets. You can study ecology as a science or as a philosophy, there's a politics of ecology, there are technologies that are ecologically oriented, and so on.

*Ecology,* as you may know, is derived from the Greek work *oikos,* which means "household." So ecology is the study of how the earth household works. More precisely, it is the study of the relationships that interlink all members of the earth household. It can be pursued as a scientific discipline or as a philosophy. As a philosophy, it is known as Deep Ecology, and this is a philosophical school founded by a Norwegian philosopher, Arne Naess.

Arne Naess was a very well established and well known philosopher before he turned to ecology. He is an expert in Spinoza and published voluminous books about various philosophical issues, and then turned to ecology and made a critical distinction between shallow and deep ecology. Shallow ecology, he said, is anthropocentric. It views humans as somehow above or outside of nature. It sees humans as the source of all value and ascribes only instrumental or use value to nature. So a redwood tree, for instance, is valuable because it can give us timber. That's the only value shallow ecology has for natural living systems, so it leads to an attitude of how to manage the environment for human purposes. Deep Ecology does not separate humans from the natural environment, nor does it separate anything else from it. It does not see the world as a collection of isolated objects but rather as a network of phenomena that are fundamentally interconnected. Deep Ecology recognizes the intrinsic value of all living beings and views humans as just one

particular strand in the web of life. It recognizes that we are all embedded in and dependent upon the cyclical processes of nature.

When you think about it, you will see very soon that, ultimately, deep ecological awareness is spiritual or religious awareness. So Deep Ecology as a philosophy is a link between science and spirituality. Why? Well, when the concept of the human spirit is understood as a mode of awareness, a mode of consciousness in which the individual feels connected to the cosmos as a whole, it becomes clear that ecological awareness, which is the awareness of connectedness—of being embedded in nature—is spiritual in its deepest essence. So it is not surprising that Deep Ecology is consistent with the so-called Perennial Philosophy of various spiritual traditions, whether we talk about the spirituality of Christian mystics or Islamic mystics, that of Buddhists, or about the philosophy and cosmology underlying the American Indian traditions. All these have common characteristics that are also characteristics of Deep Ecology.

Let me now turn to science. In science the most appropriate framework for ecology is the theory

Courtesy of Liz Ammond, The Children's House, Traverse City, Michigan

of living systems. This is a theory that is only now fully emerging but has its roots in several fields of study that were developed during the first half of the twentieth century. Organismic biology, for instance, which concentrates on the organism as a whole, is a branch of biology that originated in the 1920s and 1930s. At the same time, there was the rise of Gestalt psychology, a psychology seeing perception as the perception of patterns, of forms. The German word for "living form" is *Gestalt*. German is my native language, so it's interesting for me to consider that we have two words for *form* in German. One is the same as the English *form* and the other one is *Gestalt*. *Gestalt* is a living form—a living body has a *Gestalt*. So psychologists adopted that and it was transferred into English in the term Gestalt psychology. Then there was general systems theory, and then cybernetics was more specifically a study of theories of living systems.

In all these fields, scientists explored living systems. In my book *The Web of Life*, I have a whole chapter about this history of systems theories in the early twentieth century. Scientists explored living systems, which means integrated wholes whose properties cannot be reduced to those of smaller parts. That was the key to systems theory, and it was formulated in the phrase that became sort of the banner of systems theory, "The whole is more than the sum of its parts."

Systems theory entails a new way of seeing the world and a new way of thinking, known as *systems thinking* or *systemic thinking*. It means thinking in terms of relationships, in terms of patterns, in terms of context. Systems thinking has been raised to a new level during the past twenty years or so with the development of complexity theory, which is a new mathematical theory, a new mathematical

Six-year-old using zoological charts that isolate distinguishing characteristics to do scientific classification, Japan

language and a new set of concepts to describe the complexity of living systems.

Examples of these systems abound in nature. Every organism is a living system—that is, every animal, plant, microorganism, or human being. All these organisms are integrated, whole living systems. Parts of organisms are also living systems. For instance, a leaf or a cell are also living systems. So we see systems within systems—a nested order of systems nesting within systems. And then we have not only individual organisms and their parts but also communities of organisms, either in social systems—like a family, a school, or a village—or ecosystems, where different species live together.

All these living systems are wholes whose specific structures arise from the interactions and interdependence of their parts. Systems theory tells us that all living systems share a set of common properties and common principles of organization. This means that systems thinking can be applied to integrate academic disciplines and to discover similarities between different phenomena within the broad range of living systems. So you can talk, for example, about the *health* of a city, or you can talk about the *stress* of a community and compare it to the stress of an individual organism. Or you can talk about the *stress* of an economy and, again, you will be able to push these analogies quite far because these are all living systems that show similar phenomena.

Now let me go a little bit deeper into the nature of these living systems. One of the most important insights of the systemic understanding of life is the recognition that networks are the basic pattern of organization of all living systems. Wherever we look—for example, ecosystems are understood in terms of food webs, that is, networks of organisms that feed on one another. Then organisms are networks of cells and cells are networks of molecules. So the network is a pattern that is common to all life. Wherever we see life, we see networks.

Now, of course, not every network is a living system. A chicken wire fence is a network, a fishing net is a network, but obviously it's not alive. So what's the characteristic, or what are the characteristics, of a living network? Well, there's one key characteristic, and that is that living networks are self-generating. Let me take the example of a cell. In a cell all the biological structures are continually produced, repaired, and regenerated by a network of chemical reactions. The cell, as you probably know, has a membrane that lets in the food, the simple molecules. It doesn't let in everything; it is semi-permeable. Certain things it lets in, other things it keeps out, and so it maintains the integrity of the cell. What comes in are simple food molecules: oxygen, sugars, and so on. And the cell, the network of chemical processes, produces all the larger molecules, the so-called macro-molecules: the proteins, the enzymes, the DNA, the cell membrane. All this is produced by a network of chemical processes. By the way, I've always felt that biology teachers neglect this perspective and teach the children simply to remember the various parts of the cell. Every school textbook of biology will have these pictures of a cell with these complicated names that the kids have to remember. And they will tell them, probably, what these various parts of the cell do, but they don't tell them how they are interconnected and how they are actually built and continually renewed, repaired, and rebuilt by a network of processes.

Well, similarly, at the level of a multi-cellular organism, the bodily cells are continually regenerated and recycled by the organism's metabolic network. So living networks continually create or recreate themselves by transforming or replacing their components.

Now we can transfer this knowledge to the social domain, and this is what I've done in my last book, *The Hidden Connections.* Life in the social realm can also be understood in terms of networks. But here we are not dealing with chemical reactions; we're dealing with processes of communication. So living networks in human communities are networks of communications. Like biological networks, they are self-generating, but what they generate is mostly non-material. Each communication creates thoughts, and meaning creates information. And this gives rise to further communications. Just think of conversations, just think of, say, a conference like this—when you have lunch or dinner with people or have a drink in the bar and there's a conversation that reminds you of something you said to somebody else in the morning and that triggers a new idea and then sparks a new conversation, and so things go round and round. In this way the entire network of conversations or communications sustains itself. As this continues in a social network, these communications eventually produce a shared

system of beliefs, of explanations, of values, a common context of meaning, which is known as *culture.* This is what we call culture, which is continually sustained by further communications. And through culture, individuals acquire identities as members of the social network.

In my last book I go into considerable detail in comparing biological networks and social networks and analyzing the process of how culture is created and so on. I don't want to go into these details here. Let me just point out one aspect. It is important to realize that these living networks, both the biological networks and the social networks, are not material structures, like a spider's web, for instance. They are functional networks, that is, networks of relationships between various processes. In a cell, as I said before, these processes are chemical reactions between the cells molecules. In a food web, the processes are processes of feeding, of organisms eating one another. In a social network, the processes are communications. And in all these cases, the network itself is a non-material pattern of relationships. You cannot go out into a forest or a meadow and take a picture of a food web. You have to understand the processes, the relationships. This is why ecology is the study of relationships. Understanding living systems leads us to the understanding of relationships.

This shift of focus from objects to relationships is not an easy one because it is something that goes counter to the traditional, scientific enterprise in Western culture. In science, as you know, we have been taught that we measure and weigh things. Some people even say what cannot be measured and weighed is not important or even what cannot be measured and weighed does not exist. So we have been trained, when we want to be scientific, to measure, to quantify. Relationships cannot be measured and weighed. You cannot put relationships on a scale. Relationships need to be mapped, so you draw a map of interconnections. You map it out, you see how different elements in a system or different members of a community are interrelated. And when you do this, when you engage in this mapping, you will discover certain configurations of relationships that appear again and again. This is what we call *patterns.* A pattern is a configuration of relationships. So the study of relationships leads us to this study of patterns.

Here we discover a tension that has been characteristic in Western science and philosophy throughout the ages: the tension between two approaches to the understanding of nature, which I call the study of matter and the study of form—form or pattern. These are two very different approaches. The study of matter begins with the question, "What is it made of?" This leads to the notions of fundamental elements, building blocks; it leads to measuring and quantifying. And this of course is very necessary to understand the natural world. The study of form asks, "What is the pattern?" That leads to the notions of order, organization, relationships. Instead of quantity, the study of form involves quality. Instead of measuring, it involves mapping. So these are two very different lines of investigation that have been in competition with one another throughout our scientific and philosophical tradition.

For most of the time in Western science the study of matter, of quantities and constituents, has dominated. This is not true in Eastern science. Just think of the difference between Western and Eastern medicine. When you are sick and go to a Western doctor, typically the way of determining what's wrong with you is to take a blood sample and send it to the lab. They analyze it—that is, they determine the quantities of chemicals present in the blood. So it's a quantitative analysis, and they deduce from that some symptoms, some disease, which is defined in terms of those quantities. When you go to a traditional Chinese doctor, the situation is very different. He or she will take your pulse and, from a very complex way of taking several pulses on your hand, they will determine a pattern of relationships expressed in terms of meridians and the flow of chi. And then from that pattern of relationships, they will deduce strengths and weaknesses—you know, illness and health. So it's a very different approach. Both are scientific, but they're very different types of science.

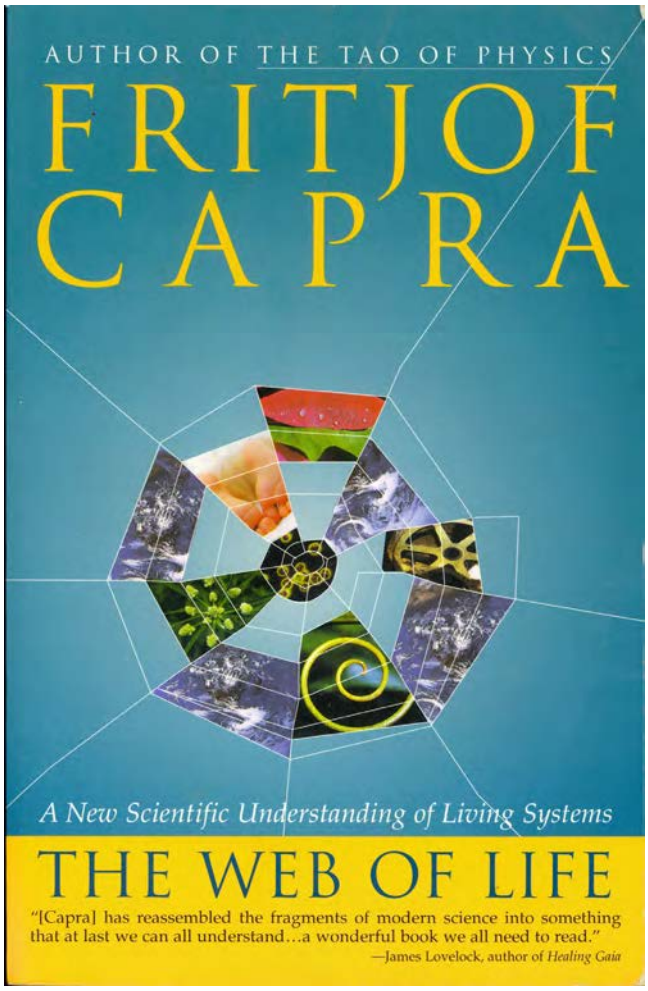
Now in the last decades, the rise of systems thinking has brought the study of patterns and relationships to the foreground again in Western science. The main emphasis of complexity theory is on patterns. You may have heard of strange attractors in chaos theory or fractals in fractal geometry; these are all patterns that are generated mathematically. In fact, the whole new mathematics of complexity is essentially a mathematics of patterns.

Now, as I said before, understanding patterns requires visualizing and mapping. And here we see something very interesting. Every time the study of pattern has been in the forefront in Western science, artists have contributed significantly to the scientific enterprise because a large part of the artistic approach is to visualize patterns. Perhaps the two most famous examples of artists who have contributed to science are Leonardo da Vinci in Renaissance Italy, whose whole scientific life was the study of pattern, and the German poet Goethe in the eighteenth century, who made significant contributions to biology through his study of pattern. I think this is important for us as educators because it opens possibilities of integrating the arts into the school curriculum. There's hardly anything more effective than the arts, whether it's the visual arts or music or the performing arts, for developing and refining a child's natural ability to recognize and express patterns.

So the arts can be a powerful tool for teaching systems thinking, in addition to other functions they have in education, in particular in addition to enhancing the emotional dimension that is increasingly being recognized as an essential component of the learning process. I'll come back to that in a few minutes.

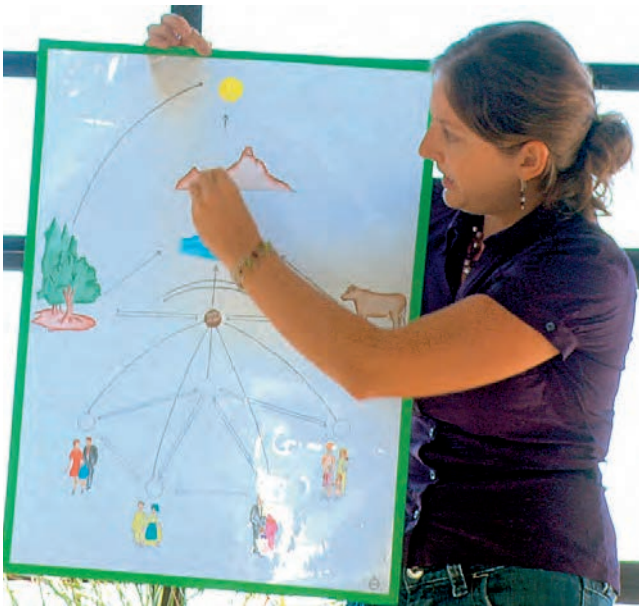
Now let me now return to the challenge of building sustainable communities. The first step on the road to sustainability is ecological literacy or *ecoliteracy,* that is, understanding the principles of organization that ecosystems have evolved to sustain the web of life. When systems thinking is applied to the study of the multiple relationships that interlink the members of the Earth household we can recognize a few basic principles. Those may be called principles of ecology or principles of sustainability or you might even call them the basic facts of life.

We need a curriculum that teaches our children these fundamental facts of life, for example, the fact that in an ecosystem one species' waste is another species' food; that matter cycles continually through the web of life; that the energy driving the ecological cycles flows from the sun; that diversity assures resilience; and last, but not least, the fact that life, from its beginning more than three billion years ago, took over the planet not by combat but by networking.




Ecoliteracy is the first step towards sustainability. The second step is to move from ecoliteracy to *ecodesign.* We need to apply our ecological knowledge to the fundamental redesign of our technologies and social institutions so as to bridge the current gap between human design and the sustainable systems of nature. Design, in the broadest sense, can be understood as the shaping of flows of energy and matter for human purposes. Ecodesign is a process in which our human purposes are carefully meshed with the larger patterns and flows in the natural world. So ecodesign principles reflect the principles of organization that nature has evolved to sustain the web of life.

To practice industrial design in such a context requires a fundamental shift in our attitude toward nature: a shift from finding out what we can extract from nature to finding out what we can learn from her. In recent years there has been a dramatic rise in ecologically oriented design practices and projects, all of which are now well documented. Again, in



Presenting the "interdependencies of life": animals, plants, land, water, air, energy, and humans, courtesy of Colegio Montessori de Tepoztlán, Mexico

the last chapter of my last book I have an extensive discussion and documentation of these ecodesign projects. For example, I begin this discussion with the renaissance of organic farming that is now happening around the world. Another example would be the organization of different industries into ecological clusters in such a way that the waste of any one organization is a resource for the next, just as in an ecosystem the waste of one species is food for the next.

Ecodesigners speak of a shift from a product-oriented economy to a service and flow economy, and what they mean is that industrial raw materials and technical components would continually cycle between manufacturers and users so that instead of buying and owning a television set, for instance, you would lease the set and you would buy the service. The set would be the property of the manufacturer, who would have the obligation to take it back after its life of use, or when you want a new television set, and to recycle the components. This implies a dramatic change of attitude of manufacturers and design practices. The reason simply is that if I buy a television, my purpose is not to own a box of four thousand toxic chemicals. That's not why I buy it. I buy it to watch TV, right? So the toxic chemicals should be owned by the manufacturer. I just lease the service. The same would be true for this floor carpet, for instance, which would go back to the manufacturer, or for cars, bicycles, or whatever. This is a big movement that is now beginning.

Well, rather than going into all these details, let me just concentrate on one important ecodesign area, and that is energy. In a sustainable society, all human activities and industrial processes must be fueled by solar energy, as in the ecosystems in nature. Because of the critical role of carbon in global climate change, it is evident now that fossil fuels are unsustainable in the long run, and therefore the shift to a sustainable society centrally includes a shift from fossil fuels to solar power. Indeed, solar energy is the energy sector that has seen the fastest growth over the past decade. During the 1990s, the use of photovoltaic cells increased by about 17% every year.

And wind power has grown even more spectacularly. It increased by about 24% each year during the 1990s, and last year—2001—it increased by an astonishing 31%. Since 1995, wind power has increased nearly fivefold while coal declined by 8%. Wind power offers long-term price stability and energy independence. It's obvious that there will never be an OPEC for wind because you can find wind everywhere; it's not concentrated in various areas. The total generating capacity from wind is now 23,000 megawatts, worldwide, which is enough to meet the residential electricity needs of some 23 million people. And over the next decade, Europe alone plans to add about three times that amount. You can look up the references I give in the book. There is a list of countries, including China and of course the United States, that plan to add massive amounts of wind power in the next few years. Wind power has reached a threshold where it is rapidly becoming economical.

Now in this hopeful solar scenario, over the past twenty years, there has always been a major stumbling block. I remember frustrating discussions for years and years when people would ask, "Well, how do we drive our buses, cars, and trucks?," or I would speak at a conference about solar power and they would say, "Well, that's all very nice, but you came here in an airplane, didn't you? And was that driven by solar power?" So the problem of having a liquid fuel that can be stored and used for our cars and buses and planes and trucks, until recently, was a major stumbling block. However, during the last few years, this problem has found a spectacular solution with the development of efficient hydrogen

fuel cells that promise to inaugurate a new era in energy production, which is now often called the *hydrogen economy.*

A fuel cell is an electrochemical device that combines hydrogen with oxygen to produce electricity, water, and nothing else. It is completely nonpolluting, has no other side effects, and operates silently—and this makes hydrogen the ideal fuel. Several companies around the world are now racing to be the first to commercially produce residential fuel cell systems. You would have a fuel cell, say the size of a washing machine, in your basement for all your energy needs in the house. In the meantime, Iceland has launched a multi-million-dollar venture to create the world's first national hydrogen economy. To do so Iceland will use its vast geothermal and hydroelectric resources to produce hydrogen from seawater just by splitting the oxygen and hydrogen in the water, and then use it first in buses and cars and then in its fishing fleet. The goal set by the Icelandic government is to complete the transition to hydrogen between 2030 and 2040.

Where do you get hydrogen from? Well, it's the most common element in the universe. At present, natural gas is the most common source of hydrogen. It's essentially methane, which is $CH_4$, so you have four hydrogen atoms to one carbon atom. But it still has carbon, so it still pollutes and contributes to global warming. In the long run, separation from water with the help of solar energy, especially wind power, will be the cleanest and most effective way of producing hydrogen. And when that happens we will have created a truly sustainable system of energy generation. We will use solar energy to split water into hydrogen and oxygen and then use the hydrogen in the fuel cell to produce electricity, which has the by-product, again, of water—that is, the hydrogen recombines with the oxygen to produce water. So it's a complete and clean cycle. Now you may ask, why go through the trouble of splitting hydrogen from water to produce electricity and then create water again? Why not use solar energy to produce electricity directly? The answer is storage, because we need a fuel that can be stored, so hydrogen can be piped like natural gas or oil and can be stored in cars to drive.

This brings me to the other technology that is closely related to energy, and that's automobile technology. There has been a redesign of automobiles that is just beginning now, that may be the ecodesign branch with the most far-reaching industrial consequences. This involves what physicist Amory B. Lovins and his colleagues at the Rocky Mountain Institute call Hypercars, hybrid electric cars using aerodynamic design, ultralight materials, and efficient accessories. As you probably know, there are several hybrid electric cars on the road now. I bought a Toyota Prius about a month ago, and it gets between forty and fifty miles per gallon. The cars that are not yet out but exist as prototypes get even better mileage: about eighty miles per gallon. Such cars have been tested by General Motors, Ford, Daimler Chrysler, and various other companies. In fact, last week Toyota announced that within ten years all its cars will be hybrid electric cars. And that will, of course, influence the whole automobile industry dramatically.

Now, one thing connected with these new technologies is the realization that a massive investment in these Hypercars could easily make us completely independent of foreign oil. Just think what this would do to our foreign and military policies. In fact, and this is an important statistic to know, if we increased the fuel efficiency of our light vehicles—not the trucks and buses, only the light vehicles—by a mere 2.7 miles per gallon, we would not need to import any Persian Gulf oil. The current average gas mileage is around 20 to 22, and as I told you, the Prius gets about 40 to 45, so to increase the average by 2.7 miles per gallon, up from 22, is nothing; it could be done very easily.

We are talking here about the future of our children and future generations, and it behooves us to teach our students that we are now at the beginning of a historic transition from the petroleum age to the hydrogen age. Oil, as you know, is currently cheap in the United States, if you look only at the price we pay at the pump. But the military costs to protect each barrel of oil are actually higher than the price of the oil. The environmental costs are even higher and make the real price of oil prohibitively high. As the transition to the hydrogen economy progresses, its energy efficiency will become so superior to oil that even cheap oil eventually will be uncompetitive and thus no longer worth extracting.

I want to close this first part with one of my favorite statements from the ecodesigners: The Stone Age did not end because people ran out of stones. So the petroleum age will not end because we run out of petroleum. It will end because we

have developed better technologies. The implications for all this—ecology, sustainability, and ecodesign—obviously are enormous. Let me stop here, and I will then go on to discuss this in the second part.

### Part 2

In the first part of my presentation, I discussed the concepts of sustainability and Deep Ecology, the basic principles of ecology and systems thinking, and then I gave you a brief overview of a recent development in ecodesign. In this second part, I shall discuss the implications of all these ideas for education. I should tell you that I have some experience of Montessori education because my daughter went to a Montessori school from grade five to eight. She is now a junior in high school, but I still remember the Montessori years very well. However, I never studied Montessori pedagogy. So my experience is just as a parent being very involved in my daughter's education and knowing her teachers and occasionally sitting in on classes and looking at their exhibits and interactions.

Although I see a lot of connections of what I'm going to say to Montessori education, I'm not going to emphasize them. I'll leave that up to you. I'll be very curious to hear from you, then, in the discussion section, how you see this being related to the Montessori system.

Let me begin with ecoliteracy. In order to be able to build and nurture sustainable communities, we need to become ecologically literate. That is, we need to understand the basic principles of ecology and we need to learn how to embody them in the daily life of our human communities. Teaching this ecological knowledge, which by the way is also ancient wisdom, is the most important role of education, I feel, in this new century. Ecological literacy, or ecoliteracy, must become a critical skill for politicians, business leaders, and professionals in all spheres and should therefore be the core of education at all levels, from primary and secondary schools to colleges, universities, and the continuing education and training of professionals.

At the Center for Ecoliteracy in Berkeley, my colleagues and I are developing a system of education for sustainable living at the primary and secondary school levels. This involves a pedagogy that puts the understanding of life at its very center—an experience of learning in the real world that overcomes our alienation from nature and rekindles a sense of place, and a curriculum that teaches our children the basic principles of ecology. This ecoliteracy is now being taught within a growing network of schools in California and is beginning to spread to other parts of the United States and the world.

Similar efforts are underway in higher education, pioneered by an organization called Second Nature, located in Boston, which collaborates with numerous colleges and universities to make education for sustainability an integral part of campus life. I know some of you have heard David Orr speak, who is also on our board of directors at the Center for Ecoliteracy. David Orr directs the Center for Environmental Science at Oberlin College in Ohio, where he pioneered a building, an environmental science study center, that is the state of the art in the world in ecological design.

Let me now review the main components of ecoliteracy as we have developed them in Berkeley. I shall try to cover as many aspects as possible in this brief overview, but I want to emphasize that my words can only convey a small part of the story. I brought a few slides, and as always the real message is in the children's faces—their smiles, their stories, their poetry. I encourage you to go to our website, www.ecoliteracy.org, where you will find plenty more pictures, stories, and additional practical information.

Over the last ten years, we have found that growing a school garden and using it as a resource for cooking school meals is an ideal project for experiencing systems thinking and the principles of ecology in action, and for integrating the school curriculum. Gardening reconnects children to the fundamentals of food, indeed to the fundamentals of life, while integrating and enlivening virtually every activity that takes place at a school.

One of the key characteristics of living networks is the fact that all the nutrients are passed along in cycles. In an ecosystem, energy flows through the network while water, oxygen, carbon, and all the other nutrients move in these well-known ecological cycles. Similarly, the blood cycles through our body and so the air, the lymph fluid, and so on. Wherever we see life we see networks, and wherever we see living networks we see cycles. The web of life, the flow of energy, and the cycles of nature are exactly

Courtesy of Cornerstone Montessori School and Cornerstone Montessori Elementary School, St. Paul, Minnesota

the phenomena that are experienced, explored, and understood by children through gardening. The understanding of life in terms of networks, flows, and cycles is relatively new in science. But it is an essential part of the wisdom of spiritual traditions. And it is not a coincidence that gardening and preparing food from what grows in the garden have been integral parts of religious practices in many spiritual traditions. Gardening and cooking are examples of cyclical work, work that has to be done over and over again, work that does not leave any lasting traces. You cook a meal that is immediately eaten. You clean the dishes, but they soon will be dirty again. You plant, tend the garden, harvest, and then plant again. This work is part of monastic practice because it helps us recognize the natural order of growth and decay, of birth and death, and thus makes us aware of how we are all embedded in those cycles of nature.

In the garden, we learn about food cycles and we integrate the natural food cycles into our cycles of planting and growing, harvesting, composting, and recycling. Through this practice, we also learn that the garden as a whole is embedded in larger systems that are again living networks with their own cycles. The food cycles intersect with these larger cycles—the water cycle, the cycle of the seasons, and so on—all of which are links in the planetary web of life. In the garden, we learn that a fertile soil is a living soil, containing billions of living organisms in every cubic centimeter. These soil bacteria carry out various chemical transformations that are essential to sustain life on earth.

Because of the basic nature of the living soil, we need to preserve the integrity of the great ecological cycles in our practice of gardening and agriculture. This principle is embodied in traditional farming methods, which are based on a profound respect for life. Farmers used to plant different crops every year, rotating them so that the balance in the soil was preserved. No pesticides were needed since insects attracted to one crop would disappear with the next. Instead of using chemical fertilizers, farmers would enrich their field with manure, thus

returning organic matter to the soil to re-enter the ecological cycles.

About four decades ago, this age-old practice of organic farming changed drastically with the massive introduction of chemical fertilizers and pesticides. Chemical farming has seriously disrupted the balance of our soil, and this has had severe impact on human health because any imbalance in the soil affects the food that grows in it and therefore the health of the people who eat the food. Fortunately, a growing number of farmers have now become aware of the hazards of chemical farming and are turning back to organic ecological methods. The school garden is the ideal place to teach the merits of organic farming to our children.

Through gardening we also become aware of how we ourselves are part of the web of life. And over time, the experience of ecology in nature give us a sense of place. We become aware of how we are embedded in an ecosystem, in a landscape with a particular flora and fauna, in a particular social system and culture, and this gives us the opportunity of integrating the school curriculum around the garden and food, drawing in history, other social sciences, and studies of culture.

Now, beyond that, as you see a little bit from these slides, being in the garden is something magical. It is something that is very special for children, especially young children. Let me quote here one of our teachers, who said the following at one of our recent meetings: "One of the most exciting things about the garden is that we are creating a magical childhood place for children who would not have such a place otherwise, who would not be in touch with the earth and the things that grow. You can teach all you want, but being out there, growing and cooking and eating, that's an ecology that touches the heart and will make it important to them." And I want to emphasize that this can be done in an urban environment. This is especially important for children in an urban environment, who would not have an opportunity otherwise to go out much into nature.

In the garden we observe the life cycle of an organism, the cycle of birth, growth, maturation, decline, death, and new growth of the next generation. Through gardening we experience growth and development on a daily basis. Indeed, the understanding of growth and development is essential, as you well know, not only for gardening, but also for education. So the children learn that while their work in the school garden changes with the development and maturing of the plants, the teacher's methods of instruction and the entire discourse in the classroom changes with the development and maturing of the students.

Since the pioneering work of Maria Montessori, Rudolf Steiner, and Jean Piaget, a broad consensus has emerged among scientists and educators about the unfolding of cognitive functions in the growing child. Part of that consensus is the recognition that a rich, multi-sensory learning environment—that is, the shapes and textures, the colors, smells, and sounds of the real world—is essential for the full cognitive and emotional development of the child. Learning in the school garden is learning in the real world at its very best. It is beneficial for the development of the individual student and the school community, and it is also one of the best ways for

Courtesy of Chris Trostel, Montessori Borealis Public, Juneau, Alaska

children to become ecologically literate and thus able to contribute to building a sustainable future.

One of our biggest school gardens is in the Berkeley Middle School, and it is called The Edible Schoolyard. We have a publication called *The Edible Schoolyard,* and it's a report about the details of how this garden was formed, interviews of the school principal, of various teachers, and pictures. Another of our publications is called *Ecoliteracy: Mapping the Terrain,* and that gives sort of the theoretical overview of the various facets as I have described them here, but in more detail. A third is called *Getting Started,* and it gives practical advice about how to start a school garden. You can order these from our Web site, www.ecoliteracy.org.

Now let me turn from those practical things to make a few comments about the process of learning. You see, because of its intellectual grounding in systems thinking, ecoliteracy thinking is much more than environmental education. It offers a powerful framework for a systemic approach to school reform, which has been widely discussed among educators. I'm talking here especially about public schools, where school reform, as I'm sure you know, has been a very hot topic. When you look at these discussions of American school reform in public schools, you can see that a systemic approach to school reform is based essentially on two insights: a new understanding of the process of learning and a new understanding of community and leadership. Recent research in neuroscience and cognitive development has resulted in a new systemic understanding of the process of learning, based on the view of the brain as a complex, highly adaptive, self-organizing system. And in the publication *Ecoliteracy: Mapping the Terrain,* there is a chapter on this with references to various books.

Because of the fundamental interconnectedness of the brain, everything that happens to a child has both direct and indirect consequences. Body and mind or brain and mind deeply interact. For example, stress can weaken the immune system, while relaxation and laughter can strengthen it. Playing the piano or singing in a choir improves spatial reasoning. Reading enhances a student's ability to think abstractly. These connections have been studied extensively in recent years. And educators increasingly have become aware that all learning is complex and that in every encounter teachers are dealing with the entire system, that is, with the entire child, the whole child.

Now, as you well know, like all living systems, the brain grows and develops. It is now well understood that in the growing child, brain growth is accompanied by a corresponding development of cognitive functions. And, as you know, in the developing cerebral cortex, brain growth does not mean growth of new nerve cells but growth of a complex network of connections, of neural interconnections. As the child matures, infinite possibilities for interconnections exist in this growing and developing neural network. Which connections actually form and which pathways and functions become stable depends very much on the child's environment. The neural network displays the important ability to alter its connectivity in response to the environment, something that neuroscientists call *neural plasticity.* This sensitivity of the brain to environmental influences is especially strong in early childhood when most of the neural network is forming. Since research in this area began in the late 1950s, there has been a broad consensus among child psychologists that early exposure to an environment rich in sensory experiences and cognitive challenges will have lasting beneficial effects, while early deprivations will inhibit future neural development.

At the Center for Ecoliteracy we believe that learning in the school garden, in the kitchen, on the farm, or in the creek is learning in the real world at its very best. Now since the neural network alters its connectivity continually in response to the child's environment, this means that different children will develop different nervous systems because they grow up in different environments. So there will be different pathways, a different mix of cognitive functions. In other words, every brain is uniquely organized and therefore children display a great diversity of learning styles, involving, as Howard Gardner called it, multiple intelligences.

Another important implication of the view of the brain as an integrated whole embedded in larger wholes is the insight that learning involves not only the brain and the nervous system but the body's entire physiology, and, in particular, it turns out, the emotions are critical. Now in education, emotions have long been treated as important but as basically separate from thinking. Recent scientific discoveries, especially the research by Antonio Damasio, which I highly recommend, have forced us to change this

view dramatically. Scientists have come to realize that emotion and cognition interact continually, energizing and shaping each other. What we learn, therefore, is not only influenced by emotions but is even organized by emotions. And this means, of course, that an emotionally safe learning environment is crucial to learning.

From the integration of cognition and emotion, let me now move to the fact that the child in the classroom is always embedded in a larger social environment, a social system. This is another insight of recent research into cognitive development and learning, that all learning is fundamentally social. Part of our identity depends on establishing community and finding ways to belong, and much of our learning depends on the communities of which we are part. And it is also a fact that learning is a fundamental property of all living organisms. All living organisms, all living systems are learning systems. So the challenge is not to stimulate the child to learn—the child will learn no matter what. Children always learn, and they learn from their communities. The questions is, Which communities do they choose to learn from and how can we shape and direct the learning? But they will always learn. You will find that children, teenagers, say, who have poor knowledge, say, in algebra or in chemistry, when it comes to pop songs they will know the lyrics of fifty, sixty songs. They will know the scripts of entire movies or episodes of *Friends* on television. They know it all by heart, they learned it all. So children always learn. The question is, What do they learn? So building healthy and intelligent communities is not only necessary for ecological sustainability but will also facilitate learning. And therefore since ecoliteracy is closely related to community building, it will provide a healthy and conducive learning environment.

Now in this very brief overview of recent brain research and its implications for learning, I've so far concentrated on the conditions that facilitate learning: a rich sensory environment, emotional safety, a supportive community. Now let me turn to the learning process itself. It is now well known that children do not come to school as empty vessels to be filled with information, but actively construct their knowledge by relating all new information to past experience in a constant search for meaning. From an evolutionary perspective, the search for meaning is survival-oriented and basic to human nature. We are innately motivated to make sense of our experience, to search for meaning. In fact, neuroscientists can show you that the brain resists having isolated pieces of information imposed on it. It will always make connections, establish patterns, and search for meaning.

How does the brain search for meaning? Well, I've come to understand meaning as the experience of context—that's my sort of definition of meaning, the experience of context. And context is a pattern of relationships between the thing or event under question and its environment. So the search for meaning is always a search for patterns. And indeed, this is what brain research tells us. The search for meaning occurs through *patterning*, as neuroscientists put it. This patterning is inherent in the physiology of the brain. Groups of brain cells combine to form cell assemblies and neuronetworks that fire in synchrony. New experiences and understandings reconfigure these automatic patterns. Learning is required when an entrenched pattern is challenged or disrupted. And one reason why such relearning often takes time is the fact that the changes are not just mental but also physiological. In fact, the two cannot be separated.

In their detailed analysis of patterning, neuroscientists have discovered that emotions are critical to this process. To me, this is one of the more fascinating results of these recent studies. They have found that when there is a lack of emotional security—when there is stress and the system is flooded with stress hormones—the perception of patterns is one of the first things that is lost. So if a child is under stress, the brain shuts down the ability to perceive patterns. The perception narrows down to concrete objects, so there's fragmentation, there's a shift from the whole to the parts. And this shows, once more, that emotional security is critical for the very essence of the learning process, the search for patterns and meaning.

Now it is obvious that the new understanding of the learning process suggests corresponding instructional strategies. In particular, it suggests designing an integrated curriculum emphasizing contextual knowledge in which the various subject areas are perceived as resources in service of a central focus or theme. An ideal way to achieve such integration is the approach that has recently been called *project-based learning*, which consists in facilitating learning experiences that engage students

in complex, real-world projects through which they develop and apply skills and knowledge. In our ecoliteracy schools we practice project-based learning with either a school garden or a creek restoration project as the central focus.

Let me just tell you one story of how this can be used to integrate the curriculum. About ten years ago, when we began this ecoliteracy work, we came across a fourth grade class in a school north of San Francisco where the teacher was a passionate ecologist who told the kids about endangered species. The students decided, by themselves, they wanted to adopt a species and preserve it from extinction. So the teacher invited a member of the Audubon Society, a naturalist, into the classroom to talk about endangered species in the area. And the kids voted to choose a small shrimp called the California freshwater shrimp, which occurred in the creeks surrounding the school in that region, and they said we want to preserve this freshwater shrimp. So how did they do it? Well, the teacher told them, first you have to find out about the shrimp. So, in came the biology class, where they learned not only about shrimp but also about habitats, food webs, about the ecological region and the ecosystem. Then very soon they moved on to geography and drawing maps of creeks and learning where the school is situated, where the village or the town is situated, and so on. They found that the reason why the shrimp was endangered was that these creeks run through farmland where there is cattle farming. There used to be willow trees around the creeks, but they were not there anymore, and the cattle were trampling down the earth on the banks of the creeks when they drank the water, and that muddied the creeks so that the shrimp could not survive.

Japanese student

So the kids studied all that and they said well, we'll have to build fences and we'll have to plant willows and we'll have to get the farmers to do that. They also said, let's write to the city council. And the teacher told them, well, if you write to the city council you better make sure that the letter is well written, because otherwise they won't read it. So in came writing, spelling, all of that. They also got their education in civics, to learn about the city council, how that functions, the relationship of the farmers to the city council, and so on. So the entire curriculum was organized around saving the shrimp.

This was ten years ago, and then the Center for Ecoliteracy came in later and gave them successive grants. Now this has grown into a project we call STRAW, which stands for Students and Teachers Restoring a Watershed. About forty to sixty schools are involved in it in northern California. They planted willows along the creeks. The willows that were planted ten years ago are now eight to ten feet high, and the kids, of course, are now in high school and college, and they come back occasionally to look at the willows, to talk to the younger kids. And just in the last year, they discovered that the shrimp is actually coming back. So it's a huge success and it shows how the entire curriculum can be organized around a single focus. In our publication *Ecoliteracy: Mapping the Terrain*, we describe this example of how the kids saved the shrimp.

Well, it is obvious that this kind of approach, integrating the curriculum through gardening or any other ecologically oriented project, creek studies or whatever, is possible only if the school itself becomes a true learning community. One of the first lessons we learned, when we tried to help teachers design integrated school curricula, was that the history teacher doesn't talk to the science teacher and the science teacher doesn't talk to the English teacher. So the first few years, the first five years of our work was spent mainly in building community. We took teachers out of the schools into weekend retreats,

and we took them through all kinds of experiences and exercises, and community building was the main part. In such a learning community, the focus is on learning and everyone in the system is both a teacher and a learner. There is a continuous, cyclical exchange of information. Feedback loops are intrinsic to the learning process, and systems thinking is crucial to understanding the functioning of these learning communities. Indeed, when you look at the principles of ecology in detail—networks, diversity, cycles, partnership, and so on—you can interpret them also as principles of community. Ecology and community go hand in hand.

To wrap this up, let me just summarize the basic components of ecoliteracy that I reviewed for you. The first is the understanding of the principles of ecology, experiencing them in nature and thereby acquiring a sense of place—the ecological dimension. The second dimension is incorporating the insights from the new understanding of learning that emphasizes the child's search for patterns and meaning. The third component is implementing the principles of ecology to build and nurture a learning community. And the fourth is integrating the curriculum in this community through project-based learning.

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Courtesy of Julie Davis, A Peaceful Path Montessori, Vancouver, Washington

Figure 1. Early example of Montessori education transitioning into the outdoors, Haus der Kinder, Vienna, Austria, 1930. Design: Franz Schuster.

# Greening Montessori School Grounds by Design

by Robin Moore and Nilda Cosco

*Robin Moore and Nilda Cosco view the Montessori approach to the prepared environment as overlapping their understanding of the naturalization of school grounds. As they present the possibilities for a naturalized setting to overcome sedentary lifestyles and maximize learning in the outdoors, they establish necessary components for success: professional design, careful attention to surface drainage, thoughtful use of a hierarchy of pathways, variety in elevation, transitional shelters and terraces, moveable parts, restoration of wild places, inclusion of fruit-bearing species, and, above all, establishing a sense of place.*

Because of the growing concern that children are not spending enough time outdoors in contact with the natural world (most recently highlighted by Richard Louv's *Last Child in the Woods: Saving Our Children from Nature Deficit Disorder*), Montessori schools are seeking help to naturalize their grounds.

This green desire is also driven by a renewed interest in Maria Montessori's insistence on the importance of hands-on experience of nature as a vehicle for implementing the Montessori curriculum and her visionary interest in transition spaces connecting classrooms to the outdoors (see Figure 1, opposite page). NAMTA initiatives in the last couple of decades have reaffirmed for teachers the potency of everyday experience of nature to instill a sense of the oneness of planetary life and of our place in the universe by feeding young children's imaginations.

A focus on nature has a double significance. First, it addresses the emerging sedentary lifestyle health crisis (Berkowitz et al.). Even though this is a complex, perplexing issue, two causes are crystal clear. Children are not spending enough time outdoors, neither moving their bodies in sustained moderate-to-vigorous physical activity for sufficient periods of time, nor interacting with their surroundings and each other in ways that ensure their proper physiological, psychological, and social development. Lack of movement means insufficient energy expenditure to metabolize food intake, which, as we know, has increased substantially over the last several years. "Calories in" and "calories out" to an alarming degree no longer equate (American Obesity Association).

Second, of direct relevance to Montessorians (and, indeed, progressive educators in general) is the potential of a carefully and deliberately *designed* and *prepared* naturalized outdoor environment for engaging teachers and learners across the curriculum (Cosco et al.). Lushly naturalized school grounds offer particular advantages difficult or impossible to offer in other ways (Fjørtoft).

Increased sensory stimulation is the most obvious benefit of naturalized spaces. Enveloped by colors and smells in spaces replete with ever-changing textures constantly responding to the passage of air, children become unified with their surroundings. This unique effect of nature may help explain its attention-focusing impacts—even suggesting that nature exposure may be a treatment for attention deficit disorder (Faber Taylor et al.; Kuo; Wells).

Inclusiveness is another but less obvious benefit. Nature is an integrating medium for children by age, gender, ethnic/racial difference, learning styles, psychomotor skills, and personality traits. The dense diversity of life in natural settings offers a broad range of choice for children to engage their genetically endowed *curiosity* (Hannaford; Moore, "The Power of Nature"). There is no need to prompt children to investigate and discover the offerings of rich, natural settings—they just do it, simultaneously providing teachers with any number of possible connections for emergent Montessori curricular learning processes and content. However, the level of natural diversity must be sufficient and accessible to activate child-prompted processes and enable child-teacher collaboration in the learning

Figure 2. Layout of the renovated grounds of the Child Study Center, Wellesley College, Massachusetts. A system of looping paths links a diversity of natural settings. Design: the Natural Learning Initiative. Courtesy of Robin Moore and Nilda Cosco

process, and the space must be designed to retain its lush quality.

### Renovation and New Construction

This article addresses school grounds renovation as well as new construction. Both are important. As hundreds of Montessori schools have been built in North America and around the world, renovation is a pressing need. New construction presents its own challenges—especially for educators who have had no construction experience. The good news is, if an appropriate design is developed from the beginning, expensive retrofitting will not have to be faced in the future.

Grounds vary in size, shape, topography, climatic zone, and vegetation cover as much as the schools that they are a part of. Some schools have ample space where all manner of settings are possible. At the other end of the spectrum are schools with restricted grounds that struggle to meet local or state space requirements. There are also sites that are classic examples of schools that have grown over many years without benefit of a master plan.

### A General Construction Advisory

Over the last several years, the Natural Learning Initiative (NLI) has worked with approximately ten Montessori schools (and several other educationally progressive independent institutions; see Figure 2). Only two of these projects were for new construction from scratch on a virgin site. The majority included an addition to existing buildings as part of a school expansion plan. Often, however, this growth had not been addressed in the past through the development of a school expansion master plan. Thus, before we

could start work on the outdoor renovation plan, a time-consuming effort with the board of trustees was required to confirm the location and timing of proposed building expansion(s). In some cases, we have been called in when new construction was already underway or completed, usually presenting a design challenge if issues addressed below had been overlooked.

The focus of the article is *design* of the outdoor environment in such a way that the *prepared environment* (in the Montessori sense) is greatly facilitated. Based on our experiences over the last two decades, we would like to stress the following general advisory steps that apply to both new construction and renovation projects.

**1. Master Plan**

Develop a phased master plan for your school, projected at least twenty years into the future. Many schools start with a Montessori visionary and a dedicated group of parents. Often the first iteration of the school occupies a temporary building until capital has been raised for permanent quarters; perhaps initially a modest children's house and single lower elementary classroom are all that can be afforded. However, as children age, parental pressure to expand continues to build year after year. Before too many years, upper elementary classrooms, and maybe even a middle school, are on the ground. If these inevitable expansions occur piecemeal and are not thought through as a unified, long-term vision for the school campus, the outdoors can end up becoming a fragmented mix, served by awkward, inefficient circulation—just to mention one of the many potential problems.

**2. Seek Design Profession Advice**

Seek advice from the state chapters of the American Institute of Architects and the American Society of Landscape Architects, if new construction is involved, about how to put together a "request for proposals" for professional design services and conduct a search for a design team. Don't make promises to the first architect that comes along. A parent architect or landscape architect can offer good advice about how to run a design team search, but may not be qualified by experience as a member of the team. Be careful to avoid potential conflicts of interest that could arise from employing a parent (or family relation) professional. Ensure that there is a formal, objective process in place and that an experienced landscape architect or landscape designer is on the team from the beginning. A reputable landscape "design-build" firm may also be appropriate. Whatever the choice, insist that a member of the architectural design team be certified by LEED (Leadership in Energy and Environmental Design, the primary developer of environmentally sustainable design in the United States) to ensure that sustainable design issues such as passive solar heating, natural air conditioning, day lighting, and water recycling are solidly addressed.

**3. Civil Engineer**

Ensure that a civil engineer is integrated into the team and that she or he is experienced and willing to implement the latest approaches to storm water runoff through rainwater harvesting and design of rainwater gardens to keep rainwater on site (see below), rather than traditional approaches of creating large, inconvenient "swales" to get the water into storm sewers as quickly as possible. When selecting a design team, probe deeply on these issues until you are satisfied that the technical design response will support your Montessori objectives. Ineffective surface drainage is the most common functional problem encountered in NLI's design assistance projects—not surprising, given the normal civil engineering approach, which treats the grounds of a school the same as a commercial landscape development, where, apart from gardens, a human footprint is unlikely to tread—let alone dozens of young children. In an office park, steeply banked swales (grassy, shallow, V-shaped ditches), large catch basins, and wet lawn are of no functional consequence. These same conditions in a school grounds can make them unusable.

**4. Building Orientation**

Ensure that the *building orientation* is such that all classrooms get sun exposure. In other words, avoid north-facing classrooms (south facing in the Southern Hemisphere). Correct orientation will ensure the feasibility of functional, plant-filled, sunny, indoor-outdoor transition spaces (see Figure 3).

**5. Minimal Site Disturbance**

Strongly stress to the design team that buildings and infrastructure should be located to minimize "site disturbance"—especially in relation to existing natural resources such as vegetation cover, mature trees, animal habitats, and natural streams.

## Design Implementation

A full range of play and learning settings was previously described in *The NAMTA Journal* (Moore, "Outdoor Settings for Playing and Learning"). Here, a focused, two-step process of naturalization design is covered: first, designing and installing the *site infrastructure,* second, developing the *living landscape* as an ongoing process that can usually be linked to the curricular program.

### Site Infrastructure

The two most common issues to be resolved before working on detailed design interventions are site circulation and site drainage. Typically, neither issue is appropriately addressed—if at all—in the initial building program. For most schools, getting the building constructed becomes an all-consuming task. The school grounds may receive some design attention earlier in the design process, but eventually concern for the grounds becomes overshadowed by the sheer drive to open the school doors on time, at the beginning of the school year. Now, two, three, or more years later, when the interior spaces of the buildings are operating smoothly, the dysfunctional, low quality grounds become the focus of attention.

### Access and Parking

Carefully consider vehicular access, parking capacity, and pedestrian safety and comfort in the

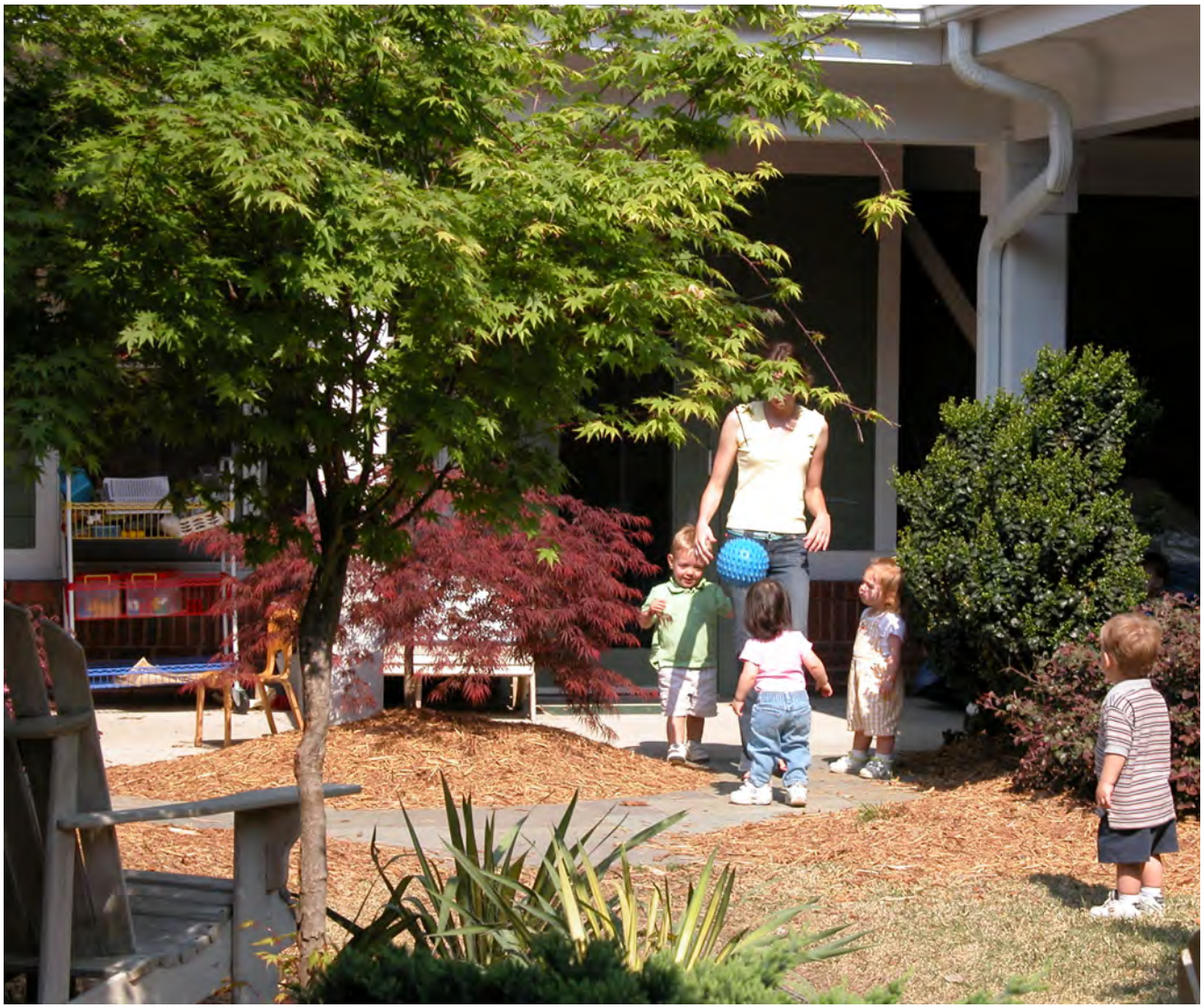

Figure 3. Cloistered courtyard shades classroom but at the same time offers an intimate, transitional, sunny, sheltered space close at hand. Bright Horizons Design and Chris Smith with the Natural Learning Initiative. Courtesy of Robin Moore and Nilda Cosco

Figure 4. Protected, welcoming naturalized entry from parking area. Bright Horizons Child Development Center, SAS Institute, Cary, NC. Design: Leslie Booker. Courtesy of Robin Moore and Nilda Cosco

long-term site development. As the school expands, these needs will grow and become more serious functionally because of sheer size. There is nothing more disheartening than being forced into converting developed grounds into parking to fulfill local mandatory regulations. Realistically, set land aside in the master plan for this eventuality. Consider designing a group games open field with a prepared turf surface to accommodate overflow parking for occasional community events at the school. Make sure the entry driveway/vehicular approach to the school entrance will continue to serve efficient dropping off and picking up of children—including possible bus transportation (see Figure 4). Hurried parents, in the morning especially, do not need to suffer extra anxiety (then transferred to children) caused by hazardous, inconvenient drop-off and parking conditions.

**Surface Drainage**

School grounds surface drainage can be designed as a life-supporting system with finely differentiated lines of flow coinciding with appropriate division in the landscape between play and learning settings. The most common is alignment along the edge of pathways (see below). Flows may also be designed as vegetated swales containing anti-erosion, wildlife-enhancing plantings (see Figure 5). The main point is that the surface drainage flows be more finely differentiated and be integrated into the design of other settings.

A growing number of communities have water quality and storm water management requirements, which should be viewed as opportunities for new types of enhanced learning settings. A required detention pond can be designed as a wildlife habitat and as a place for special study. Although enclosed

Figure 5. Vegetated swate ensures precipitation stays on site to recharge ground water to help sustain the local ecosystem. Courtesy of Robin Moore and Nilda Cosco

for safety reasons, it can be an exciting destination for classroom field investigation trips.

**Site Circulation**

Apart from surface drainage, effective site circulation is the most important aspect of the site master plan. Circulation is expressed as a pathway system, the purpose of which is to enable children and teachers to have safe, extensive access and intimate contact with the natural settings designed into the grounds. Pathways enable children to go on journeys through the landscape, exploring along the way, playing with friends, interacting with wildlife, collecting natural objects, imagining, immersed in sensory richness. Pathways are not only routes connecting different settings but offer channels of experience enhanced by adjacent beds of colorful, textured, aromatic planting. Arbors and low trees arching overhead may extend the third dimension. Benches offer resting places. The scale of pathways and related natural settings must be designed to expand in territorial scale with age. Access to a constantly changing, rich natural landscape will entice children to enjoy rediscovering it day after day. A hierarchy of three types of pathways (primary, secondary, and tertiary) can be considered. Together, they serve a variety of functions.

Primary pathways are a functional necessity. They should be designed to provide easy, attractive circulation throughout the outdoor space and connect classrooms to their respective play and learning settings. Primary pathways provide spatial structure and allow children and teachers to move easily and quickly through the space when necessary (see Figure 6). To satisfy accessibility requirements, primary pathways should also be designed to serve as accessible routes. Design specifics include the following:

- Wide curves and a minimum width of five feet will accommodate intense pedestrian traffic.

- Gently curving forms integrated with adjacent plantings and other play and learning settings will satisfy access requirements and provide an interesting, exploratory movement experience. Alignment should avoid sharp corners, bottlenecks, and dead ends.

- Small side niches can be designed to add interest and opportunities for group interaction and exploration.

- Primary path surfaces should be smooth and flat. Longitudinal slopes should not exceed twelve percent and should be limited in length. A cross-slope of not less than two percent should be provided for positive drainage.

- Concrete primary paths are preferable. As they are being poured, children may leave hand, foot, or leaf imprints in the wet surface (make sure hands are washed immediately). Alternatively, small, circular cut-outs eighteen inches (forty-five centimeters) in diameter may be left for children and teachers to later inset with artwork using pebbles, tiles, glass beads, broken china, and other interesting objects. Tinted concrete can be used to add visual appeal and blend with adjacent natural colors for a small additional cost.

- Asphalt is an acceptable primary pathway surface. However, its bland dark grey color is unattractive and provides low figure-ground contrast for visual orientation of children. Asphalt absorbs heat in the summer and can become unbearably hot in direct sun unless painted with special asphalt paint (available in many colors).

Secondary pathways should be considered as an independent circulation system intersecting with the

primary pathway system, connecting intimate play and learning settings such as wildlife habitats, gathering places, sand-and-water-play settings, sensory mazes, storytelling corners, and flower and vegetable gardens. Widths can be as narrow as thirty inches (ninety centimeters). Appropriate surfacing materials include shredded hardwood mulch, gravel, decomposed granite (preferably with a polymer binder), and timber decking (see Figure 7).

Tertiary pathways may be considered as small-scale "animal runs" that can allow children to take short, perceived by children as "secret" exploratory journeys into intimate landscape settings. They can branch directly from primary or secondary paths and be as narrow as eighteen inches (forty-five centimeters) and just a few feet or meters long. They may be surfaced with the same materials as secondary pathways or designed with stepping-stones or slices of timber (see Figure 8).

**Gathering/Meeting/Working Settings**

Pathways afford movement through and in the landscape. Children together and children working with teachers also need places to meet, to work on outdoor projects, to collect and organize samples, conduct field observations, compile records, write field notes, etc. Think of these settings collectively as a substantial expansion (doubling) of indoor classroom space.

Depending on the children's age, outdoor activities may be supported by a variety of settings. Ground-level wooden decks are appropriate for children three to six years old, or more dramatic elevations may be available (see Figure 9). Lower

Figure 6. Shady, curvy, richly planted, hard-surfaced primary pathway connects to community settings such as a drinking fountain, gathering spot, and many othersettings. Bright Horizons Child Development Center at GlaxoSmithKline. Design: the Natural Learning Initiative. Courtesy of Robin Moore and Nilda Cosco

Figure 7. Soft-surfaced secondary pathway offers children daily exploration of the natural world. Courtesy of Robin Moore and Nilda Cosco

Figure 8. Narrow tertiary pathways offer children the quiet, intimate sensory stimulation of nature. Bright Horizons Child Development Center, SAS Institute, Cary, NC. Design-build: Chris Smith with the Natural Learning Initiative. Courtesy of Robin Moore and Nilda Cosco

and upper elementary children will feel more comfortable at worktables. Upper elementary and middle school ages may spend whole periods outside and require a covered setting with tools and materials available. Classroom groups of all ages benefit from outdoor classroom settings where extensive curricular activity can be conducted (see Figure 10). Such settings may be large enough to accommodate a whole class, roofed over to shelter from the rain, and partially enclosed, depending on the level of climatic protection desired. Whatever form the design may take (which may resemble the transitional spaces described below), this type of outdoor classroom can substantially change curricular dynamics by opening up the possibility of extended periods of learning in the outdoors, setting in motion a model of Montessori education that logically leads towards the Erdkinder middle school as exemplified by the Hershey Montessori School's Adolescent Community, a Montessori farm school model (Huntsburg, OH), where the "school" becomes a cluster of indoor/outdoor spaces, each devoted to a specialized, hands-on function.

**Indoor-Outdoor Transitions**

Where classrooms meet the outdoors are crucial spaces that, with appropriate design, can substantially expand the repertoire of learning activity (see Figure 11). In cold, harsh climates, winter gardens or conservatory-type glazed settings can serve as sheltered transition spaces between classroom and outdoors. Indoor plants and seedlings can flourish there for later outdoor planting. Unfortunately there are few design precedents for these types of spaces. Architects are either unaware of their importance, and/or there is insufficient collaboration between architect, landscape architect, and teachers to create them.

Figure 9. An elevated hillside deck offers children a commanding, secluded (yet visible to teachers) "prospect and refuge" at the Child Study Center, Wellesley College, Massachusetts. Design: the Natural Learning Initiative. Courtesy of Robin Moore and Nilda Cosco

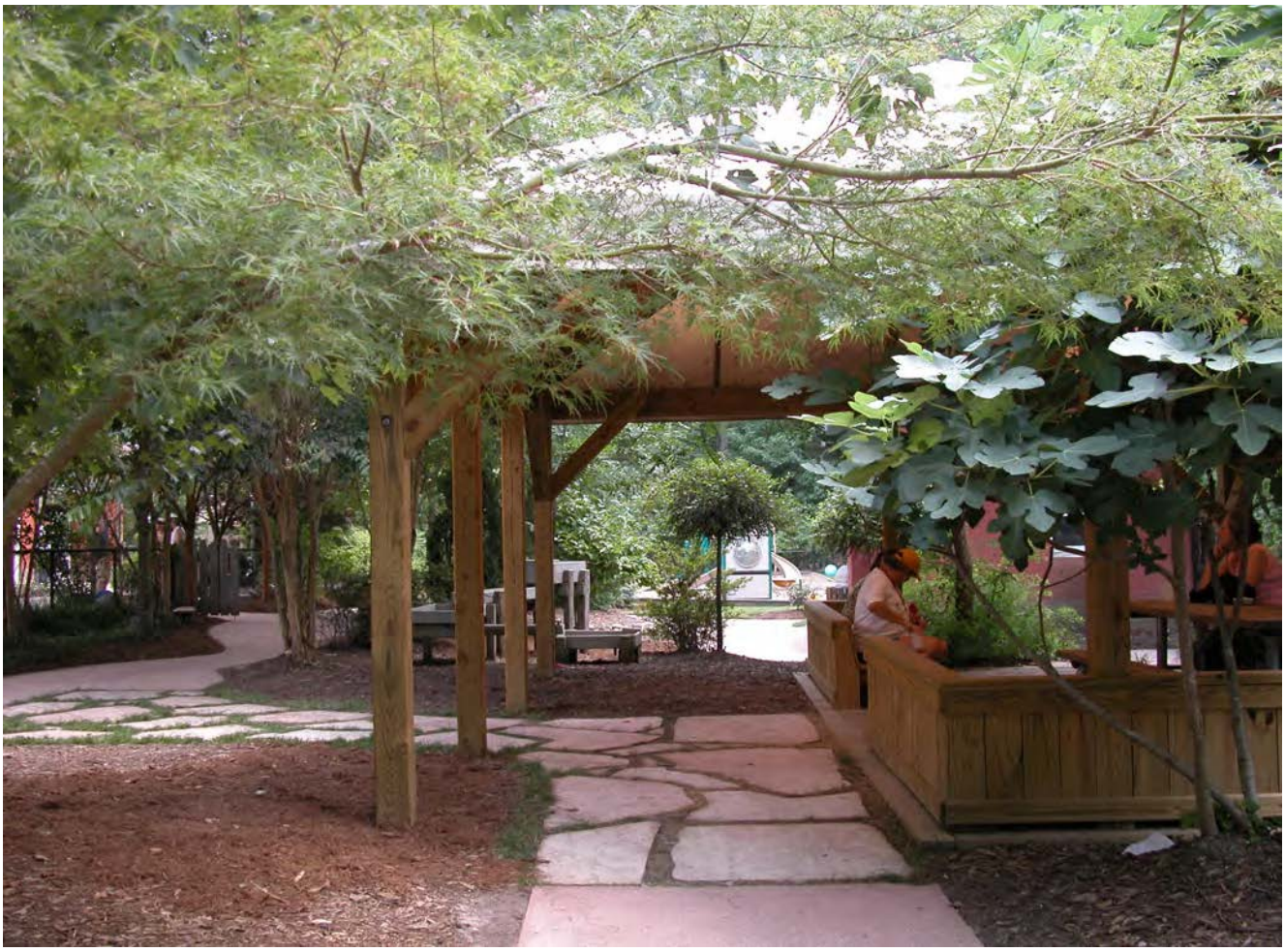

Figure 10. indoors moves outdoors in this ample, translucent, covered outdoor classroom. Bright Horizons Child Development Center at GlaxoSmithKline. Design-build: Chris Smith with the Natural Learning Institute. Courtesy of Robin Moore and Nilda Cosco

### The Living Landscape

Once the grounds are served by a circulation system and related gathering/meeting/working settings, the spaces between, depending on topography, sun exposure, and existing vegetation (if any) offer a vast array of possible natural treatments. Aquatic settings described earlier offer one such possibility (see Figure 12). Other possibilities include flower and vegetable gardening (a key priority for healthy nutrition education; see Figure 13), fruiting orchards, and native habitats (butterflies, birds, amphibians, terrestrial insects; see Figure 14). Settings may be project-focused and include shelter building, craftwork with natural materials including the making of fired clay utensils, cooking, natural dyeing, and many other possibilities linked to studies of indigenous cultures and geography (see Figure 15).

### Pedagogy in Place

Once the site infrastructure is in place, development of a nature-based Montessori curriculum depends largely on progressive pedagogical leadership to inspire sufficiently trained teachers to enthusiastically embrace the challenge of creating a place where pedagogy and designed landscape can be integrated (see Figure 16).

The impact of natural settings on children's emotional development and functional behavior is impressive and promising. Recent empirical research has produced dramatic evidence to support historical assertions that natural surroundings, even as little as a view of nature from indoors, can positively affect cognitive functioning (Wells), improve attention functioning, and thereby reduce symptoms for children with attention deficits (Faber Taylor et al.).

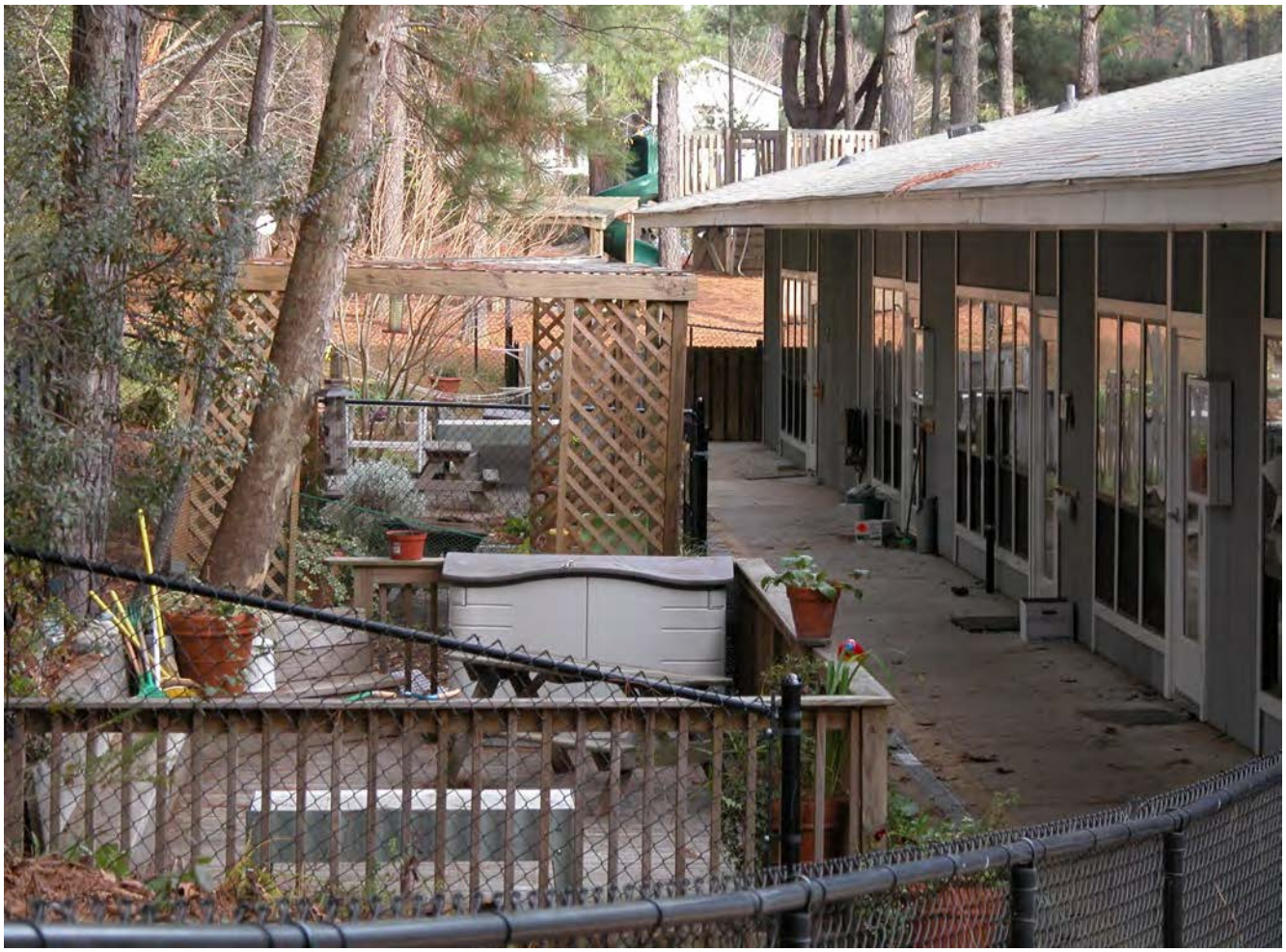

Figure 11. Transition area and outdoor classrooms. Children's House, Montessori School of Raleigh. Courtesy of Robin Moore and Nilda Cosco

Figure 12. Rain gardens are easy to install in a wet depression. Common aquatic plants rapidly establish themselves to create a mini-ecosystem attractive to a multitude of birds and insects. Courtesy of Robin Moore and Nilda Cosco

These data reinforce more general research conclusions that suggest better attention functioning and learning outcomes are linked to a variety of nature experiences such as gardening, viewing slides of nature, and simply having grass and trees in one's outdoor setting (Wells; Kaplan; Kuo; Faber Taylor et al.). Environments that are bland and bare or lack opportunities for hands-on activities become boring. Such environments actually provoke antisocial behavior in children and are not conducive to learning (Moore & Wong).

Territorial range development recognizes that maturing individuals explore, discover, and make sense of their expanding world through experience, learned skills, and spatial understanding (Moore, "Playgrounds at the Crossroads"; Moore & Young; Hart). To maintain this dynamic relationship with the environment, children repeatedly act at their territorial limits, constantly expanding the "known"

Figure 13. Easy to build multilevel learning garden. Construction above ground offers children a more comfortable, accessible working surface and provides space for higher quality planting mix. Courtesy of Robin Moore and Nilda Cosco

Figure 14. Moveable rocks offer children an irresistable urge to explore and discover what lives underneath. Courtesy of Robin Moore and Nilda Cosco

Figure 15. Rough ground in the edge of the school grounds offers learning opportunities for larger scale, hands-on projects. Courtesy of Robin Moore and Nilda Cosco

Figure 16. Fruiting plants such as grape vines provide opportunities for learning expeditions outdoors. Courtesy of Robin Moore and Nilda Cosco

world by pressing against the "unknown" (see Figure 17). For children to exercise their exploratory skills beyond the known, space must be designed with soft, extendable territorial boundaries. Territorial development, natural settings, and the learning they afford focus children's attention day after day as they progress through the school. Across successive generations experiencing a co-created landscape, children and teachers continue to evolve an outdoor culture that helps the whole school community understand their place in the universe.

Applied to design, this view of territorial development provides individuals with a landscape offering new exploration challenges and discoveries (see Figure 18) with each visit as well as novel educational opportunities. Given the range of ages, levels of ability, and variety of inter-personal relationships present among children, environments

Figure 17. Children explore the edge of their known world at further reaches of their school ground territory. Courtesy of Robin Moore and Nilda Cosco

with higher levels of diversity are likely to satisfy the exploratory needs of more children at any given moment. School grounds with effective territorial range development would thus hold the interest and attention of children regardless of their ability or learning style. Territorial design will similarly motivate the continuing interest of teachers, who will be as excited to go outdoors as their children and feel comfortable once they are there. The greening of school grounds will then bear expected fruit.

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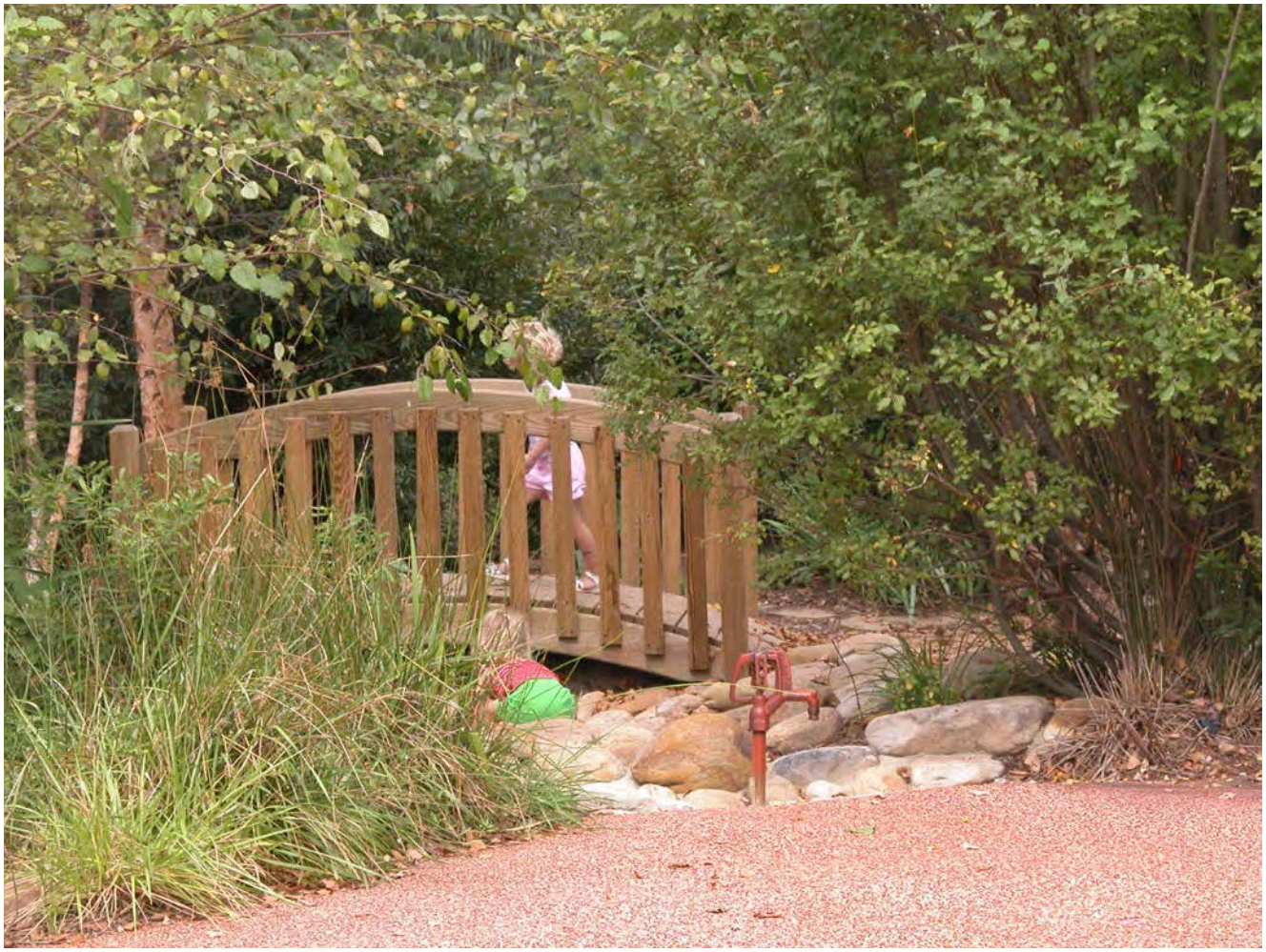

Figure 18. Landmarks offer experiential events along the way, marking the sense of an unfolding world day to day. Courtesy of Robin Moore and Nilda Cosco

### Websites

Natural Learning Initiative: www.naturalearning.org

LEED (U.S. Green Building Council): http://www.usgbc.org/DisplayPage.aspx?CategoryID=19

Hershey Montessori School adolescent program on the farm: http://www.hershey-montessori.org/adolescentCommunity.cfm

Greensboro Montessori School: http://www.thegms.org/campus/permaculture_montessori.asp

Wellesley College Child Study Center virtual tour: http://new.wellesley.edu/csc/tour

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Courtesy of Vanessa Toinet, Ecole Montessori du Morvan, Bard-le-Regulier, Burgundy, France

Courtesy of Chris Trostel, Montessori Borealis Public, Juneau, Alaska

# Nature Experience and Education

by Kevin Rathunde

*Kevin Rathunde turns his research lens to the task of finding out the relevance of the natural world, its impact on adolescent motivation, and its positive sustaining of concentration and focus. He cites "disembodiment and denaturing" as needing to be countered by contact with nature, leading to higher creativity, less drudgery, and more positive social interaction for an adolescent community.*

Today I'm going to talk about nature experience and education. It's a new research topic, but hopefully some of the connections to my previous study on flow and Montessori education will become obvious as I go along. I again feel like a kindred spirit with Montessorians, but this time connecting on the idea of nature. I'm excited about the prospect that Montessorians have something important to communicate to the outside world on this topic.

Here's a brief outline of what I'm going to talk about today. First, I'm going to discuss why it's important to study nature and education. Next, I'll talk a little bit about what Montessori had to say about the importance of nature. Finally, I'll give you a very general idea about a possible new study. This work is still in the formative process; I would love feedback and some of your ideas for conducting new research.

So why do research on nature and education? Let me start with why such research would have personal relevance. Then I'll get to some of its theoretical relevance. I accepted a job at the University of Utah partly because of experiences that I had in nature. I love the desert and the mountain environments in Utah, I love to hike in the canyons, and that was certainly one of the reasons I moved there. Also, when I was a student at the University of Chicago, right before I took my job at Utah, I bought a book called *The Experience of Nature* (Kaplan and Kaplan). It's been in the back of my mind to do this kind of research for a long time. So this is also something I'm very excited to do.

As for theoretical relevance, I want to mention three reasons why research on nature and education is important. The first reason would be our biological connection to nature. Many of you may have heard of the notion of *biophilia,* introduced by Edward O. Wilson, which basically says that, because of our evolutionary past, over thousands and thousands of years in connection with nature, we have developed an affinity with nature. We're prepared to learn about and even have preferences for certain kinds of natural environments because of our evolutionary past. Here is a related quote from Abraham Maslow, which I've been using in some of my Theories of Human Development classes for over ten years. This was written in the late 1960s, before the biophilia concept, and it says the same thing:

> Perhaps [man's] thrilling to nature . . . will someday be understood as a kind of . . . biological authenticity. . . . Here the "highest" experience ever described, the joyful fusion with the ultimate that man can conceive, can be seen simultaneously as the deepest experience of our ultimate personal animality and specieshood, as the acceptance of our profound biological nature as isomorphic with nature in general. (333)

What I see Maslow saying is that our highest transcendent experience, the kind of feeling I have in the canyons of Utah, being connected to something outside of myself, something higher, and that feeling of awe and wonder, is at the same time part of our animality, part of our biology. And I think Maria Montessori understood this as well.

A second reason, and I know you will all agree with this, is that there's a de-naturing of childhood going on. There's too much disembodied knowledge. We're disconnecting hand from head in a lot of schools. And there's a kind of second-hand experience through television, through video games, rather than primary experience in the environment. It's very distressing. Here are a couple of quotes from people that a lot of Montessorians know and

respect. David Orr comments, "The civilization we have built causes us to spend 95% or our lives indoors, isolated from nature" (204). David Hutchinson adds, "As our artificial transformation of nature advances, our presence to nature declines" (xiii). So, as I said, there's a de-natured, a disembodied aspect to student experience that I think diminishes knowledge and learning in schools.

The third thing that I would say about why it is important to study nature and education is that even though we have this biological connection and we're living at a time where we're disconnecting ourselves from nature, right now there's hardly anything about this dilemma in educational policy. I'm not talking about Montessori and Montessorians, who have seen this connection, but in broader educational policy, there's not much written, there's not much research. So I think now is a good time to be thinking about doing research on nature in an educational context.

So what does science have to say about the benefits of nature? There's some really interesting research out there, and I think you might be surprised by some of this. There are a lot of anecdotal reports in wilderness therapy suggesting that challenging experiences, being out in the wilderness, is good for self-esteem and competence. There are dozens and dozens of studies that say nature experience leads to positive affect—and even when you show people slides of beautiful environments, it picks up their moods. There are studies in medical journals about nature and the reduction of stress. Some doctors are getting involved and saying that we're forgetting about the environment and how important the environment is to health. Other studies I read were very surprising. Just having a green view is related to a number of positive outcomes. Recovery from surgery is faster when you have a green view. If you have a mural on the wall in the dental office, there are lower levels of stress. In prisons, if prisoners had a green view, they had fewer visits to the infirmary. And with homes as well, children who move from apartment buildings to greener environments show an improvement in their cognitive functioning. Some studies with children show that in green environments they are less aggressive, more social, and have better social interaction.

All of these studies suggest that a greener environment would be healthy for students. But I still don't think we've nailed down what is specific to education and what is specific to Montessori. I think we all would agree that less stress and positive affect are good for students, but let's try to narrow it down to education a little bit more. So let's talk about Montessori.

Here is a quote from Maria Montessori that I think is consistent with the Maslow quote mentioned earlier and the notion of biophilia: "There is no description, no image in any book that is capable of replacing the sight of real trees … in a real forest. Something emanates from those trees which speaks to the soul, something no book, no museum is capable of giving" (35). What I love about this quote is that she's talking about the limitations of images in a book, and I think this applies to our increasing reliance on media images as well. What is missing is primary, direct experience. Montessori clearly recognized the educational importance of the direct experience of nature.

You all know better than I the connections to nature in Montessori's writings, but here are two additional ideas where I think she was ahead of her times. First, she suggested that joy, wonder, and the experience of nature in childhood would lead to lifelong learning as an adult. A child was more likely to become an advocate for and a protector of the environment on the basis of this kind of experience. A second important idea is that sensorial experience provides a base for abstract thought. There is a lot of really interesting thought in philosophy right now on "embodied knowledge," or how abstract knowledge is an extension of our sensory experience. And I think Montessori understood this: Nature and the infinite variability of sensory experience provide an essential foundation for abstract thought.

Both of these are very important ideas, but they are also hard to study. I would have to do a longitudinal study to look at the connection from childhood to adulthood in terms of these outcomes. But I have a general idea for a new study that is more practical and better connects to the research I just completed. Believe it or not, there's research that suggests that nature has a positive effect on concentration and attention. This finding provides a potential bridge to my last study on flow and education. In other words, the reason the flow perspective provided such a good fit with Montessori philosophy was the shared belief that deep concentration, or flow, was essential for

Courtesy of Annie Fisher Montessori Magnet School, Hartford, Connecticut

education. There are many indications that nature actually has a positive effect on concentration.

I've looked at about ten studies already that have done pretty good research on how nature improves attention and concentration. Let me give you a little background before I tell you about some of the studies. The research, in general, is looking at what some call mental fatigue, which is exactly what you would get if you sit all day long, if you're concentrating, using directed attention, which means you have to focus and block out competing stimuli. That's a hard thing to do without any kind of break. Sometimes you need to use other kinds of attention, which I'll get to in a second, before you can really get your focus back. So that's the theory underlying this research. It actually comes from William James, whose work is also relevant to the flow perspective.

What others find is that nature has a restorative effect on concentration. Nature engages a different kind of attention that's more automatic and effortless, a kind of calm, focused observation that restores the ability for directed and selective attention. It is called attention-restoration theory. One group of researchers studied individuals who went on backpacking trips or nature walks versus those who participated in different kinds of recreational or resting activities. After their activities, the study participants were given cognitive tasks in proofreading, and the proofreading scores were better after the nature experience.

Other studies have looked at the greenness of preschools and children's ability to focus attention. There seemed to be benefits for attention deficit hyperactivity disorder, again showing that kids had a greater ability to focus when they were in a greener preschool environment. Breast cancer survivors—right after surgery there's a great demand on attention, and the ability for selective attention tends to decline because of all the stress. In controlled studies, when they integrated nature activities in some groups versus others, the selective attention, the ability to focus and concentrate, improved in the breast cancer survivors who integrated nature activities. Some researchers have done studies on the dorm room views of college students and found that a green view improves students' attention and concentration. There has also been a bit of physiological research—although not much—suggesting that nature evokes brain waves more characteristic of calm and focused states of attention.

This is an area where I think we can influence educational policy in the sense that no one would deny the importance of concentration and the ability to focus attention in school. I think we are undermining learning in schools that are cutting out recess, in schools that are saying, "We are so worried about evaluation and testing that we need to cut out what's frivolous and just really focus on academic tasks." Education needs to have the balance we've been talking about today at the conference: Students need the regeneration of energy that comes from the alternation of different kinds of activities. One way to get this regeneration is with the integration of nature with school-related intellectual activities.

I start from the assumption that mental fatigue and drudgery are ruining many schools and resulting in disembodied education. And I want to show you an example of this from the flow study we just finished. As you know, we looked at five Montessori schools and compared them to six demographically

Courtesy of Scripps Montessori School, San Diego, California

matched traditional schools, so these kids were all in similar-sized classes and had parents who had similar amounts of education. We used the Experience Sampling Method. Two research articles were just published in good education journals (Rathunde and Csikszentmihalyi, "Middle School Students' Motivation"; Rathunde and Csikszentmihalyi, "The Social Context").

This is my favorite finding from the study. We used a measure of experience that we called "important but not motivating." It's when students are saying they're concentrating and focused on what's going on in the school environment, but they're not enjoying it, they're not in a good mood, they're not motivated at all. This is what is meant by mental fatigue and drudgery. It's concentrating without the sense of emotional connection, without some sense of motivation. We found a big difference: Montessori students spent four hours less a week than traditional students having this kind of experience.

Now what were the reasons for this? In the research articles we talked mostly about the classroom context, things like having supportive teachers, free choice, and positive interaction with peers. But I think nature experience, and the integration of the natural environment, may be part of the answer here, too, for elimination of this kind of drudgery.

So, what I'd like do is study how nature experience can heal drudgery and mental fatigue and lead to better concentration and a higher quality of student experience. One possibility would be to introduce a task, maybe a creative task, and then have a couple of conditions: a nature experience condition and a control condition. Outcome measures might look at students' experience, concentration, and creativity during the task. Another possibility is to do something more ethnographic and qualitative. This would involve talking to the students and getting them more directly involved in the research as participants. Both are still options that I am considering

The final thing I'd like to do today is to try and convince you to help me with this research. This study will not be like the last one. The last one was a little bit like "Montessori versus . . . " and "Montessori is better than . . ." Whatever the form of the new study, it is not going to be about comparing Montessori schools to traditional schools. However, I think you should get involved for this reason: Maria Montessori was very much ahead of the times with her ideas about nature and education. Only now are people starting to realize the kind of civilization we've created that instigates a de-naturing, disembodied process where kids are primarily having secondhand experiences. There are now more people talking about the design of schools and the integration of greenness into the environment. I think a new study would come at an opportune time, and, just like the last study, where I could argue that Montessori was an existing culture that actually was living what other people were talking about as reforms, I think the same thing could be said about the integration of nature. Montessori is an existing culture that already recognizes the importance of nature for education and could be a model for looking at how to reform schools. So that's my pitch for you to give me some ideas and maybe, if I get a grant, to invite me back into your schools. Are there any questions [from the audience]?

***Q.*** *It occurs to me that there is continuing pressure on Montessori schools to de-nature their environments and place more emphasis on academic performance and academic outcomes, and there's a growing need for a body of work that substantiates and rationalizes the outdoor experience as being just as beautiful and just as productive and, in fact, as being a necessary prerequisite to academic performance. From our perspective,*

*internally, we need those kinds of research and tools to help our parents better understand the value.*

**A.** Yes, that would be a way that would also serve the Montessori community. Well, that's great to hear, because what better outcome variable could you think of than this kind of engagement and concentration? You need focused attention for learning, no one would deny that, so if you can show that the integration of the natural environment and these kinds of experiences are important for that outcome, it makes a powerful argument, and you actually are undermining learning by trying to expect nonstop concentration.

***Q.*** *If you have to overcome the anti-New Age bias, bring up people like Locke and Rousseau and Thoreau—that's all part of our tradition in this country, as innovative thinkers, this whole need for that hands-on nature experience.*

**A.** Right. And there are a lot of wonderful anecdotes of creative individuals who have had insights in nature. In interviews that I did for Csikszentmihalyi's creativity study, Linus Pauling talked about moving rocks around in his garden as an interlude in his work. The eminent historian William McNeil talked about chopping wood as an interlude in his creative work. So I heard it all the time in the creativity setting as well.

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Courtesy of Montessori School of Beaverton, Portland, Oregon

# The Ecology of the Mind

by Luciano Mazzetti

*Dr. Mazzetti's almost lyrical description of the role of encounters, both human and natural, suggests the terrible difficulty that would occur if the diversity of the natural environment, which is so essential to Montessori's prepared environment was lost. In principle, Dr. Mazzetti suggests that the child's encounter with the world needs deep exposure to a healthy natural world, spontaneous and purposeful, in order to make a contribution to saving the planet.*

The title of this lecture, "The Ecology of the Mind," comes from a book by the same title, written by the American author Bateson who confronts the problems of the 21st century with this outlook. The problems of the next century will not only be problems of ecology, i.e., the relationship between man and the environment, but they will also be problems of the ecology of the mind. Everything that humanity is now experiencing can have ramifications on the minds of men and create for humanity many risks and many dangers. These sorts of risks can be much more dangerous than an ecological disaster. I will try to give you several concrete examples of this, starting with a thought from Maria Montessori.

She wrote that the universities of war are busy doing their work, while universities of peace don't even exist. The universities of war have been very busy in recent years. Research from their laboratories of death permit us to say that we live in atomic terror, that each of us is sitting on a nuclear warhead. The manipulation of genes in laboratories, research in cybernetics, telecommunications, and computer science are reacting on our minds and on our bodies. There is medical research being done that foresees, in a not too distant future, a fixation of the optic nerve as a consequence of television exposure over many generations. Culture has always had effects on biology. The invention of the fork has modified man's dental physiology. In the past, teeth were strong instruments meant for ripping and cutting. This little technological discovery, the fork, was enough to modify a physiological condition.

Contemporary science has surrounded us with an environment that can have damaging effects on the equilibrium of the human mind. Blind faith in science also risks suffocating man and human language in a dimension of objectivity. It's almost as if computer language—formal, exact, precise—could replace the ambiguity and the fragility of the human word, the subjective word. If science has produced and is still producing all of this, the resulting imbalances in human life and especially in education appear evident.

In the last three years, three research reports have come out, each dealing with the conditions of children in our world. I will quote only their titles: *Children Without Childhood, The Disappearance of Childhood, Children in Danger.* From this research it is very evident that latch-key children, without mother, father, or environment, carry with them wounds and scars that are often indelible.

Perhaps these are the problems the 21st century offers us. Science can't solve them all. An Austrian philosopher of science, Wittenstein, wrote that even when science will have resolved all its problems, every man will wake in the morning with his own problems on his back. This means that problems are not only those of science, that man's most important truths are not those demonstrated by exact sciences. They are those precarious truths that each of us faces daily with our own courage and our own fears. Albert Camus wrote, "We have scraped the sky with great aerial furrows. We have built farms in the depths of the ocean and we are building the future in the deafening din of factories. All of this and we are discovering that perhaps it wasn't worth a friend's hug, a rose's perfume, warm pebbles in a stream."

Confronted by these problems, I have asked myself if, in Maria Montessori's pedagogic message, there might be some possible answers and therefore even a hint of necessary hope. I believe I have gathered or discovered them around two basic concepts in Maria Montessori's thought: the idea of man and the idea of liberty.

When Maria Montessori speaks of man, she often uses a capital "M." What does this capital letter represent? What does it mean to write a book and entitle it *The Formation of Man?* What does it mean to define education as a help to life? What does it mean to "educate the human potential?" What's behind the metaphor of the child as constructor of man? What's behind the metaphor of the child who works, the child laborer, the builder of man? What's behind the metaphor of the child as "intellect of love," an expression Montessori borrows from Dante? It's evident through these metaphors that Maria Montessori sees the humanization of man as the goal of her pedagogic plan.

To humanize man, to construct a new man, these are the moral principles that inspire all of Maria Montessori's thought. But what does it mean to humanize man, to make man more human? It's almost a prayer: Make us human beings. This construction of man, this creation of man, doesn't occur once and for all but rather each of us accomplishes it daily, each child constructs it daily.

In re-reading Montessori, it's evident that this process of humanization is realized through encounters. John Dewey said that the life of every man is like the course of a long river. The curves of this river are built by the encounters each of us has with others. A child encounters a mother and from this meeting, the course of the child's life is changed. A child encounters an environment, and her life can change because of it. Each of us, then, is the product of a series of more or less fortunate encounters. The encounters that have formed us have been with people, with objects, with reality, with the cosmos. Let's examine them one by one.

First, encounters with people. Psychoanalysts say that it is possible to construct the ego, the *I*, only through the encounter with another, the *you*. The construction of the ego is possible only if each of us can see himself in the face of another. In fact, the words "I" and "you" have no gender. Gender appears only with a third person. The *I* and *you* transcend every possible encounter and it's only from the *I-you* encounter that we humanize ourselves.

What are the characteristics of the encounter with another? In the first place, each of us needs to meet a master. I mean master in the Greek sense of the word, in the sense of Socrates and Plato, the master or *majenta* who recognizes that in every child and perhaps in every man there is a profound treasure, a hidden energy that the master must succeed in bringing forth. Once when the sculptor Michelangelo was in the Apennine Alps getting marble, a quarry worker asked him how he had made the David. Michelangelo answered, "It was all contained in a block of marble. All I did was bring it out." Michelangelo, an example of master as *majenta,* the one who brings forth.

Let's look for a moment at Montessori teachers. What does the delicacy of intervention mean? What does non-intervention mean? What does this capacity to attract or seduce mean? What does it mean to be present and absent at the same time? What does it mean to be ready for the child's request, "Help me to do it myself"? What does it mean to observe a child, if not listen to her most profound questions? So a Montessori directress has inside herself all the characteristics needed to encounter the other and assist the child in her humanization.

Next, there are encounters with objects. In the beginning, these encounters are casual. Yet we now know how important these encounters are. A child encounters a mother, a room, colors, sounds. The environment is hardly ever organized; nevertheless, the child's mind completely absorbs it. And this environment, full of details and particularities, many times escapes our adult mind.

Rita Montalgini, an Italian scientist who recently received a Nobel Prize, believes that neurons in the brain actually seize and envelop experiences from an environment. Therefore, contained in our neurons are its colors, the sounds, and finest details. This relationship with objects is therefore of utmost importance: the sounds that a child hears, the noises, the colors, the details.

To you who come from a Montessori perspective, what can I add to the importance of the environment? Each of you well knows what it means to organize

Courtesy of Montessori High School at University Circle, Cleveland, Ohio

and care for an environment. You know what it means to watch for the smallest detail, to transform an environment into a fragment of the cosmos that can help a child construct herself into an adult.

Then there's the encounter with reality. All of Freud's thought revolves around the principle of conflict between the world of our desires and the world of reality. Each of us forms a conscious ego in the relationship and conflict between the world of desire and reality (which doesn't bend to desires).

Almost all the psychiatric disturbances of our times are products of a terrible relationship with reality. Hallucinations (Maria Montessori wrote a thesis on hallucinations) are nothing but a falsification of reality. A paranoiac is someone who escapes from reality. A neurotic is someone who makes rigid the framework of reality. Briefly, our mental equilibrium depends on the rapport we have with reality. The precarious, unsure balance is the basis of one of the most beautiful works of Spanish literature, *Don Quixote.* Don Quixote without Sancho Panza would have been only a poor idiot. This means that reality and our relationship with reality are fundamental for every human being. An infant just a few months old will cry if her bottle isn't brought immediately. A baby just a bit older will cry if she can't get candy because the store is closed.

To educate a child means also that the child won't cry just because the store is closed. If education means educating to reality, what is normalization? Wouldn't it be just another name for educating to reality? What are escapes, deviations, barriers, if not efforts to flee from reality? When we set limits in an environment, we build a place that can educate a child to reality. This education to reality, which follows the encounters with people and with objects, leads us to the last encounter with the cosmos.

Let us go on to the encounter with everything that the human being experiences, the cosmos. The cosmos means order. It means gathering the hidden relationships between things. It means being conscious that "at this moment, my words may

disturb the stars," As a Spanish poet once said. It means being conscious that in the cosmos, we are a tiny fragment but a vital fragment. We are as a drop of ocean water, as important as the whole ocean because an integral part of it.

In short, humanizing man, helping him become more human, is possible only if we are very conscious of these different encounters—with people, with objects, with reality, with the cosmos. But humanizing man so he can respond to the problems of the 21st century, a decisive and important challenge, is possible only in presupposing a process of liberation. Liberation is another word for humanization.

When speaking of freedom, many things might be understood. I believe that when Maria Montessori spoke of education for autonomy and for freedom, she meant two things. In the first place, a transparent or easy freedom, one that can be given or taken away, doesn't exist. It's as if the freedom Maria Montessori meant were a weighty freedom. On each of us and on each child is a sort of lid or cover. We can only live in freedom when we slowly lift up the heavy edges of this cover. This means that perhaps we are not born free. Perhaps we have no freedom of choice because so often we are obliged to choose and obliged to be free.

The real process of liberation can be identified in distinguishing between the following two concepts. For many centuries, we have striven to liberate ourselves *from*—from many economic chains, from thousands of types of slavery. In confronting the 21st century, it's important to liberate ourselves *for*—for carrying out a plan or a mission.

Perhaps in the 21st century, the mission for which we liberate ourselves is a cosmic mission. For every educational deed, there is a dream or hope that animates it. It's impossible to educate without a goal or without a hope. An Italian has written that "to educate is to dream." Even today as we confront the 21st century, we need a dream, but a concrete dream. We need to take this difficult risk.

Maria Montessori offers this concrete dream and the reason for this risk. Humanize man, construct man, bring out the man hidden inside. A free and human man can build a new world and a new society. Freedom is a long process of liberation which has spanned human history and which, in the 21st century, runs some great risks. Technology is the ruler today, a less visible prince but perhaps more dangerous than the ruling princes and kings of the past. Each of us here must achieve Maria Montessori's *freedom for* so that we may all succeed in being human and conscientious. One day, we will find ourselves face to face with a child, an adolescent, or simply with another person with whom we share life, and we must be *free for* them. As an English poet said when speaking of his own children, "Let them fly free in the sky like birds and be for them that piece of beach where they will go to rest when tired."

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Courtesy of Vanessa Toinet, Ecole Montessori du Morvan, Bard-le-Regulier, Burgundy, France

Courtesy of Chris Trostel, Montessori Borealis Public, Juneau, Alaska

# The Great Work of the New Millennium

by Thomas Berry

*Thomas Berry explores the meaning of work from the standpoint of human civilization responding to the call of the Universe, replacing use and exploitation of nature with the wonder, rapport, and intimacy so important to the psychic balance of the developing human and natural harmony of life on earth. The Great Work is defined as the work of thousands upon thousands of humans who recognize how to be present to the Universe and reverse the tragic misuse of our natural environment.*

I'm highly honored to be invited to spend some time with you this morning and also honored that a group of people such as you have dedicated yourselves to the children. I have a certain awe of children. In this difficult period of human history I've always wanted to assist them to be themselves and to shape a world that would be more filled with joy than our world seems to be.

That's why I dedicated the book *The Great Work* to the children—but to all the children, and that is the key to the book: the dedication to all the children. To the children who swim beneath the waves of the sea, to the children who live in the soils of the earth, to the children of the trees, to the children of the flowers in the meadows and the crickets in the fields, to the children that fly with the wings of the wind, to the human children, too; to all the children, because none of the children are going to succeed in the future without the others.

The earth venture, the life venture, is a single venture. If the other living forms don't succeed we cannot succeed in the deepest realm of our being, in our minds, in our souls. There's no success without the trees in all their majesty, the mountains and the rivers, the birds, the flowers, the butterflies, the bees. Without all this, we're nothing. We don't exist. The created world is a single community, a community that's all woven together in a single piece. The universe is granted the grace of being what might be called a self-composing symphony, or a self-shaping process. This endowment of inner powers of self-formation is the way the world has been created from the beginning.

When St. Thomas, the great thinker of the Medieval period, was asked why there are so many different things in the world, he replied that "because the divine could not image itself forth in any single being, the divine created the great diversity of things so that the perfections lacking to one would be supplied by the others and that all the universe together would participate in and manifest the divine more than any single being whatsoever." He also says that "the order of the universe is the ultimate and noblest perfection in things." The great mistake, or the great difficulty, of civilization, particularly of modern Western civilization, is to isolate human affairs from the larger Earth community.

Any adequate discussion of Western civilization must begin with the moment when Western civilization began to think of the world out there as having a discontinuity from themselves. This discontinuity is, in a certain sense, the price that we pay for the Biblical communication, because this revelation brought a more immediate experience of the divine reality through messages spoken by the prophets. Biblical revelation was a move from the primacy of the cosmological order to the primacy of the historical order in our perception of the divine. That's why the Bible as we have it, both the Hebrew and the Christian Bible, has a distinctive place in the scriptures of the world.

It's the historical realism that distinguishes the Bible. Other scriptures also bring communication with the world of the divine, but the Bible is distinguished by the historical realism which tells us that the creation took place at an identifiable moment in

Courtesy of Mi Casita Montessori, Quetzaltenango, Guatemala

time. The Biblical world and the modern scientific world agree on this one very great thing, the origin of the universe in a moment of time that can be measured numerically in relation to our present. Of all the mythic stories of beginnings, only in those of the West, I believe, do we have the beginning in numbered, historical time. For this agreement to exist between the Biblical world and the scientific world is something quite significant. Possibly it is only out of our Western world that our evolutionary story of the universe could have evolved.

Even so, it's difficult to hold together the human historical and the cosmological evolutionary dimensions of the universe. Just let me talk a moment about the child in this context, because the cosmos or the universe is what the child awakens to. The child does not awaken to history; the child awakens to the universe, and that's very important. The child is in history and will develop its ideas of history in our civilization and our historical order, but the basic and earliest awakening is to the universe.

A few weeks ago someone sent me a book of poetry written for children and asked me to write a comment; I wrote a comment, and then I wrote a little verse myself. It's a brief little verse, but perhaps it says something worthwhile. It's so simple you only have to hear it once and you know it. I would love for Maria Montessori and myself to sit down and talk over the ideas expressed here.

> The child awakens to a universe.
> The mind of the child to a world of wonder,
> Imagination, to a world of beauty,
> Emotions, to a world of intimacy.
> It takes a universe to make a child
> Both in outer form and inner spirit.
> It takes a universe to educate a child.
> It takes a universe to fulfill a child,
> And the first obligation of one generation
> In relation to the succeeding generation
> Is to bring these two together
> So that the universe is fulfilled in the child
> And the child is fulfilled in the universe.

This verse brings out something that's so utterly, so absolutely important, particularly in the twenty-first century, the historical period in which our children are going to live. It brings out the element of wonder first. Wonder is almost the first of our conscious experiences. It is said to be the primary experience of paradise. Our mention of the "Glory" that we behold in Paradise is described sometimes as "Wonder with Praise." Wonder is frequently described simply as that awe we feel at the mystery of things, because a finite mind can never really comprehend the universe before us. We are entranced by the dawn. We go to the overwhelming mystery of things to be healed both in mind and body, to the mountains, the sea, to where we can listen to the song of the birds or see the stars at night. Rachel Carson recognized the full significance of this basic experience when she wrote that fascinating book, *A Sense of Wonder.*

The capacity to wonder is the deep experience of life and its grandeur. It's the highest experience we can have. It's the moment when a person, or a thing, or a mountain, or a tree, or whatever it is, overwhelms us with delight. It's an ecstatic moment, you might say. When we see a butterfly dance

its way over a meadow, it's a kind of ecstatic joy. Watch children. They wade in a stream or sit in a mud puddle; it's such a great experience. They like to chase a butterfly. It's kind of an ecstatic moment. Or simply to run over a field after being cooped up for a while. Let a two- or three- or four-year-old child loose, and they just run into the distance, to the universe, to the larger self of their own being. As Brian Swimme has said, "The human being within the universe, is a sounding board within a musical instrument" (Swimme & Berry 40).

Wonder is especially important in our times, because our world has given up *wonder* for *use* as our primary experience of the universe. Use might be considered the primary orientation of American civilization toward the universe it inhabits, especially to the North American continent. Use goes with personal freedom and rights to property. To be real, a thing must be useful. Anything non-useful is wasted, is meaningless. Education has to be useful. If we study the history of education in this country, we find that in the colonial period and on up through the beginning of our constitutional period, education was thought of as useful. Science was especially valued because it was useful. When the American Philosophical Society was formed in 1743 with Benjamin Franklin, it was dedicated to useful knowledge.

There was an overlay of concern for what we call the classics or the humanities, but there was a greater concern for useful knowledge, which through the years has become increasingly in control of our entire life program. That's why we are destroying the biosystems of the planet, why all the beauty created in the Cenozoic period has got to be used—even if use brings about the devastation of the entire planet. If something is not used it's wasted. For anything beyond use, there was religion, the Bible especially. Education, at one time in this country, was considered primarily as a training needed for a person to be able to read the Bible.

This sense of use has led to a kind of pathological ruin of this continent in its forests, its soils, its rivers and streams, its wildlife. We have lost 95% of our glorious trees. The white pines in the northeast were six feet in diameter. Of the great forests of the West—the Douglas firs, the redwoods, the ponderosa pines—95% have been cut. All on the assumption that if they can be used for even minimal human benefit, then do it, no matter what the majesty of the forest, or the wonder, or the habitat for wildlife, no matter what the evil. We might wonder if the whole scientific venture and the whole economic venture of our times really knows what they're doing.

When we created the automobile, we didn't have the slightest idea what an automobile was. To this day I'm not sure that we're willing to admit the destructive dimension of the automobile, the automobile and all the transformations it would bring about in the lives of people or the consequences it would bring about on the land, even though these consequences are so obvious. The automobile has made our air and water dirty. It has paved over vast areas of fertile soil for parking lots. It has been ruinous to health. It has been one of the main forces leading to corporate control over the political life of our society.

We seldom consider just how all this affects our way of life, the education of our children, or the fulfillment of our interior needs for something beyond the merely material experiences of life. What is so important, I think, for children, is for them to learn

Courtesy of Maria Montessori Foundation, Alabang, Muntinlupa, Philippines

to live deeply in the abiding wonder and beauty and intimacy presented to them throughout the natural world. It is this world that awakens them to their own interior space, their soul space, their psychic space. We constantly live in this interior space and are not aware of it. All our sense faculties function in a trans-material manner, even though the physical experience is necessary for the experience of any of our senses. The physical and the psychic are two dimensions of the one experience, just as the music and physical vibrations of the violin strings are such that neither can exist separately when the music is being played.

Children need to be taught how to listen to music, how to make music, how to appreciate the poetry in the natural world, how to compose poetry, how to see the world, how to delight in any of their physical activities, running or skipping or jumping rope. Take sight for example. You may say that scientists think they can explain or have explained sight by studying the vibrations of light and the synapses of the nerves and all that and are putting it all in an equation. But they have not explained sight although they have explained one dimension of the process.

Sight is trans-physical or trans-material. It is why, when they are seen, the tree and the person, the flower and the person, begin to live in the same psychic space. That is the intimacy that we call knowledge. The tree that we see and the mind that sees experience a certain identity, what Brian Swimme indicates in the passage that has just been quoted above. Material things cannot exist in the same physical space, yet any number of realities can exist in the same psychic space. It's the difference between what you might call the psychic world and the material world. The psychic dimension of the child communes with the soul-space in the surrounding world. Knowledge is a presence of two beings in a single psychic space.

One of the things I say most often is that "the universe is a communion of subjects, not a collection of objects." Yet in the phenomenal world

Courtesy of Cornerstone Montessori School and Cornerstone Montessori Elementary School, St. Paul, Minnesota

everything is both object and subject. As objects they are used; as subjects they are communed with. When the spiritual subject uses things as objects, it is always with a transforming intimacy. That is why we willingly serve each other and, in a way, say to each other, "I will serve you; I will feed, clothe and shelter you; I will heal you; I will do any number of things for you; I will dedicate life to you. But don't simply use me in this sense of devastating the finer parts of what I want to give you, because I'm here that we may be a presence to each other. We give to each other wonder and splendor and fulfillment. I'm here for intimacy. All of the other comes with it, but only so long as we experience communion and intimate presence to each other. As long as we have that, then we can give our lives to each other, but only so long as it's honored."

Courtesy of Colegio Montessori de Tepoztlán, Mexico

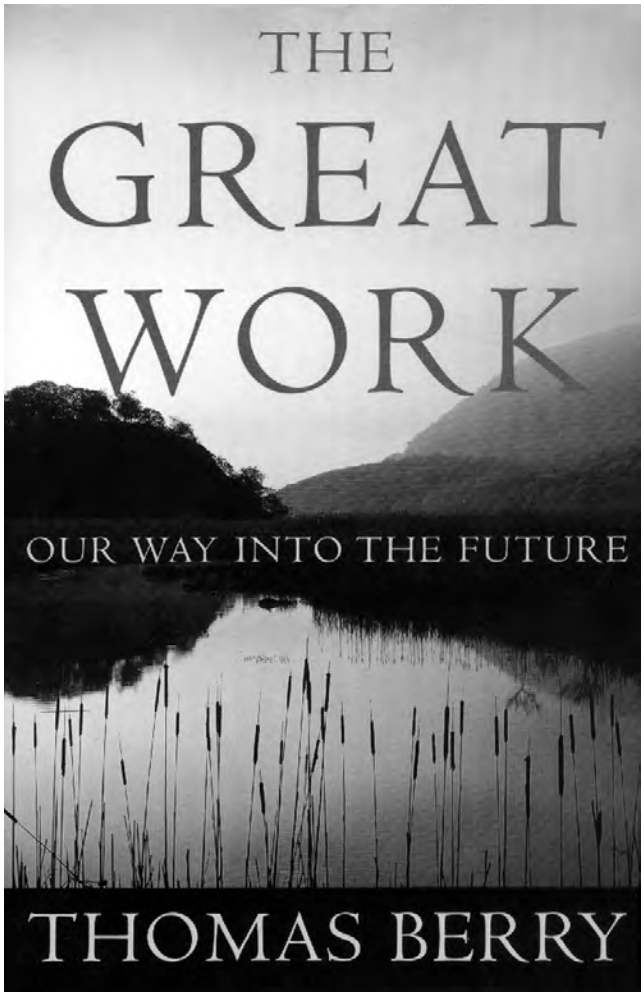
So with both the human and the natural worlds. The natural world tells us of these trans-material experiences. These are the things that the children need to learn, and at great depth. This sense of psychic presence is what children need to develop, this intimacy with both the human and the natural world. To lose either the natural or the human world is to lose everything.

One of the reasons why we can never live in space is that only the Earth can nourish our inner psychic space. Even with all our space exploits we've never been off the earth. It's not really possible, in my view, for humans to exist in space or off the Earth for even a minimal period of time. People say we went to the moon. Well, in some sense, we went on a piece of earth to the moon. But we didn't go to the moon just ourselves without the earth. That's why, in my mind, it's absurd for us to think that after using up the earth we can exist off in space somewhere or on some other planet. The main reason is not any physical reason. It's an inner reason, a psychic reason.

We came into being at a moment when the world was supremely beautiful, in the late Cenozoic period, when the planet had achieved its high moment of wonder and beauty and intimacy. Flowers had come into being. We couldn't exist without flowers for two reasons: Physically we couldn't exist because the flowers brought us concentrated protein that didn't exist before. But also the flowers and all the wonders of the natural world brought us a mind experience. If we lived on the moon, our sense of the divine would reflect the dullness of the lunar landscape. Our imagination would be as desolate as the moon. Undoubtedly, there would be something there, but it would not be adequate, or anything like what we have here.

That's why the child needs what Rachel Carson was talking about when she noted the need that children have for an older person to assist in their experience of the world around them. This companionship is, I think, one of the things that we need to pay attention to, also for ourselves. Just as the child needs the older person, the older person needs the child. We have at least as much need for children, in some ways maybe more need of them, to lead us into a world of wonder and wisdom and beauty and intimacy. So what we both need is our presence to each other, helping each other to appreciate the wonders that give life its fulfillment.

Now, in the twenty-first century, we're in a moment of rethinking our world and what we are doing with all the magnificence presented to us by the world around us. The extinction of living species that we are bringing about is now on a scale that has not existed for 65 million years. When people of the stature of Peter Raven and Edward O. Wilson and Norman Myers tell us that the extinction going on now has not been equaled for 65 million years, that's a powerful indictment of what's happening, and it must not, it cannot continue. Because the further we go in this regard, the more desolate the




planet earth will be, not only desolate physically but mentally. Life will be less fulfilling, even less possible. The truly human quality of life will progressively diminish.

Sometimes I reflect on the moment of my birth and the twentieth century, during which my life has been lived. I was born in the year 1914, the beginning of the First World War. General Motors and the other automobile corporations had just come into existence in 1908, six years previously. The roads were just being paved. There were fewer than two billion people on the planet. In this country there were ninety million. The roads were being paved, and that's what determined the direction that my thought has taken since I was eight or nine years old.

The real development of the twentieth century began in the 1880s, you might say. It really began when Standard Oil Company, with John Davidson Rockefeller, was formed, in 1870. But then in the 1880s, in the period after the Civil War, everything came together: the corporations, the petroleum, the science and technology, and this massive industrialism that threw us into the twentieth century. Since then, education has become a kind of job training for the industrial-commercial world. This new world of science and technology was dedicated to the task of turning the planet into products, products to be used and then discarded as useless junk. We passed from an ever-renewing organic economy to a non-renewing industrial economy. Progress—industrial, commercial, money-making Progress—this has been the supreme objective sought in this century.

But what we have done we need, in the twenty-first century, to undo, mitigate in some way, or deal with it more effectively than we have dealt with it so far. Just after saying that, I would say also that the new world is already begun. We can indeed be hopeful. Some extraordinary people are living at the present time, people who would draw us back to the land, back to a more integral relationship with the larger Earth-community to which we belong.

In the 1880s was we moved from an organic, ever-renewing, land-based economy to a non-renewing, extractive, industrial economy. That's a one-way road. You only go down that road for a certain number of years. Then exhaustion sets in, exhaustion of the basic resources upon which industrialism depends; for these resources are non-renewable. Once gone they are gone forever. The easily available petroleum, all that there ever was or ever will be, is already half used up. The remainder, in the shale, is too expensive to dig out of the earth and process into usable form.

But in an organic economy, the child learns how to interact with things so as to promote an ever-renewing world of beauty and wonder and abundance rather than more destruction. When a person learns about soil and plants and flowers and trees and insects and animals and fish in the sea, that person learns life and death. These provide forever both our physical needs and our soul needs. Those three primordial experiences that I mention so frequently—the wonder, the beauty, and the intimacy—these are the fulfilling experiences that give life its fulfillment.

Here I would like to mention some of the people who are providing the guidance we need. Wes

Jackson with his Land Institute in Selina, Kansas, is one. There in the lower western plains he is doing the research needed into the basic plants that will supply our food for the indefinite future. There are others too, others such as Fred Kirschenmann, in the northern plains, who is establishing a pattern of large-scale organic agriculture (see his essay in *For* all *Generations: Making World Agriculture More Sustainable*, edited by J. Patrick Madden, OM Publications, 1997). Then in the world of economics there are the remarkable studies being carried out by Herman Daly, Robert Costanza, and Richard Norgaard, who have founded the International Society for Ecological Economics. This work in the revision of economics was inspired by the work of Nicholas Georgescu-Roegen, whose book *The Entropy Law and the Economic Process* (iUniverse.com Publishers, 1999) first appeared in 1971.

In energy sources for the future, we will depend on the renewable energy available from the sun, the wind, and the rivers, sources identified years ago by Amory Lovins in his book, *Soft Energy Paths: Toward a Durable Peace* (Friends of the Earth International, 1977). More recently he, with Paul Hawkens, has written *Natural Capitalism: Creating the Next Industrial Revolution* (Back Bay Books, 2000), an outline of modifications in our present technologies that will considerably assist in establishing human technologies more coherent with the technologies of nature.

There are others, such as Sister Miriam Therese McGillis, who has established a viable rapport with nature in her program for community-supported agriculture at Genesis Farm. Richard Register of Ecocity Builders has established a program for the architecture of cities in the future, cities that would be self-sustaining in their food supply and in their energy sources, cities that would function without the automobile or with a severe reduction in the need for the automobile. Travel within the city would be by bicycle or by walking. People would live closer to where they would be working.

Courtesy of Brad Bachulis

There would also be a rethinking of the inner life of mind and soul through programs featuring Henry Thoreau, John Muir, Loren Eiseley, Wallace Stegner, David Brower, Joanna Macey. They might develop their knowledge of the evolutionary story of the universe through such writers as Brian Swimme in *The Universe Story.*

Children need to learn early in life, possibly through gardening, that the first law of economics is to preserve the integral economy of the land since the human economy is a sub-system of the earth's economy. So in medicine: Human health is a subsystem of Earth health. We cannot have well humans on a sick planet. We cannot have a sustainable human economy in a non-sustainable earth economy. And so we can go through everything, every aspect of life. We will find that in every aspect of our lives, the human system is a subsystem of the Earth system.

Another way of thinking about this relationship is to consider the individual self as the small self, related to the Earth or to the Universe as the Great Self. When Maria Montessori speaks of children finding their center at the center of the universe, this is basically what she is saying. Only in this context can children feel secure in their various studies.

It's why children need to learn about "the small self and the Great Self," because, as scientists tell us all the time, the universe as it is, is necessary for every being in the universe to be what it is in the reality of contemporary existence. We are who we are because the universe is as it is. To explain this creating of humans we have to say that we have a Great Self and a small self, and we're reaching for our Great Self. That's why the child, when the child delights in flowers, is reaching for its Great Self. When we plunge into a river or a lake to experience the refreshing waters, that's our Great Self. When we look at the stars, that's a self-presence, that's what I call intimacy, and the child experiences the intimacy, and the child needs to learn to follow its attractions in this regard and not let its limited self be seduced away.

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Swimme, Brian, & Thomas Berry. The Universe Story: A Celebration of the Unfolding of the Cosmos. San Francisco: Harper, 1994.

### Resources for Sustainability

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*Thomas Berry (1914-2009) founded the History of Religions Program at Fordham University and the Riverdale Center of Religious Research. He is author of* The Dream of the Earth *(Sierra Club Books, 1990) and coauthor, with Brian Swimme, of* The Universe Story: A Celebration of the Unfolding of the Cosmos *(Harper San Francisco, 1994).*
*Reprinted from The NAMTA Journal, 26,1 (2001 Winter): pp. 156-167. This talk was presented at the NAMTA conference titled* Celebrating Montessori's Great Work: Our Gift for the Future*, Cleveland, OH, October 5-8, 2000.*

Courtesy of Chris Trostel, Montessori Borealis Public, Juneau, Alaska

Courtesy of Mr. Katsuhiko Yorita, Information Center, Okinawa, Japan, submitted byTakako Fukatsu

# Fifth Lecture

by Maria Montessori

*We include the ninth chapter of Education and Peace by Maria Montessori (1949) to draw attention to the relationship between peace and sustainability. Nature is an integral part of peace studies.*

The education that will lead the way to a new humanity has one end alone: leading the individual and society to a higher stage of development. This concept involves many factors and may seem obscure, but it becomes clearer if we realize that mankind has to fulfil a collective mission on earth, a mission involving all of humanity and therefore each and every human being. This concept may enable us to set a definite goal for our efforts. But what can this mission of humanity be?

Is this mission the predominance of one nation over another? The power of the people? Industrial or cultural progress? And what will the individual regard as his personal mission? Ensuring that he and others have the means to survive? Ensuring the possibility of securing an education? It would seem that above and beyond these goals, which have to do with the interests of specific individuals or groups, there is something that involves all mankind and perhaps even the universe itself, creation, cosmic harmony.

This 'something' might be considered as involving a religious ideal. But what I should like to discuss is the possibility that science may have a predominant role to play in helping us discover this single universal mission.

It is possible to consider the life of the creatures of the earth from a single point of view, and I would like to make a few remarks about the modern study of geology and evolution.

The most interesting, and indeed almost awesome, fact resulting from such study is that the earth is a creation of life. Life created rocks and soil, and it is life that sustains the harmony of the earth. Yes, the earth is the handiwork of living things. The oceans are kept in constant chemical balance by living things, and living things also maintain the purity of the air.

All creatures who live on earth have a cosmic role to play. The maintenance of life on earth depends on many species, each one of which has a special, specific function. Animals feed and live and reproduce; each one has a life-cycle that fulfils a special role in relation to the life of other species. Everyone knows, for instance, that the disappearance of one species in a certain place upsets the balance, because the lives of all species are interrelated. Life therefore can be regarded as an energy that maintains life itself.

I would now like to pose a question: does not man also have a cosmic mission to fulfil on earth? Is it conceivable that this being who has such great intelligence, who is the worker *par excellence,* has no part to play in the labour of the cosmos?

Human energy, too, has appeared on earth to undertake and fulfil a specific mission.

It is quite evident that man has a mission. He has extracted hidden wealth and marvellous energies from the bowels of the earth, and he has created a superworld, or, more precisely, a supernature. As he has constructed this supernature little by little, man has also perfected himself and made the natural man he was into a supernatural man. Nature is a domain that has existed for centuries, and supernature is yet another domain, which man has gradually constructed.

Contemporary man no longer lives with nature, but with supernature. An animal can procure its food directly from the earth, but man is dependent on other men. How many men labour so that the bread we eat may reach our mouths! And fruit that comes to us from a faraway place may represent a vast organization of men, a formidable and strict organization, that holds human society together.

We must be aware of this organization if we are to evaluate properly certain widespread ideas that find expression in a number of slogans: 'Let us return to nature.' 'Let us become one with nature.'

Courtesy of the Montessori Institute for the Science of Peace, www.constructingpeace.org

The life that some call 'artificial' is mankind's supernatural life. Our way of life is not artificial, but rather the product of labour. If we did not make such a distinction, we might be inclined to say that even the way of life of certain animals is artificial - that of bees, who 'artificially' produce honey, for instance. Man is a great worker, capable of creating a supernature through his labours.

But we might now ask ourselves: if animals labour so joyously, why do men not also take delight in their work? Man should be much happier than animals. His unhappiness is proof that there must be errors inherent in human society and in the supernature that humanity has constructed. Man must labour not only to support himself and his family, but also to become an instrument of something great and awesome - not only to serve his individual interests, but also to serve humanity as a whole. From this point of view, the history of humanity becomes very interesting. As we study man from this perspective, we witness first his effort to explore the earth and extract its riches and then his effort to explore the heavens and master the energies of the intangible, the infinite, the limitless. An enormous, immense human conquest! And yet man today considers mere physical survival a problem.

Man is not conscious of his mission, nor of the heights that he has reached. Humanity has fallen sick, like an organism suffering from a circulatory disease; man is weak and unhappy. Yet he continues to pursue his irresistible mission, and humanity is now united as one single nation.

And man, that feeble and unhappy creature, may be cured if he so wills. He need only open his eyes, rectify his errors, and realize his powers. When we say that man must intensify the means of communication and interchange available to him, we are pointing to a goal that he cannot attain immediately. Humanity must first be convinced of the urgency of attaining this goal. Man must be educated. It is true that education can create a better kind of man, but this is a vast undertaking. It is a labour that may well take a long time, but it will nonetheless be brief in comparison with the work that man has already accomplished.

The first thing that must be done is to construct an environment that answers the needs of young people. What has been done to date with regard to that period of human life that precedes maturity? What has been done for children, for young people? Practically noth-

ing, or at any rate very little. Unlike animals, who build extensively for their young, man, the intelligent being who labours with his own hands, has failed to build on a similar scale for his progeny. What has the world, with its wealth of great constructions, with all its comforts, done on behalf of children? It is not enough to love in an abstract way; we must begin to do something concrete, something practical- to construct the supernature necessary for the life of children and young people.

I would like to review briefly what we have done along these lines.

We have constructed, first of all, an environment providing all the little things necessary for the life of children. The child has not said thank you, but he has revealed to us the hidden treasure of man's soul. And this knowledge of the human soul, of its grandeur and power, represents both a warning and a hope for us.

Let us therefore continue our efforts! Let us construct an environment for children and young people; the thanks we will receive for so doing will be the enlightenment we need to see all the errors inherent in the supernature that we adults have created only for ourselves. We must build something new, not offer older children the same things we offer the young ones. Miniature objects and utensils no longer satisfy seven-year-old children. They need other things. The four walls of a 'house'[1] become too confining; older children need to go out and explore the world. They must have broader social horizons. Man feels a great need to make genuine efforts, so as to measure his own worth; the Boy Scout movement has partially answered this need. The idea of organizing young people is not an error. The mistake arises when the most intimate needs of the individual young person are not satisfied.

It is time now to correct these errors, to bring about a great reform, to offer young people the means necessary for their development and the enhancement of their personalities.

This task cannot be entrusted to private efforts alone; it is society as a whole that is called upon to fulfil it. It is of vital interest to the state to organize the life of young people. The child by the age of twelve should already be taking an active part in social life; he should be producing, selling, and working, not in order to learn a trade, but because working means coming into contact with life, participating in the building of supernature. These young people should engage in economic transactions, learn the value of money, and take conscious part in productive activities.

Objects made carefully by hand have today been replaced by articles mass-produced by machines, a change made necessary by the fact that men's lives proceed at a more and more frantic pace. But handicrafts, which produce beautiful objects, and which society is now attempting to revive, could well be entrusted to young people. Let us hope that the art of fine craftsmanship is not lost simply because machines exist. May young people be given the possibility of continuing to lovingly produce beautiful things! And the creative spirit of young

Courtesy of Scripps Montessori School, San Diego, California

[1]The Montessori environment for children between two and one-half and six years of age is called 'House of the Children'.

people can accomplish many other things as well. Botany, for instance, requires a keen eye and accurate judgement. Young people can become passionately involved in doing calm, serene, beautiful work that enables their young personalities to develop and find worthwhile goals. If young people at a certain point are called upon to take an active part in the life of humanity, they must first feel that they have a great mission to accomplish and prepare themselves for it. They must have the chance to meditate upon it a little. We call this period 'the period of the desert'. Christ himself as he emerged from childhood went off into the desert before beginning his great mission. The man prepared in this way will fulfil his mission faithfully and consciously.

The young person today is urged to study, to buckle down, to conserve his time, to get ahead in the world. Poor thing. When he has completed his studies, he knows nothing of social life, and he feels lost and forsaken. Why should he have worked so hard? Why should he have studied, if books are no longer of any importance?

Courtesy of Montessori de la Condesa, Mexico City, Mexico

I cannot discuss the subject at greater length. I will simply say that as we see it, man must be inspired to seek universality until the day he dies. Man thus prepared, conscious of his mission in the cosmos, will be capable of building the new world of peace.

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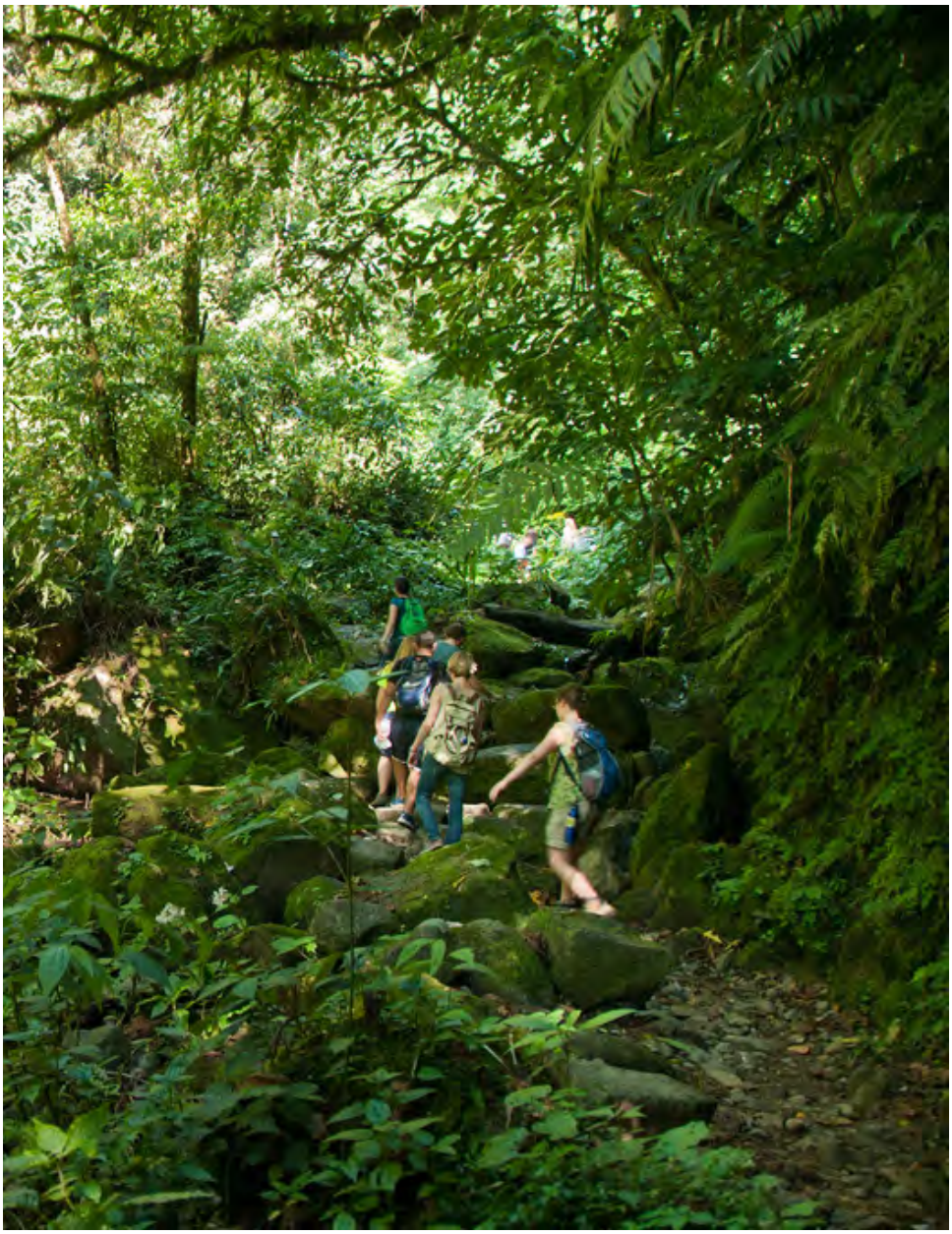

Courtesy of the Montessori Institute for the Science of Peace, www.constructingpeace.org

Courtesy of Rusty Keeler, www.earthplay.net

# Creating Planet Earth

by Rusty Keeler

*Every generation of new ecologists addresses the need for playscapes to match the landscapes while engendering wonder and beauty into child's everyday world. Keeler's playground style imitates nature with designs of innovative path finding, inventive structures, and "swarm builds" that make each play space entirely original.*

What is the most important place on the planet for children? Is it the Amazon Rain Forest? The Pacific Ocean? The Himalayan Mountains? How majestic! As adults we may think of lofty places of great natural importance, and yet the most important place on the planet for young children is . . . your back yard. That's right. The place that children visit every day is actually the most important place in the world. It is the place where children use their senses to explore the planet and experience the wonders of nature.

What do your children experience when they step outside? Are they able to touch dirt? Smell flowers? Find worms? Plant seeds? Climb trees? Hug chickens? All children deserve to squish mud and splash in puddles. All children need to smile at the sun and feel its warmth smiling back. Every child should be able to roll down hills and hide in tall grass. All children deserve to have their sense of wonder sparked by the possibilities of the planet.

Courtesy of Rusty Keeler, www.earthplay.net


Courtesy of Rusty Keeler, www.earthplay.net

Courtesy of Rusty Keeler, www.earthplay.net

But doesn't it take an extensive nature center or national park for children to make friends with the planet? No! All it takes is someone like you to decide to bring nature into your yard and allow children to explore. Plant bulbs that pop into flowers in spring. Bring dirt, sand, and water into your yard. Plant shade trees and fruit trees and trees that burst into fragrant bloom. Plant pumpkin seeds. Allow corners of your yard to grow wild. Hang birdhouses and bird feeders. Bring children outside to study nature first-hand. Add magnifying glasses and shovels to your outdoor loose parts collection.

Today people all over the world are making beautiful changes to their yards by creating opportunities like these for children to play and explore in the natural world. School communities everywhere are working together to green their yards, create outdoor classrooms, and build natural playgrounds. You can too. Form a small committee, dream your yard, assess and tap your local community resources, and plan a volunteer community "swarm build." With the help of family and friends (and folks with a backhoe or two!) you can transform your space into a beautiful, inviting space for children's play, learning, exploration, and creativity. As you beautify your school yard you are beautifying the world and beautifying children's introductions to the planet.

Dream Big. Start Small. Never Stop.

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*Rusty Keeler is an artist and designer who works with communities and schools around the world to design and build natural play and learning spaces for children. He is the author of the book* Natural Playscapes *(Exchange Press, 2008). Rusty lives among the hills and gorges outside Ithaca, NY. Visit www.earthplay.net for more information.*

Courtesy of New Canaan Montessori School, Corner of Hope, AMI, New Canaan Community, Nakuru, Kenya

# You Are Brilliant, and the Earth Is Hiring

by Paul Hawken

*Paul Hawken's commencement address presents a picture of the deterioration that is being wrought by human activity and motivates college graduates to join the invisible, ordinary masses who are already saving the planet with everyday processes. In a call to live and hope for something better, he stresses, in the language of a poet, how nature requires optimism, realism, and a penchant for reconstructing what has been lost as part of one's life legacy.*

When I was invited to give this speech, I was asked if I could give a simple short talk that was "direct, naked, taut, honest, passionate, lean, shivering, startling, and graceful." No pressure there.

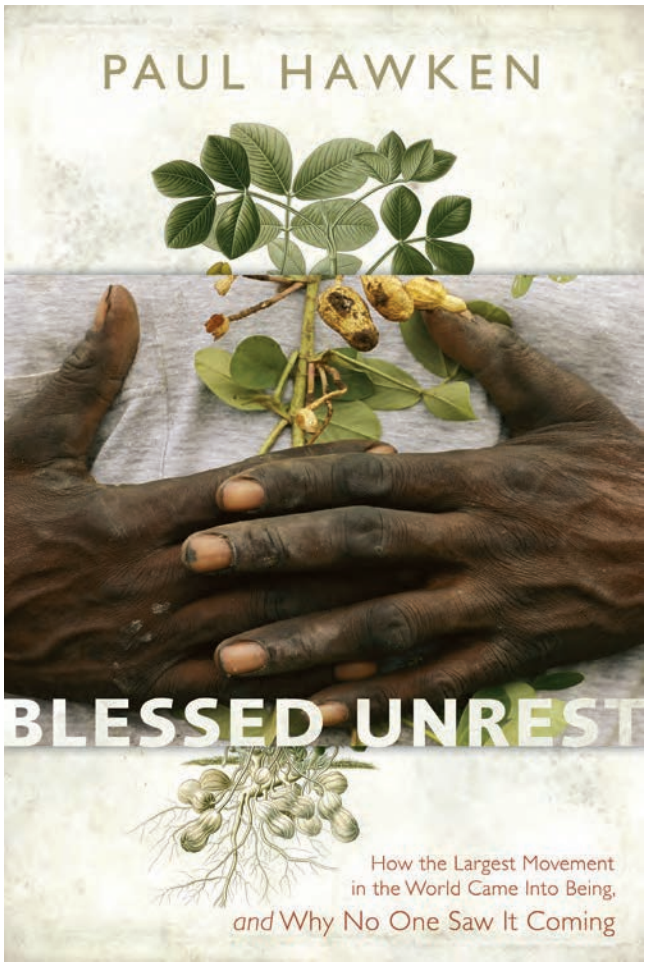
Let's begin with the startling part. Class of 2009: you are going to have to figure out what it means to be a human being on earth at a time when every living system is declining, and the rate of decline is accelerating. Kind of a mind-boggling situation, but not one peer-reviewed paper published in the last thirty years can refute that statement. Basically, civilization needs a new operating system, you are the programmers, and we need it within a few decades.

This planet came with a set of instructions, but we seem to have misplaced them. Important rules like don't poison the water, soil, or air, don't let the earth get overcrowded, and don't touch the thermostat have been broken. Buckminster Fuller said that spaceship earth was so ingeniously designed that no one has a clue that we are on one, flying through the universe at a million miles per hour, with no need for seat belts, lots of room in coach, and really good food—but all that is changing.

There is invisible writing on the back of the diploma you will receive, and in case you didn't bring lemon juice to decode it, I can tell you what it says: You are Brilliant, and the Earth is Hiring. The earth couldn't afford to send recruiters or limos to your school. It sent you rain, sunsets, ripe cherries, night blooming jasmine, and that unbelievably cute person you are dating. Take the hint. And here's the deal: Forget that this task of planet-saving is not possible in the time required. Don't be put off by people who know what is not possible. Do what needs to be done, and check to see if it was impossible only after you are done.

When asked if I am pessimistic or optimistic about the future, my answer is always the same: If you look at the science about what is happening on earth and aren't pessimistic, you don't understand the data. But if you meet the people who are working to restore this earth and the lives of the poor, and you aren't optimistic, you haven't got a pulse. What I see everywhere in the world are ordinary people willing to confront despair, power, and incalculable odds in order to restore some semblance of grace, justice, and beauty to this world. The poet Adrienne Rich wrote, "So much has been destroyed I have cast my lot with those who, age after age, perversely, with no extraordinary power, reconstitute the world." There could be no better description. Humanity is coalescing. It is reconstituting the world, and the action is taking place in schoolrooms, farms, jungles, villages, campuses, companies, refugee camps, deserts, fisheries, and slums.

You join a multitude of caring people. No one knows how many groups and organizations are working on the most salient issues of our day: climate change, poverty, deforestation, peace, water, hunger, conservation, human rights, and more. This is the largest movement the world has ever seen. Rather than control, it seeks connection. Rather than dominance, it strives to disperse concentrations of power. Like Mercy Corps, it works behind the scenes and gets the job done. Large as it is, no one knows the true size of this movement. It provides hope, support, and meaning to billions of people in the world. Its clout resides in idea, not in force. It is made up of teachers, children, peasants, businesspeople, rappers, organic farmers, nuns, artists, government




workers, fisherfolk, engineers, students, incorrigible writers, weeping Muslims, concerned mothers, poets, doctors without borders, grieving Christians, street musicians, the President of the United States of America, and as the writer David James Duncan would say, the Creator, the One who loves us all in such a huge way.

There is a rabbinical teaching that says if the world is ending and the Messiah arrives, first plant a tree, and then see if the story is true. Inspiration is not garnered from the litanies of what may befall us; it resides in humanity's willingness to restore, redress, reform, rebuild, recover, reimagine, and reconsider. "One day you finally knew what you had to do, and began, though the voices around you kept shouting their bad advice," is Mary Oliver's description of moving away from the profane toward a deep sense of connectedness to the living world.

Millions of people are working on behalf of strangers, even if the evening news is usually about the death of strangers. This kindness of strangers has religious, even mythic origins, and very specific eighteenth-century roots. Abolitionists were the first people to create a national and global movement to defend the rights of those they did not know. Until that time, no group had filed a grievance except on behalf of itself. The founders of this movement were largely unknown — Granville Clark, Thomas Clarkson, Josiah Wedgwood — and their goal was ridiculous on the face of it: at that time three out of four people in the world were enslaved. Enslaving each other was what human beings had done for ages. And the abolitionist movement was greeted with incredulity. Conservative spokesmen ridiculed the abolitionists as liberals, progressives, do-gooders, meddlers, and activists. They were told they would ruin the economy and drive England into poverty. But for the first time in history a group of people organized themselves to help people they would never know, from whom they would never receive direct or indirect benefit. And today tens of millions of people do this every day. It is called the world of non-profits, civil society, schools, social entrepreneurship, non-governmental organizations, and companies who place social and environmental justice at the top of their strategic goals. The scope and scale of this effort is unparalleled in history.

The living world is not "out there" somewhere, but in your heart. What do we know about life? In the words of biologist Janine Benyus, life creates the conditions that are conducive to life. I can think of no better motto for a future economy. We have tens of thousands of abandoned homes without people and tens of thousands of abandoned people without homes. We have failed bankers advising failed regulators on how to save failed assets. We are the only species on the planet without full employment. Brilliant. We have an economy that tells us that it is cheaper to destroy earth in real time rather than renew, restore, and sustain it. You can print money to bail out a bank but you can't print life to bail out a planet. At present we are stealing the future, selling it in the present, and calling it gross domestic product. We can just as easily have an economy that is based on healing the future instead of stealing it. We can either create assets for the future or take the assets of the future. One is called restoration and the other exploitation. And whenever we exploit the earth we exploit people and cause untold suffering. Working for the earth is not a way to get rich, it is a way to be rich.

The first living cell came into being nearly 40 million centuries ago, and its direct descendants are in all of our bloodstreams. Literally you are breathing molecules this very second that were inhaled by Moses, Mother Teresa, and Bono. We are vastly interconnected. Our fates are inseparable. We are here because the dream of every cell is to become two cells. And dreams come true. In each of you are one quadrillion cells, 90 percent of which are not human cells. Your body is a community, and without those other microorganisms you would perish in hours. Each human cell has 400 billion molecules conducting millions of processes between trillions of atoms. The total cellular activity in one human body is staggering: one septillion actions at any one moment, a one with twenty-four zeros after it. In a millisecond, our body has undergone ten times more processes than there are stars in the universe, which is exactly what Charles Darwin foretold when he said science would discover that each living creature was a "little universe, formed of a host of self-propagating organisms, inconceivably minute and as numerous as the stars of heaven."

So I have two questions for you all: First, can you feel your body? Stop for a moment. Feel your body. One septillion activities going on simultaneously, and your body does this so well you are free to ignore it, and wonder instead when this speech will end. You can feel it. It is called life. This is who you are. Second question: who is in charge of your body? Who is managing those molecules? Hopefully not a political party. Life is creating the conditions that are conducive to life inside you, just as in all of nature. Our innate nature is to create the conditions that are conducive to life. What I want you to imagine is that collectively humanity is evincing a deep innate wisdom in coming together to heal the wounds and insults of the past.

Ralph Waldo Emerson once asked what we would do if the stars only came out once every thousand years. No one would sleep that night, of course. The world would create new religions overnight.

Courtesy of New Canaan Montessori School, Corner of Hope, AMI, New Canaan Community, Nakuru, Kenya

We would be ecstatic, delirious, made rapturous by the glory of God. Instead, the stars come out every night and we watch television.

This extraordinary time when we are globally aware of each other and the multiple dangers that threaten civilization has never happened, not in a thousand years, not in ten thousand years. Each of us is as complex and beautiful as all the stars in the universe. We have done great things and we have gone way off course in terms of honoring creation. You are graduating to the most amazing, stupefying challenge ever bequested to any generation. The generations before you failed. They didn't stay up all night. They got distracted and lost sight of the fact that life is a miracle every moment of your existence. Nature beckons you to be on her side. You couldn't ask for a better boss. The most unrealistic person in the world is the cynic, not the dreamer. Hope only makes sense when it doesn't make sense to be hopeful. This is your century. Take it and run as if your life depends on it.

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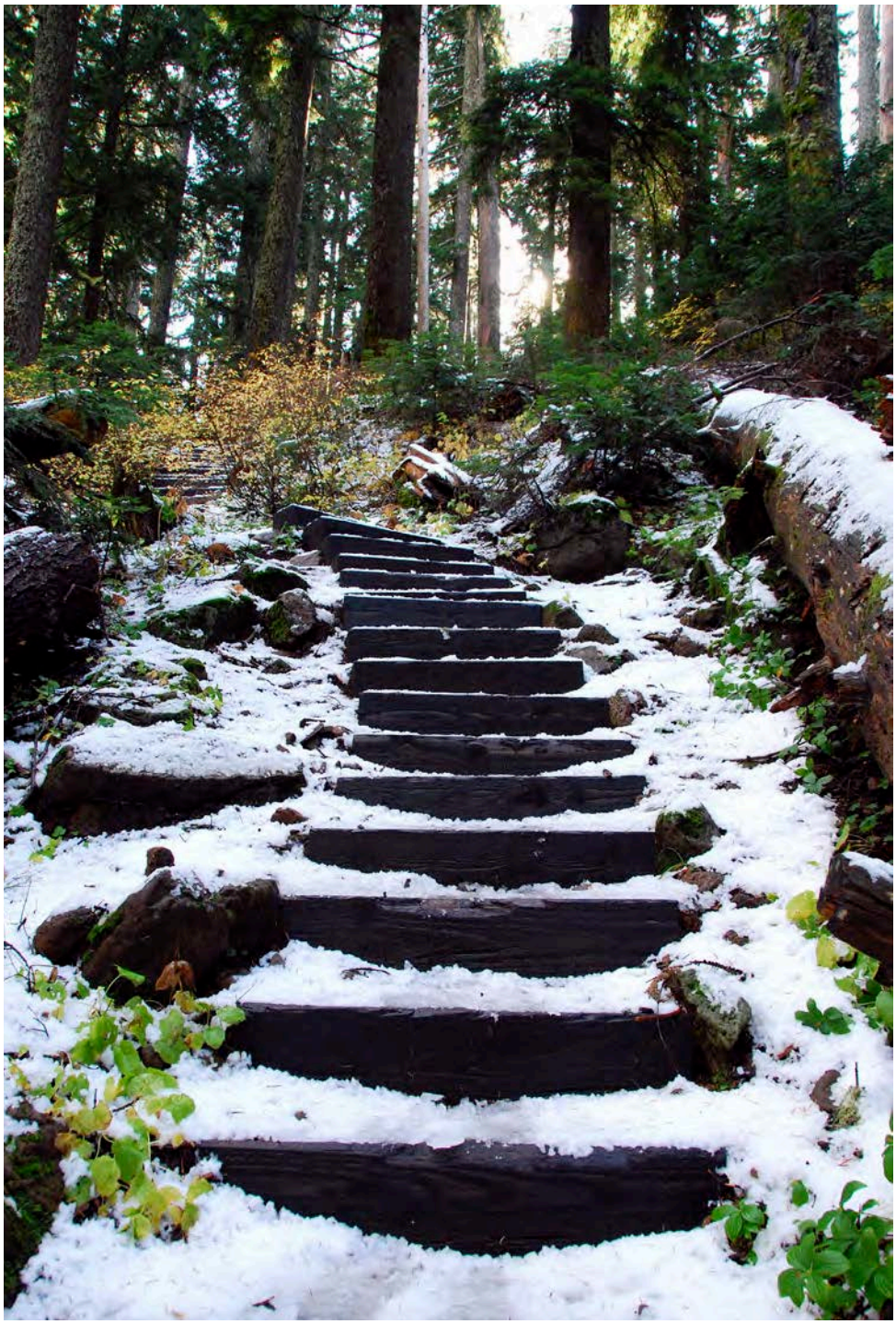
*Paul Hawken is a renowned entrepreneur, visionary environmental activist, and author of many books, most recently Blessed Unrest: How the Largest Movement in the World Came into Being and Why No One Saw It Coming. He was presented with an honorary doctorate of humane letters by Portland University's president, Father Bill Beauchamp, when he delivered this superb speech.*
*This commencement address to the Class of 2009 at University of Portland was reprinted by permission of the author.*



Courtesy of Amy Gedgaudas

# Everything I Need to Know I Learned in the Forest

by Vandana Shiva

*A lyrical storyteller, Vandana Shiva begins from the roots of the Chipko movement in India, under the canopy of the Himalayan forests while listening to the teachings of the forest. Her evolution of ideas, first based in the history of science and then in the creation of an Earth University on her own Navdanya's farm, suggests a mind's journey to see nature as live, diverse, and as a source for harmony and self-perfection.*

My ecological journey started in the forests of the Himalaya. My father was a forest conservator, and my mother became a farmer after fleeing the tragic partition of India and Pakistan. It is from the Himalayan forests and ecosystems that I learned most of what I know about ecology. The songs and poems our mother composed for us were about trees, forests, and India's forest civilizations.

My involvement in the contemporary ecology movement began with Chipko, a nonviolent response to the large-scale deforestation that was taking place in this Himalayan region. In the 1970s, peasant women from my region in the Garhwal Himalaya had come out in defense of the forests. Logging had led to landslides and floods, and scarcity of water, fodder and fuel. Since women provide these basic needs, the scarcity meant longer walks for collecting water and firewood, and a heavier burden.

Women knew that the real value of forests was not the timber from a dead tree, but the springs and streams, food for their cattle, and fuel for their hearth, and they declared that they would hug the trees, and the loggers would have to kill them before they killed the trees.

A folk song of that period said:

> These beautiful oaks and
> rhododendrons,
> They give us cool water
> Don't cut these trees
> We have to keep them alive.

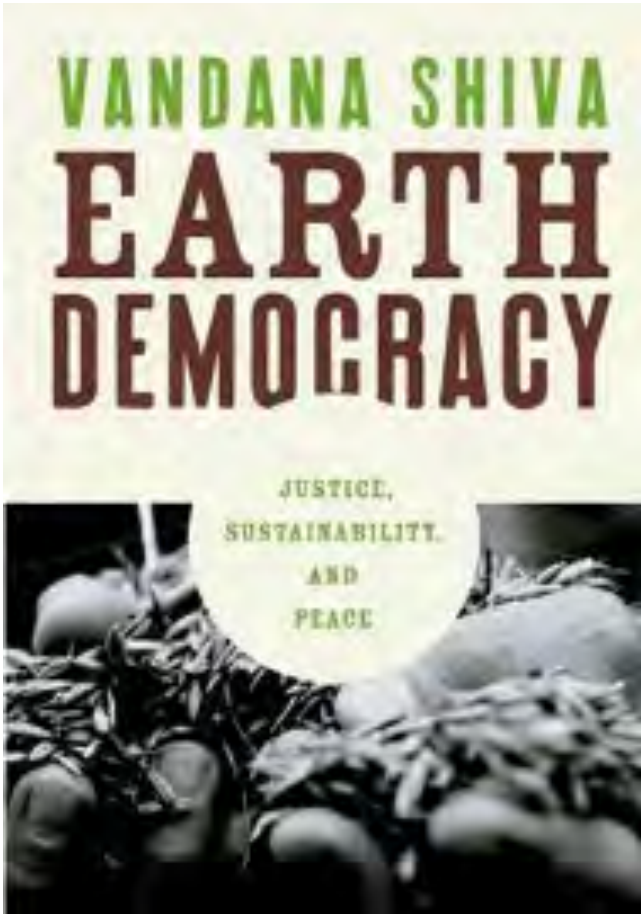
In 1973, I had gone to visit my favorite forests and swim in my favorite stream before leaving for Canada to do my PhD. But the forests were gone, and the stream was reduced to a trickle.

I decided to become a volunteer for the Chipko movement, and I spent every vacation doing *pad yatras* (walking pilgrimages), documenting the deforestation and the work of the forest activists, and spreading the message of Chipko.

One of the dramatic Chipko actions took place in the Himalayan village of Adwani in 1977, when a village woman named Bachni Devi, led a resistance against her own husband, who had obtained a contract to cut trees. When officials arrived at the forest, the women held up lighted lanterns although it was broad daylight. The forester asked them to explain. The women replied, "We have come to teach you forestry." He retorted, "You foolish women, how can you prevent tree felling by those who know the value of the forest? Do you know what forests bear? They produce profit and resin and timber."

The women sang back in chorus:

> What do the forests bear?
> Soil, water, and pure air.
> Soil, water, and pure air
> Sustain the Earth and all she bears.




### Beyond Monocultures

From Chipko, I learned about biodiversity and biodiversity-based living economies; the protection of both has become my life's mission. As I described in my book *Monocultures of the Mind*, the failure to understand biodiversity and its diverse functions is at the root of the impoverishment of nature and culture.

The lessons I learned about diversity in the Himalayan forests I transferred to the protection of biodiversity on our farms. I started saving seeds from farmers' fields and then realized we needed a farm for demonstration and training. Thus Navdanya Farm was started in 1994 in the Doon Valley, located in the lower elevation Himalayan region of Uttarakhand Province. Today we conserve and grow 130 varieties of rice, 150 varieties of wheat, and hundreds of other species. We practice and promote a biodiversity-intensive form of farming that produces more food and nutrition per acre. The conservation of biodiversity is therefore also the answer to the food and nutrition crisis.

Navdanya, the movement for biodiversity conservation and organic farming that I started in 1987, is spreading. So far, we've worked with farmers to set up more than 100 community seed banks across India. We also help farmers make a transition from fossil-fuel and chemical-based monocultures to biodiverse ecological systems nourished by the sun and the soil. Biodiversity has been my teacher of abundance and freedom, of cooperation and mutual giving.

### Rights of Nature On the Global Stage

When nature is a teacher, we co-create with her—we recognize her agency and her rights. That is why it is significant that Ecuador has recognized the "rights of nature" in its constitution. In April 2011, the United Nations General Assembly—inspired by the constitution of Ecuador—organized a conference on harmony with nature as part of the celebration of Earth Day. Much of the discussion centered on ways to transform systems based on domination of people over nature, men over women, and rich over poor into new systems based on partnership.

The UN Secretary General's report, "Harmony with Nature," issued in conjunction with the conference, elaborates on the importance of reconnecting with nature: "Ultimately, environmentally destructive behaviour is the result of a failure to recognize that human beings are an inseparable part of nature and that we cannot damage it without severely damaging ourselves."

Separatism is indeed at the root of disharmony with nature and violence against nature and people. As the prominent South African environmentalist Cormac Cullinan points out, apartheid means separateness. The world joined the anti-apartheid movement to end the violent separation of people on the basis of color. Apartheid in South Africa was put behind us. Today, we need to overcome the wider and deeper apartheid—an eco-apartheid based on the illusion of separateness of humans from nature in our minds and lives.

### The Dead Earth Worldview

The war against the Earth began with this idea of separateness. Its contemporary seeds were sown when the living Earth was transformed into dead matter to facilitate the industrial revolution. Monocultures replaced diversity. "Raw materials" and "dead matter" replaced a vibrant Earth. Terra Nullius (the empty land, ready for occupation regardless of the presence of indigenous peoples) replaced Terra Madre (Mother Earth).

This philosophy goes back to Francis Bacon, called the father of modern science, who said that science and the inventions that result do not "merely exert a gentle guidance over nature's course; they have the power to conquer and subdue her, to shake her to her foundations."

Robert Boyle, the famous 17th century chemist and governor of the Corporation for the Propagation of the Gospel among the New England Indians, was clear that he wanted to rid native people of their ideas about nature. He attacked their perception of nature, "as a kind of goddess," and argued that "the veneration, where with men are imbued for what they call nature, has been a discouraging impediment to the empire of man over the inferior creatures of God."

The death of nature idea allows a war to be unleashed against the Earth. After all, if the Earth is merely dead matter, then nothing is being killed. As philosopher and historian Carolyn Merchant points out, this shift of perspective, from nature as a living, nurturing mother to inert, dead, and manipulable matter was well suited to the activities that would lead to capitalism. The domination images created by Bacon and other leaders of the scientific revolution replaced those of the nurturing Earth, removing a cultural constraint on the exploitation of nature. "One does not readily slay a mother, dig into her entrails for gold, or mutilate her body," Merchant wrote.

### What Nature Teaches

Today, at a time of multiple crises intensified by globalization, we need to move away from the paradigm of nature as dead matter. We need to move to an ecological paradigm, and for this, the best teacher is nature herself.

This is the reason I started the Earth University / Bija Vidyapeeth at Navdanya's farm.

The Earth University teaches Earth Democracy, which is the freedom for all species to evolve within the web of life, and the freedom and responsibility of humans, as members of the Earth family, to recognize, protect, and respect the rights of other species. Earth Democracy is a shift from anthropocentrism to eco-centrism. And since we all depend on the Earth, Earth Democracy translates into human rights to food and water, to freedom from hunger and thirst.

Because the Earth University is located at Navdanya, a biodiversity farm, participants learn to work with living seeds, living soil, and the web of life. Participants include farmers, school children, and people from across the world. Two of our most popular courses are the one-month course "The A-Z of Organic Farming and Agro-ecology," and "Gandhi and Globalization."

Courtesy of Montessori High School at University Circle, Cleveland, Ohio

### The Poetry of the Forest

The Earth University is inspired by Rabindranath Tagore, India's national poet and a Nobel Prize laureate. Tagore started a learning center in Shantiniketan, in West Bengal, India, as a forest school, both to take inspiration from nature and to create an Indian cultural renaissance. The school became a university in 1921, growing into one of India's most famous centers of learning.

Today, just as in Tagore's time, we need to turn to nature and the forest for lessons in freedom. In "The Religion of the Forest," Tagore wrote about the influence that the forest dwellers of ancient India had on classical Indian literature. The forests are sources of water and the storehouse of a biodiversity that can teach us the lessons of democracy—of leaving space for others while drawing sustenance from the common web of life. Tagore saw unity with nature as the highest stage of human evolution.

In his essay Tapovan (Forest of Purity), Tagore writes: "Indian civilization has been distinctive in locating its source of regeneration, material and intellectual, in the forest, not the city. India's best ideas have come where man was in communion with trees and rivers and lakes, away from the crowds. The peace of the forest has helped the intellectual evolution of man. The culture of the forest has fuelled the culture of Indian society. The culture that has arisen from the forest has been influenced by the diverse processes of renewal of life, which are always at play in the forest, varying from species to species, from season to season, in sight and sound and smell. The unifying principle of life in diversity, of democratic pluralism, thus became the principle of Indian civilisation."

It is this unity in diversity that is the basis of both ecological sustainability and democracy. Diversity without unity becomes the source of conflict and contest. Unity without diversity becomes the ground for external control. This is true of both nature and culture. The forest is a unity in its diversity, and we are united with nature through our relationship with the forest.

In Tagore's writings, the forest was not just the source of knowledge and freedom: it was the source of beauty and joy, of art and aesthetics, of harmony and perfection. It symbolized the universe.

In "The Religion of the Forest," the poet says that our frame of mind "guides our attempts to establish relations with the universe either by conquest or by union, either through the cultivation of power or through that of sympathy."

The forest teaches us union and compassion.

The forest also teaches us enoughness: as a principle of equity, how to enjoy the gifts of nature without exploitation and accumulation. In "The Religion of the Forest," Tagore quotes from the ancient texts written in the forest: "Know all that moves in this moving world as enveloped by God; and find enjoyment through renunciation, not through greed of possession." No species in a forest appropriates the share of another species. Every species sustains itself in cooperation with others.

The end of consumerism and accumulation is the beginning of the joy of living.

The conflict between greed and compassion, conquest and cooperation, violence and harmony that Tagore wrote about continues today. And it is the forest that can show us the way beyond this conflict.

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Courtesy of Rusty Keeler, www.earthplay.net

Sèvres, France, around 1935, courtesy Margot Waltuch collection

# Epilogue: The Child and the Environment

by Molly O'Shaughnessy

*Molly wrote this article thirteen years ago. It is a fitting counterpart to the preface of this publicaton because it predicts the role of nature across the planes of education even before the Erdkinder was tested. The article combines contemporary environmentalists with Montessori's seminal insight into the developmental impact of nature on the child's personality.*

Once upon a time there was a young child who spent every summer of life in a magical land. To her it was a land of infinite beauty and mystery. She was cooled by the water, her hair brushed by the wind—gray and pink granite decorated the land, lily pads revealed their single, most precious blossoms. Her companions were the skunks, raccoons, chipmunks, turtles, frogs, and numerous insects. All kinds of pathways led to basements transformed into dungeons, haunted houses, barns with haystacks, dark passages, and musty smells. Ponds were identified as the home of frogs or the home of the turtles. A massive solitary rock on the edge of a garden was a source of fantasy—princes and princesses, people in captivity, natives lurking, a place to be alone, completely alone. Sitting on a small ledge of that rock, there she became attentive to the lessons of silence, of beauty, of imagination. To embrace the rock was to feel connected to everything, Oh what peace, what serenity, what celebration, always another way to imagine a fairy in a fairyland.

And then there was the family she loved so dearly, ensured of everyday playmates and fellow explorers, active by day, and settling in by night to stories read out loud—*The Lion, the Witch, and the Wardrobe* and *Alice in Wonderland*.

But summers are never forever, except in my memory's eye, and I yearn for that summer place, which is now sold and barely accessible. Faded away is that contact with the earth and its capricious lessons. Faded away is that glistening of the natural world, enhanced by the prisms of wonder and affection for the out-of-doors. Faded away, giving in to business, to comfort, to inside workspace, worrying and scurrying through the day, with cell phones, laptops, e-mails. And stop. Where is that child's space in the natural world, so connected and fulfilled? How can we once more learn to live in the moment, with the senses near to the ground, wondering what to make, wondering what about the next surprise, wondering about more to come, or, better still, more to do. What happened to "the power of perceptual participation in the known and unknown" (Cobb 28) all at once? As Dr. Montessori wrote, "only poets and little children *feel the fascination* of a tiny rivulet flowing over pebbles" (*The Discovery of the Child* 86). The great question before us is can we who are in a void of wonder and connectedness "feel the fascination" once again or even lead young children to do the same?

In *The Secret of Childhood,* Dr. Montessori said, "The adult's environment is not a life-giving environment for the child" (107). Our frenzied pace of life, our insatiable need for making money, and our economic exploitation of cheap labor and energy consumption have changed the culture of our lives, rich and poor. Additionally, family life has changed dramatically. In the United States, nearly seventy percent of mothers work outside the home, the number of children under six living in poverty has risen to one in five, and violence in the home and schools is on the rise. Inner-city life for many children is stripped of life-enhancing stimuli. Studies show that

> 57 percent of all children born this decade in developing countries grow up in urban slums. A quarter of the children born in the United States in this next generation will start their lives in such slums, and it is predicted that most of these

> will never experience the lands upon which their food is grown, let alone terrain dominated by species other than our own.... And should they have contact with other creatures, it will most likely be with dogs, cats, cockroaches, and trees that have had much of the wilderness drained of them as they have adapted to human habitations. (Nabhan & Trimble 11)

Children are placed in day care centers for longer hours, sometimes up to twelve hours a day, starting as early as six weeks old. In winter, there are children who enter and leave the center in the dark, spending only a limited amount of time outdoors throughout the day in storefronts, asphalt jungles, without trees, without grass, without fresh air to breathe either inside or out.

Moving into the twenty-first century, environmental issues are paramount. The damage and threat to the viability of our natural world is of grave concern to educators as well as philosophers. In the preface of his book *Growing up Green,* David Hutchison says,

> The twentieth century has been one of strange contrasts. We have learned a great deal about the universe, yet we have also lost our intimacy with it. The skills we have invented for our grand space adventures are the same ones that enable us to despoil the air, soil, and waters of their life-giving powers. As our artificial transformation of nature advances, our presence to nature declines. We live in a plundering industrial world of wires, wheels, and machines, of steel and plastics, of paved-over land and poisoned seas. (xiii)

We have moved from the industrial age to the "information age" or the "age of technology." The entire span of the world is at our fingertips. On a moment's notice we can communicate through fax or e-mail with the most remote parts of the world. The computer revolution has begun to shape much of the current educational curriculum. Cultural psychologists point out that "as a culture we increasingly esteem technological intelligence and devalue the social and emotional" (Healy 28). Once again, the adult environment becomes detrimental to child development, as we now impose computers on children as young as eighteen months. Schools are advised not to consider submitting a proposal for funding without a computer component in it. Anxious parents, fearing their children may fall behind, demand computers at all educational levels, and many children have access to computers in the home from the moment they can manipulate a mouse.

The rush to "jump start" children's cognitive development by hooking them up to computers at a very early age can rob them of the necessary sensorial interaction with the physical environment leading to a fully developed and integrated person. Jane Healy writes in her new book *Failure to Connect*, "Time spent with computers in the early years not only subtracts from important developmental tasks but may also entrench bad learning habits, leading to poor motivation and even symptoms of learning disability" (205). Computer use in the early years disconnects the child from vital emotional and linguistic interactions with primary caregivers, as well as interfering with the child's human tendency to explore the natural world. A young child of nine, when asked whether he liked to play indoors or outdoors, said indoors because "that's where the electrical outlets are" (Sobel 3). Sobel explains, "What's emerging is a strange kind of schizophrenia. Children are disconnected from the world outside their doors and connected with endangered animals and ecosystems around the globe through electronic media" (3). But the remoteness of the natural world is not limited to children.

Consider our present scene. We sit in a hotel, with four walls, air conditioning, listening to the clanging of coffee cups and the shuffling of papers. For many people, the confines of rooms such as these are familiar and commonplace. We move from our homes to our workplace, often into underground garages, walking through buildings connected by skyways, to office buildings and shopping malls. The average American walks only 1.4 miles a week, just 350 yards a day. (Bryson 128)

David Orr remarks, "the civilization we have built causes us to spend ninety-five percent of our lives indoors, isolated from nature.... We live lives full of traffic jams, noise, artificiality, and substitutes for the real thing" (204). We have created a bubble-like environment for our children and us.

And like the childhood recollection of a full summer vacation in the lake country of western Wisconsin, the natural world has become far, far away, long, long ago.

In an attempt to address the environmental crisis, teachers implement "politically correct" ecological curricula in classrooms across the nation. Children do projects on the rainforest in Brazil, study the effects of ozone depletion, celebrate Earth Week, see

videos about various forms of environmental abuse, and so forth. Studies have shown that this approach to the problem can be counterproductive, causing students to feel "hopeless and disempowered" (Sobel 9). The environmental crisis appears to be so overwhelming that children feel powerless in seeking solutions. David Sobel, in an attempt to understand why this kind of curriculum does not help in solving the Earth's problems, asked environmentalists what most influenced their strong commitment to ecological values. The response was indeed telling. They stated two main reasons: "many hours spent outdoors in a keenly remembered wild or semi-wild place in childhood or adolescence, and an adult who taught respect for nature" (10).

Teachers need to recognize and help parents recognize that love of the environment cannot happen in the abstract. Empathy for the environment cannot be taught simply through words. Sobel states, "What's important is that children have an opportunity to bond with the natural world, to learn to love it, before being asked to heal its wounds" (9). We must help forge a bond between the child and nature by starting in the child's immediate environment. Young children feel a natural empathy and affinity with all aspects of the natural world. Children love to touch and care for animals, to smell and pick flowers, to listen to the sounds of birds and ducks, to take refuge in small places such as trees and snow forts. Stephen Trimble states, "By forging connections with plants, animals, and land, by finding ways to experience some relationship to the Earth, individuals can gain a sense of worth" (Nabhan & Trimble 22). Early contact with the natural world is irreplaceable.

A kind of "ecophobia" or fear of the natural world can develop if a child is deprived of first-hand experience and interaction with the environment. I can relay a story to illustrate this point. In the late 1960s a group of teenaged boys from the inner city in Chicago were sent to a wilderness expedition experience called "Outward Bound" in northern Minnesota. None of them had ever experienced the wilds before. As part of the program, after being trained in survival techniques, each boy was left alone on an island for three days with just the basic survival supplies. One of the boys, who desperately wanted to successfully complete this part of the program, screamed for three solid days. Each day, when the leaders came to see what the problem was, he stated he was afraid that bears would harm him and was screaming to ward them off. The natural world had been so removed from his own reality that it produced in him an acute anxiety. He at first experienced the wilderness as the enemy, something to fear, something apart from himself.

The lack of encounter with the natural world has implications for the way Montessorians implement Montessori as well. Many Montessori teachers, at some emotional level, feel the confusion and estrangement about their own environments. They find it difficult to balance the indoor and outdoor environments, to let the child explore the natural environment, to experience a real leaf before offering the nomenclature for it, to offer substantial outdoor practical life activities, to provide sufficient "going out" expeditions. In many instances, there remains a separation of the indoor and outdoor environments, if not a complete isolation. The architecture and structure of many environments does not permit a natural flow between the inside and outside. Children are often required to wear beads around their necks in order to leave the work space—one at a time. Activities in the natural environment are viewed as outside the work cycle, something to be done after the "real" work has been completed. "Playtime" is different than "work time."

Playgrounds still more often than not have "adventure" structures with ropes, bridges, swings, and climbing apparatus, with minimal green space and artificial surfaces, void of diversity of vegetation and wildlife. This happens to all schools, but given Dr. Montessori's view of the indoors and outdoors, it is surprising that Montessori children are sometimes restricted so completely in their access to the out-of-doors. There are many reasons for this. Children need supervision. They will get dirty. They will make a mess. They will get a chill. Adult caregivers do not like to be out-of-doors. Liability, liability, liability. What then provides a model for our schools to get beyond the classroom's four walls, to make a prepared space for children in the out-of-doors, and, in Montessori's words, "to set the children free, let them have fair play, let them run out when it is raining, take off their shoes when they find pools of water, and when the grass of the meadows is damp with dew let them run about with bare feet and trample on it" (*The Discovery of the Child* 83). We need to reconnect to Dr. Montessori's vision of the integrated indoor/outdoor experience.

Courtesy of Cornerstone Montessori School and Cornerstone Montessori Elementary School, St. Paul, Minnesota

We must re-examine the significance of the natural environment in education across the planes. All will answer to the environment in the twenty-first century. To provide these answers, we must begin with the child. As Dr. Montessori states, "Infancy is a period of true importance, because, when we want to infuse new ideas, to modify or better the habits and customs of a people, to breathe new vigor into its national traits, we must use the child as our vehicle" (*The Absorbent Mind,* 82).

The child by nature loves the environment. By helping the child forge an emotional bond with nature, we help guarantee survival of the species as well as renewed health for our planet. We will not fight to save something we do not love. Dr. Montessori's vision of the child included a blueprint that would help forge this bond between the developing being and natural environment—a plan that ultimately empowers the child to find his place in society and nurtures his innate love of the environment. The environments that we prepare for the developing child must correspond to the needs and capabilities across the planes. The formative years of bonding with the environment express themselves in various ways, and the tenor and style of each period must correspond to development across the continuum.

We speak of the need for education to be holistic—to consider in balance all aspects of the human being—physical, cognitive, affective, and spiritual—and to seek to build connections between them. The spiritual aspects are often misunderstood or ignored. The spiritual must always be present. Spirituality—the human quest for connectedness—must be at the heart of everything we offer the child. The essence of holistic learning is a deep connection with the environment so that learning is deeply integrated—a connection among subjects, among people, to the earth, and to the universe. The image of interconnectedness surfaces in a scene from Thornton Wilder's *Our Town* as Rebecca explains to George: "I never told you about that letter that Jane Crofut got from her minister when she was sick. The address was like this. It said: Jane Crofut, The Crofut farm. Grover's Corners, Second county, New Hampshire, United States of America." George interrupts: "What's so funny about that?" Rebecca continues: "But listen, it's not finished: The United States of America, Continent of North America, Western Hemisphere, the Earth, the Solar system, the Universe, the Mind of God—that's what it said on the envelope" (46).

From a Montessori perspective, we see a similar organic relationship in the interconnected parts and systems of the universe. But the initial connection must take its rise at birth. As Dr. Montessori said, "The greatness of the human personality begins at the hour of birth. From this almost mystic affirmation there comes what may seem a strange conclusion: that education must start from birth" (*The Absorbent Mind* 2).

Our first task is to nourish the natural urge within the child to connect to her environment—to develop a reverence for it. A deep reverence for all of life may be the salvation of civilization. There are cultures in which "each person is accompanied through life by a totem animal, whose name a child might be given along with other names, and whose

function is to embody the child's link with the natural world" (Roszak, Gomes, & Kanner 102). In the Western world our ties to the earth are not so strong. It requires a conscious commitment and a belief in the connection between heart and mind to help the child establish her "cosmic task" and become a productive and contributing member of society—to continue the work of creation, in a *constructive,* rather than a *destructive* manner. In order to pave the way for cosmic education and the later work of the adolescent, the rudimentary emotional attachment to the environment and the *feeling* of being one with all must be in place.

The child's first sensorial experience of the world is through the human body—its mother. From its beginning, the human being is designed and motivated to connect to the world, to feel as if she belongs and is part of the world. The fetus experiences the sensorial sensations of the beating of the mother's heart, the taste of the amniotic fluids, the vibrations of the mother's voice, the temperature of the fluid surrounding her. She feels the movement of the mother. The mother's voice and communication with the unborn child is an important step in the bonding process. Memory and the absorbent mind are already at work The unborn child feels a deep security, and life is bliss. The genesis of the child's love for the environment begins even before birth.

Dr. Montessori states, "The newborn child comes into the world as a 'spiritual embryo'—a spirit enclosed in flesh" (*The Child in the Family* 10). The manner in which we receive this magnificent spirit can help establish a natural transition from one environment to the next. Our contemporary hospital birthing scenes do not often accommodate the needs of the newborn babe. Joseph Chilton Pearce, in *Evolution's End,* says, "Our mothers are conditioned to believe that birth is an unbearably painful and dangerous ordeal needing maximum professional assistance" (119). Efforts by people such as Frederick Leboyer have brought to our consciousness the need for "birth without violence."

The mother is the child's first contact with the environment—a sacred bond is created, allowing the child to trust that the world is a safe and interesting place. The bedrock of security is formed in these earliest years of life. At this earliest moment, there is not "environment without the mother." The mother is the child's first environment (Kahn, "Of Roots and Wings" 2). The newborn is open to experiencing the totality and fullness of what the world has to offer, but in a very protected way. The world of the newborn consists primarily of his immediate surroundings, beginning with his mother and father. The child experiences a very sensorial connection to his mother. A deep attachment occurs through feeding, holding, singing, rocking, and so forth. The inner creation of the child is blossoming through this vital contact with the environment.

Once the child feels secure with the immediate environment of the mother, she feels safe to turn outward to other family members and the prepared environment of the home. The eyes, hands, mouth, ears continue to be the instruments for exploration. There is a tremendous attraction to the environment. We clearly see the sense of wonder and awe within the child. For the young child "the world of nature is not a 'scene,' or even a landscape. Nature for the child is sheer sensory experience" (Cobb 29).

The child becomes transfixed on objects and people in the environment, and we can clearly identify deep concentration in the child. She becomes attracted and curious about all the objects in the environment and explores them with her mouth. A process of identification begins. Development of the human personality is dependent upon both

Courtesy of Liz Ammond, The Children's House, Traverse City, Michigan

environmental and social dimensions. Edith Cobb explains: "the adaptive give and take between living organisms and their environment, represents the ecology of the individual organism. In this sense, life is a matter of mutual, functional interaction or intercourse with the environment. This mutuality is equally nourishing and productive of life and form to the mind and to the body" (29).

With the beginnings of purposeful movement, the child's environment begins to expand. The child begins to actively seek out the environment. The environment becomes a means of development for the child. Children use the environment *to improve and create themselves*, whereas adults use *themselves to improve the environment.* The human tendencies and sensitive periods guide and motivate the child. The tendencies have aided human adaptation to the environment from the beginning of time. They have supported human beings as a change agent—a creative, imaginative being who modifies, improves, or, unfortunately, even destroys his environment. Consider the tendency to explore for a moment. Through the natural inclination or urge to explore, human beings have progressed from simple discoveries about which foods are safe to eat and which are not, to sophisticated knowledge about outer space and the ocean floors.

In light of Dr. Montessori's work, it is interesting to note that studies suggests that "we have map-making genes strung along the DNA, promoting our ability to integrate and organize our experiences of geographic space. Such mental map-making skills clearly gave our hunter-gatherer ancestors an evolutionary advantage" (Nabhan & Trimble 19). Exploration leads to an orientation, ordering, and classifying of the world, helping the child develop roots and a sense of place, both critical to human development. According to the National Geography Standards, to know where you are in the world, you must see meaning in the arrangement of things in space, see relationships between people, places, and environments, use geographic skills, and apply spatial and ecological perspectives to life situations (*Geography for Life*). The tendency and sensitive period for order helps the child establish these relationships.

Courtesy of Mrs. Risa Kazama, Japan, submitted by Takako Fukatsu

Additionally, the absorbent mind assists the child in taking in all aspects of the world and incarnating them, making it part of him. The child's experience of the world is very different than the adult's. Walt Whitman expresses this through his poetry—showing the interplay between the child and the world:

> There was a child went forth every day,
> and the first object he looked upon, that object he became,
> And that object became part of him for the day or a certain part
> Of the day,
> Or for many years or stretching cycles of years.

Consider the young toddler—this "spiritual embryo," compelled to seek out and connect to his world: an impassioned explorer, senses alive, face close to the ground to inspect the small and inconspicuous. The active senses continually store up memories and impressions to weave the web of the mind. The child builds his mind connected to his heart. The very young child does not differentiate between himself and others. He demonstrates a natural empathy and is implicitly drawn to the natural world—every puddle is exhilarating, every flower glorious, every baby animal a friend. Providing for the child's innate sense of wonder and sense of connectedness at this stage is paramount. It helps lay the emotional foundation for more abstract learning in later stages.

The greatest gift we can give this spontaneous explorer is time and opportunity—time to create intimacy with the world, time for free play, time to wonder, time to arouse the emotions, and time with

us as her loyal companion to share in the discoveries and mysteries of the world. At this stage it is more important to feel than to know. In her book *The Sense of Wonder,* Rachel Carson explains:

> If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow. The years of childhood are the time to prepare the soil. Once the emotions have been aroused—a sense of the beautiful, the excitement of the new and the unknown, a feeling of sympathy, pity, admiration or love—then we wish for knowledge about the object of our emotional response. Once found, it has lasting meaning. It is more important to pave the way for the child to want to know than to put him on a diet of facts he is not ready to assimilate. (56)

Infants and very young children should have ample time to just "be" outside—to explore with parents, grandparents, and older siblings. They need to experience organisms in their immediate surroundings—to cultivate a relationship with all the elements of the natural world. Judi Orion says that trees were the first mobiles.

The Montessori toddler community also helps prepare the soil in a protected space. The young child, barely out of its cocoon, with emotions still worn on its sleeve, takes the first steps toward self-sufficiency and independent activity. Very low windows allow the young child to view the out-of-doors. A nearby reading area can promote a peaceful respite for the young child, looking at a book with plants surrounding him and the outside vista in close proximity. By caring for plants and animals, the child readily comes to understand that other living things depend on him to sustain life. The outdoor environment is also small and protected. Many things are seen or heard for the first time! Imagine the delight and wonder of seeing a worm or chipmunk or snow for the first time. The most minute details are of the greatest fascination to the child.

As the child moves into the Casa dei Bambini, the environment must continue to represent a living, organic environment, not simply become Montessori materials arranged neatly on the shelves. The materials as "keys to the world" come fully alive only if the child is able to relate them to real-life experiences—to use them as tools for exploration, rather than in isolation. The sensorial materials act as spotlights on reality. Each piece of apparatus reveals some particular aspect of the world to the child.

Sèvres, France, around 1935, courtesy Margot Waltuch collection

The child needs to continue experiencing the living environment—the wilds, plants, animals, rocks, various kinds of terrain—and to be offered the opportunity for contemplation and solitude. The need to strengthen the muscles and coordinate movement is prominent. The child continues to possess a natural affinity for growing things. Nature must continue to be a constant in the child's life—not be treated as a distant abstraction to be learned about from books.

In looking back to the earlier Children's Houses, we see that Dr. Montessori provides for this in her vision of the prepared environment—terraces, gardens, elder gardeners, easy access to the out-of-doors. Many of our modern environments have lost

much of the intimacy with the natural world. Many children have very limited access to the outdoors. There is much we can learn about beauty, simplicity, and interconnectedness from these earlier environments, and from environments in other parts of the world, such as Africa, India, and Japan, to mention just a few.

Hopefully, by the time the child enters the Casa dei Bambini, she has experienced the world as a friendly place, with luxurious sensory offerings, a place for great adventure, discovery, and joy. Ideally, she has had active participation with caring adults who, like the artist or poet, have retained their own sense of wonder and remain open to the sensory offerings of the world. This is the time to further ground the roots, to follow the child in her intuitive wisdom that we are all part of the natural world. This is the time to keep the body and hand in motion, to offer purposeful work, to foster functional independence, and to label prior experiences and impressions with precise language, enabling the child to communicate with others in social partnership. This is the time we offer the world and all its trappings to the child—setting the foundation for culture. We lay the seeds for cosmic education by offering the concrete world as the springboard for the imagination.

Many Montessori environments today face the challenge of having children stay in the environment all day. There is great debate on how to best serve children who stay for extended hours. In the earlier part of this century, many of the children stayed in the Children's Houses for the entire day. There are many lessons to be learned from those days. The physical and psychological design of the environment must offer the full components of life and allow the child to live her life in the most natural way. To force the child to live in a predominately artificial world is an act of cruelty toward her humanity. As Dr. Montessori says, "The child, who is the greatest observer of nature undoubtedly needs to have placed at his disposal material on which to work" (*The Discovery of the Child* 85).

Outdoor work is not limited to what is deemed "appropriate outdoor work" as evidenced in this photo of a young boy playing the bells with great concentration. Courtesy Margot Waltuch collection

The physical structure of the prepared environment should provide easy access to the outdoors. Once outside, there should be adequate space for working, planting and harvesting, movement activities, free play, walks, rest, and solitude. Inside, the environment should have low ceilings, windows scaled to the child's dimensions, and steps half height to accommodate the youngest children. Plots of soil for planting can be directly outside the indoor space. An ideal floor plan includes various areas that provide fully for the children's needs, including indoor work spaces, terraces, trees, bushes, and other plantings, quiet corners, dressing rooms, gym equipment, balancing beams, a tool and animal shed, a quiet shady corner with table and benches, wading pool and shower, sundial, and area for children's plantings. Various activities can take place on the terrace and in the gardens. The diversity of work and social interaction should depict the natural order of human life.

With the Exercises of Practical Life, the emphasis should be on the word *practical*—relating to real-life work, not something contrived and artificial. Freely participating in the art of daily living allows the child to become functionally and socially independent. These activities must not remain isolated exercises on shelves only to be used during the morning work cycle, but must be the heart and soul of community life.

Gardening, planting, harvesting, preparing, and serving food all help the children feel part of the cycle of life. It truly becomes a labor of love, and the children feel a sense of pride and accomplishment. Dr. Montessori said, "The truth is that when a free spirit exists, it has to materialize itself in some form of work, and for this the hands are needed. It is thanks to the hand, the companion of the mind, that civilization has arisen" (cited in *Winter Count*).

At the school in Sèvres, France the children spent many hours gardening. All the necessary tools were close at hand: wheelbarrows, rakes, hoes, shovels,

spades, watering cans, and baskets. The opportunity for choice was abundant. Where should the garden be planted? What should be grown? How should the soil be prepared?

Children hoe the land, work with the wheelbarrow, water tulips, shell peas, cut beans, learn and work with an elder gardener, preparing food, serving food, and eating together.

At Sèvres the children stayed all day. There were plenty of times just to "be" outside or perhaps take a nap outdoors on cots.

Control of movement exercises were not restricted to the indoor spaces. Walking on the line at Sèvres was a daily occurrence—often outdoors. A line was simply made in the dirt and the children proceeded with the activity. Mazes in England provide ample opportunity for development of balance and equilibrium.

The silence activity done out-of-doors opens up a different kind of sensory experience for the children. The sounds of nature are often not noticed without muffling extraneous noises. Rachel Carson proclaims, "hearing can be a source of exquisite pleasure but it requires conscious cultivation. Take time to listen to the voices of the earth and what they mean—the majestic voice of thunder, the winds, the sound of surf or flowing streams. And the voices of living things. No child should grow up unaware of the dawn chorus of the birds in spring" (82).

The power of the elementary-aged child is the ability to explore through the energy of the imagination coupled with a highly intellectual and reasoning mind. The boundaries for exploration expand tremendously. The smaller protective environment of the younger child no longer suffices. The sensorial learner of the first plane becomes the abstract learner of the second plane. The brain is fully developed and the child is capable of more sophisticated learning. In *The Geography of Childhood*, Trimble states:

> In other primates, this shift leads right into puberty. Humans, however, have postponed the hormonal rush until the teenage years, opening up a six year interval when childhood brains receive and learn in a uniquely fresh, receptive, and playful way.... This is the time the children are in love with the universe and poised halfway between inner and outer worlds. Here lie latent power and purpose, the seeds of the writer's art, the painter's vision, the explorer's passions.... [It is the time when] he wants to possess the world as his theater of perception. (Nabhan & Trimble 28)

Sèvres, France, around 1935, courtesy Margot Waltuch collection

Paul Shepard speaks of this time as "the ark of the mind.... A decade, from the beginnings of speech to the onset of puberty, is all we have to load the ark with animals, with plants, with place, with sunrises and moonsets. With wildness" (cited in Nabhan & Trimble 28).

This is the period of "acquisition of culture," whereas the first period was the absorption of the environment. The child explores the whole universe and is interested in its inner workings. This is not something the child can see directly. Giving the child the framework through the whole and then moving to the parts is the approach at this moment. We present the whole vision of the universe—both past and present. Dr. Montessori said, "the universe is an imposing reality and an answer to all questions" (*To Educate the Human Potential* 8). The child explores the universe aided by the imagination. We assist the imagination by offering imaginative stories about the origins of the universe, how the earth began, how humans came to be. Dr. Montessori recognized that

> The narrative model is built on a philosophical premise that questions deal not only with facts, but with origins, with issues of life and death, and, most importantly, that questions relate to the emotional needs of children to understand and explore their biological and psychological connection to the natural world and their cultures. (Kahn, "The Montessori Contribution" 6)

At this time we expose the child to the "cosmic task" of creation. The concept is that all parts of the universe are related—it leads from the whole to the parts and back to the whole again. Within this cosmic task, we find, human beings have a part to play. Through the great stories we help the child realize that all created things are one with us and to be loved.

The motive running through cosmic education is service. Everything that exists has a service to perform, from the plants to the animals to human beings. Everyone and everything that exists has a contribution to make. We have to help the child become grateful to our ancestors, who have performed significant services for us, such as inventing the wheel, discovering fire, and so forth. Studying the universe in all its glory keeps alive the child's sense of wonder and helps her approach life with reverence.

We also give the child illustrated maps, photographs, symbolic pictures, charts, and graphs to help the child understand creation and as follow up to the stories. All of this helps fire the now precocious intellect and helps the child think for herself. The child begins to understand the interdependency of things; is able to see the invisible; can imagine such things as the components of the food chain—how energy is transmitted, the complexities of the solar system, the evolution of humanity.

Courtesy of Cornerstone Montessori School and Cornerstone Montessori Elementary School, St. Paul, Minnesota

But even during this most intellectually powerful period of life, the child must continue to experience and have contact with nature—the charts, stories, and indoor scientific experiments are not sufficient. It is not enough to see the nomenclature for taproots—children should be able to pull up roots, examine, and discuss them. In a 1979 interview with David Kahn, Mario Montessori lamented, "if you take all the charts and timelines and call it cosmic education, that is ridiculous. It goes much further than that.... We tried then to work with the child in nature—we would try to help the imagination of the child with real experiences" (cited in Kahn, "The Kodaikanal Experience" 57).

We run the risk of damaging the sense of wonder if we reduce learning to abstractions divorced from lived experiences. Ralph Waldo Emerson said, "We are shut up in schools and college recitation rooms for ten or fifteen years, and come out at least with a bellyful of words and do not know a thing. We cannot use our hands, or our legs, or our eyes or arms. We do not know an edible root in the woods, we cannot tell our course by the stars, nor the hour of the day by the sun" (cited in Orr 18).

The "going out" program, which unfortunately is severely under-utilized in many schools, provides ample opportunity for firsthand experience of what is studied in class. If the children study herbs and their classification, they should be able to visit a real herb farm. When studying basic food items, they should visit farms as well as planting and harvesting their own food. When studying the works of rivers and streams, real field experience helps internalize the process as well as providing an emotional attachment. Children begin to see the relationship between organisms and the environment—they become "aware of the factors of life and the factors of earth and their interrelatedness" (Travis).

These kinds of experiences can also be related to the developing moral sense in the child. Children of this age are keenly interested is exploring what is right and wrong, what is just and unjust. Upon witnessing pollution of the waters, destruc-

Courtesy of Pacific Crest Montessori School, Seattle, Washington

tion of property, and poor waste management, the children can debate and discuss the ethical issues surrounding these matters. If, from birth, children have been taught and have been shown respect for nature, they will respond with indignation at such abuses. It will provide opportunity for them to take action, to come up with practical solutions—to be in service—which is the heart of cosmic education. I remember while vacationing in Arizona with my two sons, aged eleven and thirteen, the absolute disbelief and shock they felt upon discovering that there was no recycling in that part of the country. It was painful for them to have to throw cans and bottles into the regular trash.

Once again, the bedding of empathy and knowledge grows stronger roots and helps keep the *sense of wonder* alive. To be able to sift through a handful of dirt and see how decayed leaves become nutrients to feed plants, which in turn feed animals, leads to the beginnings of understanding of the food chain. Or telling the great stories out in nature, as often done by Mario Montessori—would that not add to the power and relevance of the message?

We must not insulate the child from the out-of-doors. The child of this age is physically strong, agile, and wants to move into the outside world. The child's home becomes less significant and the landscape looms large. Dr. Montessori says:

> The child of seven has strong legs and seeks to escape from the closed circle. Instead of hemming him in, let us facilitate his mobility.… when the child shows us his desire to escape from the house, let us attract his attention somewhat solemnly to his feet.… The foot is noble. To walk is noble. Thanks to our feet, the child who already walks can expect of the outdoors certain answers to his secret questions. (*From Childhood to Adolescence* 25)

She added that the child "ought to develop the habit of observing all in his universe" (29) as well as learning "how to orient himself in the field" (28). There remains a strong affinity and need to interact in the natural world, but with the emergence of the

social being, we see a preference for working and exploring in groups.

There remains a need for reflection and solitude. Time for rest and time for "just being" with nature has become the antithesis of the cultural values in most parts of the western world. Throughout Dr. Montessori's work she speaks of the need for rest as part of the learning process.

Adolescence marks the end of childhood; it is a time of great transformation and instability. The transition is a fragile one, often misunderstood and mishandled by much of society. The adolescent may be alienated from society instead of embraced and nurtured through a dramatic passage from one realm of existence to another. Instead of bestowing trust and granting real responsibilities, we lock adolescents away in classrooms, saying we must first prepare them for future adult life. Believing intellectual capacity grows with age, we tend to pile on the work. Subjects are taught in isolation without logical continuity. Unaware of their vulnerable physical constitution, we interfere with sleep cycles and dietary needs. Many view adolescence as an awkward stage, characterized by rebellious, destructive behavior, outrageous clothes, and equally ridiculous ideas.

What is most needed during this delicate transition is an orientation toward service. We witness the birth of the social being—a socially conscious person with a strong desire to contribute to society. Renilde Montessori says, "The adolescent is a social embryo, so your prepared environment must be what society is all about, in the context of the natural world. Human society cannot be divorced from the natural world" (cited in Ewert-Krocker & Kahn 170). The child began his exploration of society during the second plane, but now the adolescent puts himself at the service of society—the service of humanity. This is the age of realization of a vocation and service. The adolescent explores what his life's work might be. He is sensitive to the facts and experiences of social life. The tendency is toward creative work such as the arts—drama, art, music, and dance. This is the time for acting out the cosmic mission. Everything that was learned at the second plane should now be worked with and experienced at the third plane—in a very real sense.

Dr. Montessori says that "since there is a radical change in the person, there must be a radical change in his education" (*From Childhood to Adolescence* 102). Dr. Montessori's vision was to provide an alternative prepared environment, away from the city and the pressures of city life. She said it is "desirable to have the child live outside his habitual surroundings, outside the family, in the country, in a peaceful place, in the bosom of nature.... the calm environment, the silence, the marvels of nature satisfy the mind and are conducive to its functions of reflection and meditation" (*From Childhood to Adolescence* 105-106).

The environment is Erdkinder, or "children of the soil," and must not be mistaken for a *school* in any traditional sense (Ewert-Krocker & Kahn 169). It is a place where children live their lives. In the second plane, the children intellectually explored civilization and how it came about; now the children actually change the face of the earth with their own hands. They are "penetrating civilization from

Courtesy of Sara Guren © MDP, Hershey Montessori School, Huntsburg, Ohio

its origins" (Montessori, *From Childhood to Adolescence* 107). It is the time to go back to the physical environment—to the water, soil, pond, and forest.

The setting is a farm. The work is the land. All components from the farm should be available, allowing the adolescents to grow and sell their products. Montessori said all civilizations depend on the products of the earth. Work in the Erdkinder takes two directions—manual and intellectual, both of which are necessary for civilized society. Dr. Montessori said, "The men with hands and no heads and the men with head and no hands are equally out of place in the modern community" (*From Childhood to Adolescence* 98). Here the children are allowed to explore economic independence.

There are many parallels to the first plane. The Exercises of Practical Life once again play an important role in the education of the adolescent. The children are responsible for the maintenance and domestic needs of the hostel, doing laundry, making meals, maintaining order, and so forth.

Montessori also envisioned a shop that would sell the products and crafts of the children. The children would be responsible for all that it entailed, such as bringing in and selling their wares, managing the store, and all the economics pertaining to it. This helps the children understand the law of supply and demand, essentially beginning the study of economics.

In the Erdkinder environment the children study the arts by performing, architecture by building things, botany by growing things, history by studying inventions, and chemistry by laboratory experiments. They can sew, cook, make arts and crafts, and learn political structure by managing their own community.

In such an environment we are able to avoid the separation of abstract learning from practical intelligence—both necessary to the integrated being. If the educational process from birth through adolescence truly integrates all elements of the world, allowing full and active participation on the part of children and adults alike, we can expect a very different result than is common today. At a gathering of ecopsychologists it was concluded, "if the self is expanded to include the natural world, behavior leading to destruction of this world will be experienced as self-destruction" (Roszak, Gomes, & Kanner 12). The patterns that we unconsciously and consciously establish with nature throughout childhood will continue to influence us throughout life.

An understanding of ecosystems, in the heart and in the mind, will safeguard the innate *love of the environment* that Dr. Montessori so eloquently speaks of in her writings. Ecologist Paul Ehrlich says, "Familiarity with basic ecology will permanently change your world view. You will never again regard plants, microorganisms, and animals (including people) as isolated entities. Instead you will see them—more accurately—as parts of a vast complex natural machinery —as related elements in a system that operates in a definable manner" (cited in Suzuki & Knudtson 91).

Moving into the twenty-first century, we are faced with an ecological crisis calling for nothing less than an "environmental revolution." We have before us a challenge that requires us to keep an open heart. The question posed at the beginning of this talk remains to be answered—can we who are in a void of wonder and connectedness feel the fascination once again or even lead young children to do the same? Perhaps it is the child that can lead the way. I believe she can. The capacity for love is abundant in the child. The child is capable of embracing life in its totality. As we journey on in life, we tend to dissect life, to compartmentalize it—to separate heart and mind, thinking and feeling. We all possess a heart that longs to be connected to the largeness of life. We must reestablish an integrated self to truly serve the child—to be able to nourish what is most noble in the human spirit.

Return to the basics—focus on what is ultimately important in life. We must learn to use our senses again. Reclaim the gifts from the earth we received in childhood. And as David Orr reminds us:

> We are of the earth; our flesh is grass. We live in the cycle of birth and death, growth and decay. Our bodies respond to daily rhythms of lightness and darkness, to the tug of the moon, and the change of the seasons. The salt content of our blood, our genetic similarity to other life forms, and our behavior at every turn gives us away. We are shot through with wildness.... the earth is inscribed in us, we are of the earth. (204)

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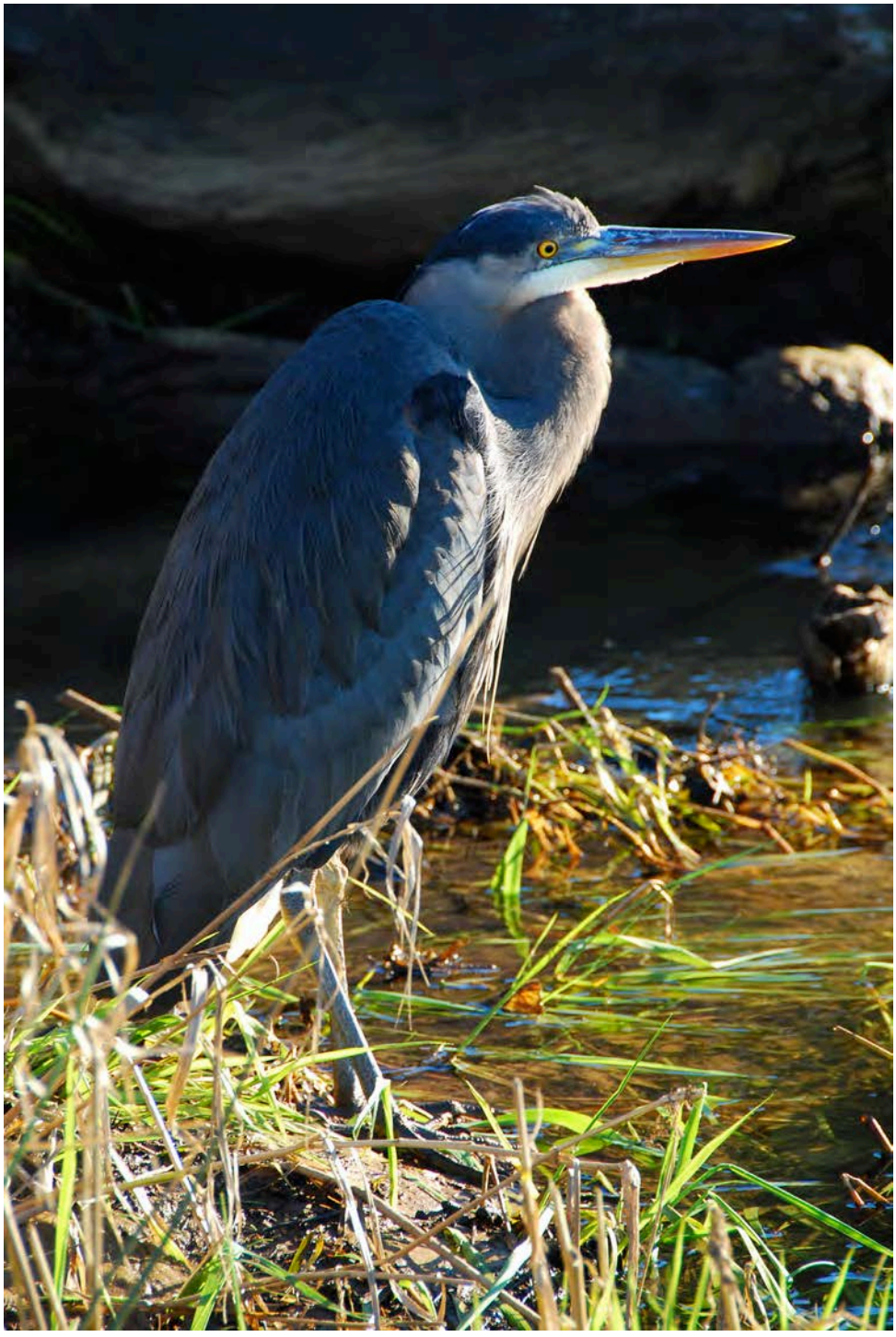
Shelling peas, Pakistan



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