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 nonhuman 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 said, "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 multi-sensory, 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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This article is reprinted from The NAMTA Journal 13,*2 (1988, Spring): 27-32.*