Nature Study

THE JOURNAL: Past, Present, and Future

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A JOURNAL OF ENVIRONMENTAL EDUCATION AND INTERPRETATION

The Nature Study Journal: Past, Present and Future

In 1905 Maurice Bigelow of Columbia University started a magazine entitled the Nature Study Review. On its Board, as an active contributor of ideas and articles, was Liberty Hyde Bailey. Bailey was the dean of the College of Agriculture at Cornell University in New York State who had established the first statewide school program in Nature Study. Bailey wrote, "It is astonishing when one comes to think of it how indirect and far removed from the lives of our pupils much of our education has been ------Surely the best education is that which begins with the materials at hand."

Later, in his book, The Nature Study Idea, Bailey said, "Nature-study ought to revolutionize the school life, for it is capable of putting new force and enthusiasm into the school and the child."

Nature study as Bailey and Bigelow conceived it was hands-on, starting in the school and the school yard, and reaching into the home and community. It was participatory, pertinent and present tense! In 1907 an article in the Nature Study Review invited anyone who was interested in forming a society to promote the teaching of nature study to meet in Chicago after the American Association for the Advancement of Science conference. It is not surprising that at that organizational meeting Bailey was elected the first president. Maurice Bigelow was elected secretary and he also continued as editor of the Review which then became the official publication of the Society. When Bigelow gave up editing, Anna Botsford Comstock took it over. Later, editing the magazine became the responsibility of the president. When Nature Magazine was published by the Pack foundation, ANSS had a section in that and discontinued publication of the Review.

The present form of the Journal is the result of the efforts of Stanley Mulaik and John Gustafson, who took a newsletter that was issued quarterly and built it into the magazine we have today. Stan was editor for almost 20 years. His contributions to the Society at conferences, as president, and particularly as editor are extraordinary. Through the years the Journal has tried to bring thought-provoking information and teachable ideas to its readership. It also provides an opportunity for members to share their concerns and techniques.

A volunteer editor with all-volunteer contributors has a challenging job. In fact, the Journal can only be as useful as you, the members, make it. Right now four issues are in the process. Where do you fit into this schedule? The first will be out this fall, entitled YOUTH AND THE ENVIRONMENT. According to guest editor Sean Duffy it will include programs initiated by kids, by schools, by organizations. It will tell of awards, of scholarships, of career opportunities. Sean has been working on this Journal for two years. I asked him to do an every-issue column on programs for youth and he said, "There's too much going on for a column. I'd like to do an entire Journal."

He now has boxes and boxes of material. In fact, he says the tough part is that new material is coming every day, but he still considers each entry. He particularly needs illustrations: art work from kids and art work or black and white photos of young people doing projects. Illustrations should be carefully labeled and include the name and address of the contributor. Send material to: Sean Duffy, 1541 Twisted Oak Drive, Reston, VA 22094 before August 1, 1992.

The next Journal, FIRST NATIONS PEOPLES, will deal with the wide spectrum of Native American materials developing today, including samples of the wonderful diversity of the environmentally sensitive cultures and gifts of the ancient peoples, problems and progress of present day groups, and teaching tips. If you have suggestions or want to contribute an article contact, Helen Ross Russell, 44 College Drive, Jersey City, NJ, 07305.

Eva Gordon Award Winner and former editor of the out-of-print American Museum of Natural History magazine for children, Laurence Pringle, will edit a journal on ANIMALS. His address is: PO Box 252, West Nyack, NY 10994.

And finally, late in 1993, a journal on FORESTS will be taking form. Like forests themselves, and all other environmental concerns, it will be many-faceted: ecological, economic, political, cultural, educational. Suggestions and proposed articles on this topic should be sent to Helen

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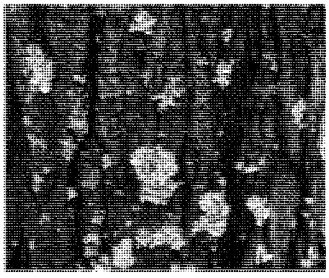

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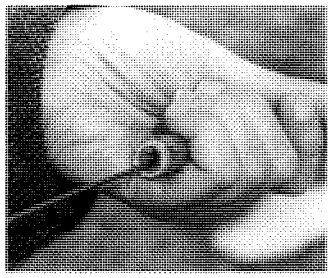

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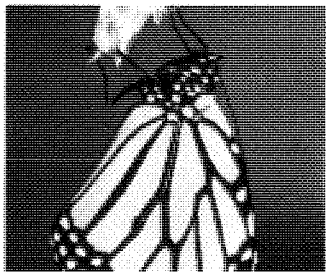

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Lichens, Earth's Oldest Living Organisms

John Serrao

They have been called the toughest, hardiest plants in the world, capable of thriving in the harshest of all environments, where they may very well be the only living things. Scientists have also claimed that they are the earth's oldest living organisms -- some colonies on remote, cold mountaintops and Arctic rocks may have started growing there several thousands of years ago.

As a group, they are ubiquitous, found around the world from pole to pole, deserts to tropical rainforest, mountaintops to seacoasts. Their success is largely due to their unique dual nature, a phenomenon which has recently been yielding its secrets to scientific research. Yet, despite all their adaptations to survival, many species have been disappearing over the years from the vicinities of our larger cities because of air pollution.

These plants are called lichens, a name derived from the Greek word for leprous and applied way back in the first century to these small plants because the surfaces of many species are blistery, pitted, and leathery like the skin of a person with leprosy. We've all seen these small plants on bare rock, soil, and tree trunks, sometimes appearing like dried patches of green paint or skin-like folds of leather. Over 2,000 species exist in North America (over 20,000 worldwide), and their physical growth forms are usually divided into four main groups.

Crustose Lichens are the kinds that grow like discolored patches on rocks and trees. These species are very flat, thin, granular, and so firmly and closely attached to their substrates that they can't even be peeled off the rocks or bark they grow on. Examples include the Whitewash Lichen *(Lecidea speirea)*, the greenish Map Lichen *(Rhizocarpon geographicum)*, found on mountains throughout the world, and the white Script Lichen *(Graphis scripta)*, whose surface appears to have been etched in ancient hieroglyphic writing.

The second group is called the Foliose Lichens, which are leathery, leafy, plate-like mats on rocks and trees. Unlike the crustose species, foliose lichens have definite upper and lower surfaces like leaves, and they are loosely anchored to their substrates only in spots so that they can be peeled or lifted off like doilies. In most species, the margins are lobed like the edges of a leaf.

Generally silvery-gray or blue-green in color, and with lobed margins, common species include the Boulder Lichen *(Parmelia conspersa)*, the Shield Lichen *(Cetraria glauca)*, and the Rock Tripes *(Umbilicaria sp.)*, which differ from the others in being anchored to the vertical surfaces of cliffs in only one spot, like an umbilical cord attached to their black undersides. One common species of rock tripe is smooth and leathery *(U. mammulata)*, while another is "blistered" and warty like a toad's skin *(U. papulosa)*. A few species of small birds, especially ruby-throated hummingbirds, regularly use pieces of foliose lichens in the outsides of their nests.

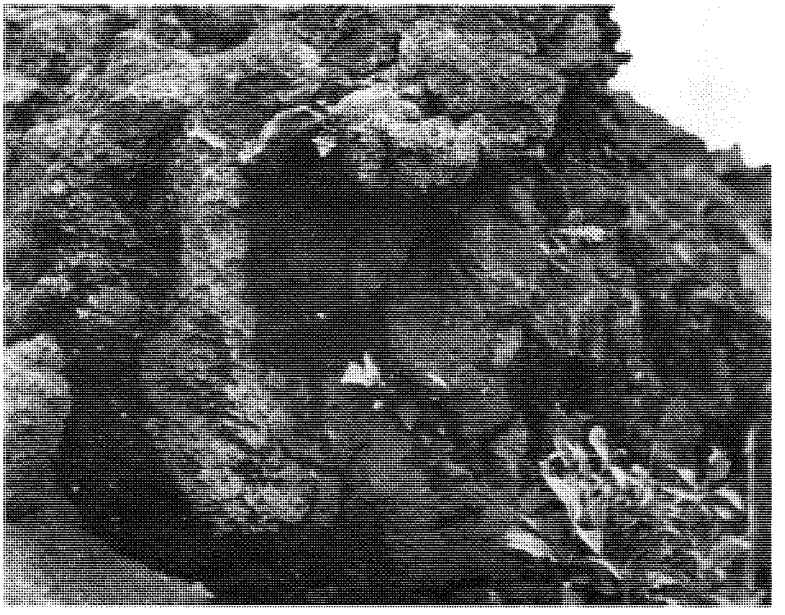

photo: Helen R. Russell

Lichen Initiated Succession

Paricutin erupted in a farmer's cornfield in 1943 and covered two Mexican villages with lava before it lapsed into total inactivity in 1952. This photograph, taken 20 years later, shows the surface of the scoriaceous basalt almost entirely covered with lichens while the pits and pockets contain lichen-formed soil on which mosses, ferns and occasional flowering plants grow.

A third lichen group, found much more abundantly in the spruce-fir forests of New England and Canada, are the Pendant Lichens. This group, which includes the striking Old Man's Beard *(Usnea barbata)*, is characterized by long, wispy, thread-like streamers that hang down from branches (similar to the completely unrelated Spanish Moss of the South).

The fourth group of lichens includes the most beautiful and easily recognized species.

Called the Fruticose Lichens, these are the kinds which grow like tiny, upright, branched shrubs on rotting wood or barren ground. They are named after the various structures they resemble in miniature: Powder Horn *(Cladonia coniocraea)*, Pyxie Cup or Goblet *(C.pyxidata)*, and Organ Pipe or Ladder Lichens *(C. verticillata)*.

The most beautiful species in this group is British Soldiers *(C. cristatella)*, named after the brilliant red caps (the color of the English uniforms during the Revolution) atop their greenish upright stalks. Another very widespread northern species, called Reindeer "Moss" *(C. rangiferina)* grows in thick, silvery-gray or greenish clumps on the ground, and is sometimes used in model train displays to imitate shrubs. It covers thousands of square miles in the Arctic tundra, where it comprises 60 to 90 percent of the diet of caribou and their Eurasian relatives, the reindeer.

Wild animals aren't the only things that make use of lichens. The Iceland moss lichen *(Certraria islandica)* is not only eaten by wildlife but is ground into powder, boiled, and converted into soups and other foods for humans in northern countries. The rock tripe lichens have often been used as an emergency food by hikers, explorers, and native Americans. Boiled into a gelatin or soup, it still retains its bitter taste, but the lives of Arctic explorers may have been saved by this meal.

The "manna from heaven" which saved the lives of the wandering Israelites in the Bible is thought to have been a lichen *(Lecanora esculenta)* which grows in great quantities on desert mountains and gets blown down onto the desert floor by high winds. Lichens have also been used as stabilizers in perfumes and soaps, and in making the dyes used in litmus paper (for testing pH) and, most famously, Scottish wool tweeds ("Harris tweeds").

During the Middle ages, lichens were also believed to be valuable as drugs and medicinal herbs. The ancient "Doctrine of Signatures" held that many plants were endowed by the Creator with signatures indicating their value in curing human diseases and injuries. Thus, lichens were often used to treat ailments of the lungs, skin, and hair since they resembled those parts of the body.

When we look at one of these unusual plants called lichens, we are actually observing two plants in one. What we see is a type of fungus, but embedded in the fungus are thousands of tiny green cells of algae. Each algal cell is surrounded by and enmeshed within a network of fungal threads, all of which unite to create a tough, resistant, closely-felted sheet. The green algal cells are protected within their enclosure and may benefit by the higher humidity there.

But it is the fungus that receives the main advantage from this dual relationship. Being green plants, the agal cells can produce their own food (sugars) by photosynthesis in the presence of sunlight, air and moisture. Fungi are incapable of this, and so they must get their nourishment either as parasites on living plants or as saprophytes on dead leaves, wood or other organic matter. In lichens the fungal members act as parasites on their algal partners in a controlled manner, extracting just enough nourishment but not enough to kill their hosts.

Lichens were once thought to be prime examples of "mutualism," a form of symbiosis in which each partner benefits the other. Recent scientific research, however, has advanced the idea that the two members of the lichen partnership live in a more "sinister" sort of natural balance, with the algae constantly replacing cells destroyed by the parasitic fungi.

The algae probably receive little advantage in this relationship. In fact, they can live independently in nature whereas the fungal partner is never free-living. Apparently this system has evolved many times in the distant past, with various types of fungi parasitizing free-living algae, and certain species of these algae evolving degrees of resistance to the fungi and acquiring the ability to survive in a new dual partnership, a lichen. Today, lichens can even be synthesized in the laboratory by bringing the correct fungi and free-living algae into contact with each other.

Lichens can reproduce in several ways, including simply shedding fragments of themselves containing both fungus and alga components. Specialized, powdery granules called soredia are also produced. Dispersed by the wind and rain, these tiny, dust-like particles are comprised of a few algal cells enveloped by filaments of the fungus. The fungus body of the lichen may also independently grow cups (like many other fungi) which produce microscopic spores. However, these spores will not transform into lichens unless the fungus into which they develop finds the specific free-living alga of its species.

Their dual nature is partly responsible for enabling lichens to survive in the most demanding of environments, where neither partner would be able to survive alone. Lichens exist in the hottest deserts and the highest mountains, from the Arctic to the Antarctic, and from tropical rain forest to salty seacoasts. They can survive exposure to 140 degrees F. (and as high as 400 degrees in the lab) and have been found as the only living things 19,000 feet up in the Himalaya Mountains. Recently, scientists in Antarctica found lichens existing in tiny air spaces a few millimeters beneath the surface of sandstone. Here, they are

apparently able to soak up enough sunshine and moisture for photosynthesis and evade the minus 70 degree temperatures and extreme dryness in this most southerly outpost of life on earth.

The hardiest plants on earth, lichens are also the foremost pioneers, able to begin growing on bare rock with no soil. They can survive extreme, year-long drought, crumbling up like old paint until they can soak up water like blotting paper and miraculously come back to life when it rains or snows. When the water held by lichens seeps into the cracks in rocks and freezes, it expands and flakes away some of the rock -- the first step in soil formation.

Lichens also secrete acids which help dissolve minerals from the rock upon which they grow. (Lichens which grow on trunks of trees use them strictly for support and do not affect them in any way.) By breaking up the rock, extracting minerals, holding rain water and air-blown debris, and adding their own dead tissues, lichens start the process of soil formation in barren northern areas and mountaintops still devoid of soil and life after the retreat of the last glaciers. They are the true "pioneers" which make the rocks ready to be colonized by the more demanding plants like mosses, ferns and shrubs in the next stages of plant succession. It has also been found in recent studies that lichens are key components in maintaining the integrity of prairie soils – without their presence, the soil matrix more readily disintegrates.

Photo Helen R. Russell

Several forms of foliose Lichens are growing on this tree.

Based on their extremely slow annual rates of growth (less than a millimeter each year), large patches of lichens growing on some barren mountains and cliffs up north are estimated to be well over 4,000 and possibly as much as 10,000 years old -- the oldest living things on earth. (Some scientists argue that, since only the outsides of these patches are still alive and the original, central sections have died long ago as the patch spread outward, the ages of these lichens are considerably less than the 4,000 - to 5,000-year old bristlecone pines of the West.)

Despite their remarkable success in conquering the earth's harshest, most inhospitable environments, lichens have suffered defeat at the hands of a man-made product -- air pollution. They are very sensitive to sulfur dioxide and other pollutants and have largely disappeared from the vicinities of big cities and industrial centers in North America and Europe. At the Mohonk Preserve in New Paltz, New York, comparisons between photographs of the same rock scenery made in the 1870's and the 1970's have shown a clear decline in the rock tripe lichens over that 100-year period. From 1800 to 1970, 129 species of lichens disappeared from London. However, since that time the air has become cleaner around this city, and some species of lichens have made a comeback -- evidence of the amazing tenacity of these dual organisms.

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Study Nature for A Sanative Environment

John Padalino

There is broad agreement in the United States that environmental literacy is a good thing, that there isn't enough of it, and that it is especially important for our young people to become literate about the environment. There is also broad agreement that schools are the place where young people should "get" their environmental literacy, but that schools are failing to produce an acceptable level of environmental literacy in an acceptable proportion of students. Most Americans, to paraphrase the Declaration of Independence, find these truths to be " self evident." As educators; however, we cannot accept truths as self-evident, but must seek to advance the concept of environmental literacy, its roots, and consequences.

Nature educators should take the lead in helping the environmental community to come to consensus on what knowledge, skills, and habits of mind as well as behaviors associated with a sanative, that is a healthful and healing, environment, all Americans should have by the time they leave school.

Contemporary education about environment is integral with nature and science. For over two decades, research in environmental science has documented the adverse impact of industrial society. We as nature educators are concerned with the linkage between science and education about environment for two reasons. First, environmentalism has affected the pursuit of science in dramatic ways. Concern for the environment has made science a more pluralistic enterprise, by expanding the number and variety of participants, legitimizing a broader range of research topics, and integrating previously discrete disciplines. Science is involving more conflict-oriented activity with the need for making complex trade-offs. The notion of risk analysis has emerged as citizens are faced with making choices among research on global change, climate modification, greenhouse effect, and acid rain based in large part on the risks presented by these environmental problems. Second, science has affected education about environment. The requirement for scientific competence has professionalized the environmental movement and brought about more pragmatic and less confrontational approaches for becoming environmentally literate. For these reasons, nature educators should advocate the following:

* that all students develop an understanding of how humans relate to nature and the importance of making wise decisions with respect to the use of natural resources and maintaining a human habitat fit for life and fit for living.

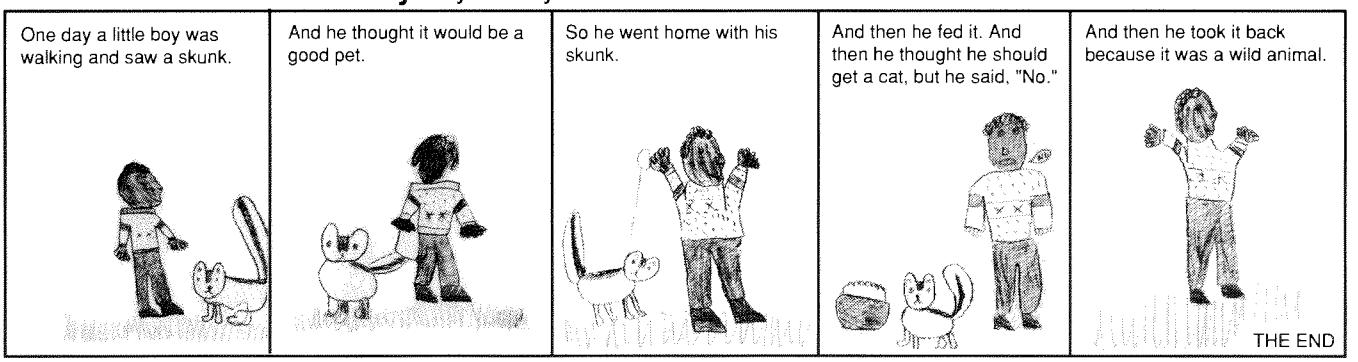
* that nature educators have the responsibility for helping students establish a firm knowledge of fundamental scientific principles in order that they might better understand and predict the consequences of human actions on natural systems.

* that firsthand interaction with nature: atmospheric, aquatic, terrestrial, and human designed components of the environment - be a part of effective teaching and learning. With an experiential base, nature educators can help students to develop the reasoned thinking that results in responsible decision making and action regarding human/ecosystem interaction.

It is essential that students recognize their interdependence with nature and with life everywhere and that they strive to maintain an environment fit for life and fit for living: a sanative environment.

John Padalino is Director of Pocono Environmental Education Center, Dingmans Ferry, Pennsylvania.

The Skunk and a Little Boy by Ashley Jane McFalls



Meet a Member:

Glenn O. Blough

If you look Glenn O. Blough up in Who's Who in America or Who's Who in Education or in Biographies of Authors of Children's Books you will discover all kinds of facts: his years of teaching in various colleges; his ten years (1945-1955) as science specialist in the U.S. Office of Education; his authoring of a book, the first of its type, called Elementary Science and How to Teach It ; the consultantships he has held, the national committees he has served on; the books he has written for children; his winning of the Eva L. Gordon Award in 1980. It's all there but you still don't KNOW Glenn O. Blough; in fact, I think you will know a lot more about Dr. Blough after you read this little essay which has been in the Nature Study file for several years. You will also understand why he won the Eva L. Gordon Award, for here is a scientist whose love and concern for young people permeated all his activities.

SOMETIMES I THINK I'LL QUIT

Glenn O. Blough

Sometimes I think I'll quit teaching. I get sick of being asked so many questions, tired of teachers meeting, fed up with living on a budget. Then something happens that makes me know I never shall.

Like the day Midge Maddy found out she could read. She'd tried and tried and I was worn out trying to help her. Then one day she stopped getting so mixed up, the words seemed to fit together with sense. She didn't say much about it the day it happened, just smiled and said, "I can read", that was enough. The look in her eyes said what she felt.

Or the day we had the Halloween Party and that ragged Bates boy said to me when we were cleaning up the room, "Gee, that's the most fun I've had since last summer when I went to Grandma's". Everyone in town knows that the Bates' don't get on at home. Sometimes I know Bud Bates hates to go home after school.

Or time during the war that I got the letter from Charlie Pulatsi telling me that he'd been thinking a lot about his days in school and how contented he'd been. The letter came from some place in the South Pacific.

Sometimes I think I'll quit teaching and get a job where there's less responsibility, nothing to do after five o'clock in the afternoon and fewer people to please. Then I remember:

The time Millie Kibb's mother came in and thanked me for helping Millie get over being ashamed because her father was a junk man. She said "I sure depend on you to help me."

The afternoon Pete Carter came to see me the very afternoon his water color won first place in the art contest and he was awarded a scholarship at the institute. He said "I first got interested in art that spring our class spent sketching over by the park and you put my sketch on the bulletin board in the corridor."

Sometimes I think I'll quit. Then I remember about Midge and Bud and Charlie and Millie and Pete and I know that they need somebody to help them grow, to jump over the tough spots, to develop a set of values that fit, to realize their potentialities and to enjoy themselves while they are at it. I think of these things and then I know how much I'd miss teaching and know that when everything's been said and done, I like it better than anything else I could possibly do.

The Greening of Harlem Coalition

Bernadette Cozart

A project that started with a small group of young people in one park has grown to serve many populations in different ways while it uses gardening as a tool for community experiment and cooperation and develops a responsible and healthy attitude of stewardship toward the earth.

It was Spring of 1989 and I was the gardener in charge of the plantings for the Carl Schruz Park which surrounds Gracey Mansion, the home of the Mayor of New York City. Wherever I turned I seemed to bump into teenagers hanging out in the park. Teenagers who should have been in school. It was obvious that these young people needed some direction, and certainly the planting program could use some help.

While I worked ideas were germinating in my mind. I was working for the park department but I would need to involve other people and other organizations. Some of my immediate help and support came from the Carl Schruz Park Association. We planned a school/ park program where the young people would be required to attend classes and work in the park after school and on Saturdays. They would be paid for their work while they were learning about plants, plant care, and other aspects of horticultural knowledge.

I didn't get much sleep for the next several days. It took a lot of planning, talking, contacting people who could help obtain sponsors, open doors of bureaucracy, share their expertise and suggestions. But it was only a short time before the program took off.

When the project was finished Carl Shruz Park was a beautiful place. The young people had a real feeling of accomplishment . There was also a feeling of resentment. Parks in their neighborhood were bleak, unplanted, litter strewn, and neglected. Obviously they needed the skills that these young people were learning.

It was time to form the Greening of Harlem Coalition. This is a community-based and evolving coalition of city agencies, local organizations, businesses, and churches. Coalition members include Harlem Hospital's Injury Prevention Project, Marcus Garvey Park Conservancy, 150-155th Street Edgecombe Avenue Block Association, Security Five Block Association, NYC Department of Parks and Recreation.

Soon my assistant, George Morris, and I were occupied full time helping to coordinate the efforts of coalition members and service their needs -- to help fundraise, get plants, and organize work crews and help provide, or serve as a clearinghouse for, the technical assistance needed to make a project successful.

Two hundred school children have been involved in this project this year, but they are just one of many populations participating. Others include: prisoners on work release programs, abused women and children, people in drug rehabilation programs, HIV positive persons and people with AIDS.

Tulips planted by fourth grade class in the fall of 1990, brighten the PS #133 schoolyard in the spring of 1991.

Vacant lots have become gardens producing food and flowers, parks have become more beautiful and better cared for. If you have planned and planted for your community there's a pride in accomplishment which results in attitudinal changes.

The coalition has as many concerns as its members choose to tackle or to dream about: safe playgrounds with modern equipment, urban farms, gardens for the physically challenged, gardens for members of the community struggling with AIDS -- it's open-ended. The biggest concern running through all these visions is funding, even though the Coalition has achieved success with minimal funds because people are in there volunteering their time and expertise.

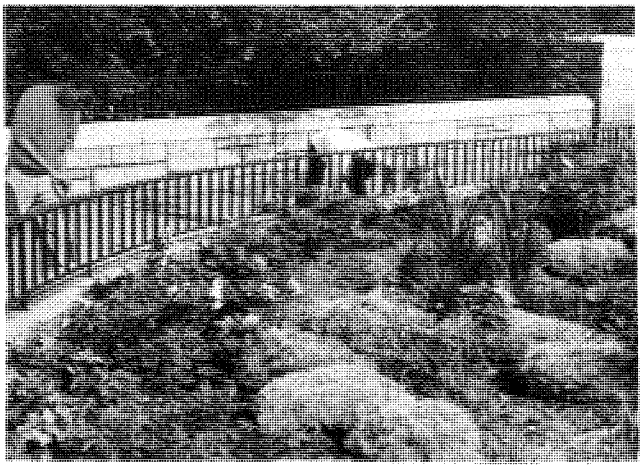
As we work to help develop life-enhancing realities in Harlem by reclaiming parks,

playgrounds with modern equipment, urban farms, gardens for the physically challenged, gardens for

Fourth graders and kindergarten children joined forces to produce this display at 130th Street and 5th Avenue

members of the community struggling with AIDS -- it's open-ended. The biggest concern running through all these visions is funding, even though the Coalition has achieved success with minimal funds because people are in there volunteering their time and expertise.

As we work to help develop life-enhancing realities in Harlem by reclaiming parks, playgrounds, and vacant lots; by creating gardens suited to the needs of various constituencies; and by teaching horticultural skills to the schoolchildren of Harlem, we are employing gardening as a tool of community empowerment and cooperation. We provide opportunity for individual development of self-worth, of good work habits, of personal responsibility, along with a responsible and healthy attitude of stewardship toward the earth. We seek and happily accept donations of time, talents, and money and we encourage people everywhere to urge their local governments to allocate funds and resources to support community-based and community-oriented organizations and projects.



Two fourteen year old trainees working on the board walk area of Carl Schurz Park in 1989.

For more information, contact
Bernadette Cozart at the New York City Parks Department, Arsenal, Central Park, NY, NY, 10021.

Food for thought; *signs in the NYC Subways:*

"SUBWAY Rides Save the Earth"

Every commuter who takes the subway to work instead of driving,
saves about 400 gallons of gas a year.
New York transit riders save 1.33 billion gallons of gas annually.

Riders Save

All that oil stays in the ground instead of going up in smoke. So breathe easy and thanks for riding the subway. You are not just saving gas you are saving THE EARTH.

Metropolitan Transportation Authority
NY City Transit Authority
Long Island Railroad

Educate as if Ecology Matters

Michael J. Cohen

Any person born and raised in a closet has and causes problems. As these individuals grow, they adopt and bond to their closet, not to living responsibly in society or the environment. Hurt and anxious, they fearfully cling to their closeted ways.

With respect to responsible survival, the plight of a closeted person is little different than our own. On average, we Americans spend over 95% of our lives indoors. Even outdoors, we habitually think, feel and act in closeted ways. Our extreme indoor life programs our mentality. It alienates us from the natural environment.

The natural world within and around us survives responsibly by continually organizing, preserving and regenerating itself. This creates a perfection, an optimum of life and diversity without war, pollution, garbage, crime, insanity, or excessive stress and violence. In striking contrast, our closeted cultural story irresponsibly says *"To survive, we must continually conquer the natural world and grind it into grist for building our indoor environment."* None of us are born evil, bad or wrong. It is this story that is wrong.

The natural world within us is our trusting, dependent *inner child.* We seldom learn that conquering the natural world includes conquering it. Conquest demeans, stresses and injures our inner child, just as it does the rest of the natural world. Our injured inner child continually seeks pacifiers, substances and resources, for when we hurt, we want, and when we want, there is never enough. This vicious circle is the core of most personal, social and environmental problems.

Changing our destructive conquer-nature story is only part of the solution. As demonstrated by the ineffectiveness of the warning notices on cigarette packages, changing stories seldom changes our dependency relationships.

To live responsibly, we must learn to rejuvenate our natural connections with nature's ways and wisdom. Our hurt inner nature craves that genuine, fulfilling, lasting partnership. We each need bonds with Earth and natural people, not just with our closet. People who bond to the natural environment are seldom subject to excessive hurt, stress or abandonment feelings. They don't create our problems. Rather, they enjoy and help sustain Earth's vitality, balance and peace.

Today, new state-of-the-art backyard and backcountry sensory learning activities enable individuals to build lasting bonds with ecosystems. The activities create teachable moments in natural areas, moments in which more than 50 inherent, nature-connecting senses and feelings awaken. These nonlanguage ways of knowing strengthen and safely enjoin our inner child with the natural world in others and the environment. Ensuing thoughts, feelings and understandings motivate sharing, community and involvement. The hands-on experiences have been shown to catalyze personal, social and environmental responsibility. They give added impact and value to natural areas as well as to environmental and outdoor education, stress management, counseling, personal growth and peace studies.

Dr. Michael Cohen is founder of the World Peace University. For information, workshops or financial aid, send a self addressed stamped envelope to: PNC, The World Peace University, Box 4112, Roche Harbor, WA 98250 (206)378-6313

The Nature Study Journal

continued from inside front cover

Ross Russell.

A picture, they say, is worth 10,000 words. If you have a story-telling black and white picture or pictures to share with ANSS members in future journals send to ANSS Story Telling Photos, c/o Frank Knight, 50 Wolf Road, Rm 504, Albany, NY 12233. Be sure you put your name, address and all pertinent information on the back.

We are looking forward to a busy two years. Work is progressing on the volume of TIPS. If you have a good teaching tip you want to share, write it up following the format in this journal and submit it. If you have time to edit published and new Tips, the final (we hope) putting-together session will be held at Bob and Helen Russell's farm at 51 S. Ramona Rd., Myerstown PA 17067 on the weekend of August 21 - 23. If you are interested in participating contact Bob and Helen Russell at that address for details: (717) 866-4680.

If you have suggestions for marketing or obtaining a grant for printing, share them with John Gustafson, 5881 Cold Brook Rd., Homer, NY 13077.

H.R.R.

Developing An Environmental Ethic

Questions to Consider

Clifford E. Knapp

Introduction: All of us in the fields of nature interpretation, outdoor/environmental education, organized camping, or other related professions would readily admit to having an environmental ethic. When pressed to elaborate and explain the specific components of our ethic, we may begin to stumble and hesitate. Communicating our environmental ethic to others is difficult, especially if we have not given the topic careful consideration. As professionals, I believe that we have not adequately engaged in written and verbal discourse about our own environmental ethic. Without this dialogue, we will not clarify and refine our thinking. Why haven't we done this? Do we really understand what an environmental ethic is? Have we read enough on the topic? Have we attempted to resolve the conflicts and inconsistencies between what we say we believe and how we actually live our lives?

I would like to challenge the readers of Nature Study to engage in thoughtful writing about our environmental ethic and explain how we came to believe what we do about the environment around us. One way to begin is to consider some of the following questions:

_____ 1. What available technology should we chose not to use?

_____ 2. What are some specific examples of environmentally responsible (right) behaviors?

_____ 3. How much positive interaction with the outdoors does the school curriculum promote?

_____ 4. How can we use the school and surrounding community more effectively to achieve important learning of an environmental ethic?

_____ 5. To what extent should we use alternate forms of energy that make less impact on natural ecosystems?

_____ 6. How can we make more responsible purchases of goods and services?

_____ 7. How can we refuse, reduce, reuse, reclaim and recycle more material goods?

_____ 8. What are some effective outdoor activities to promote an environmental ethic in students?

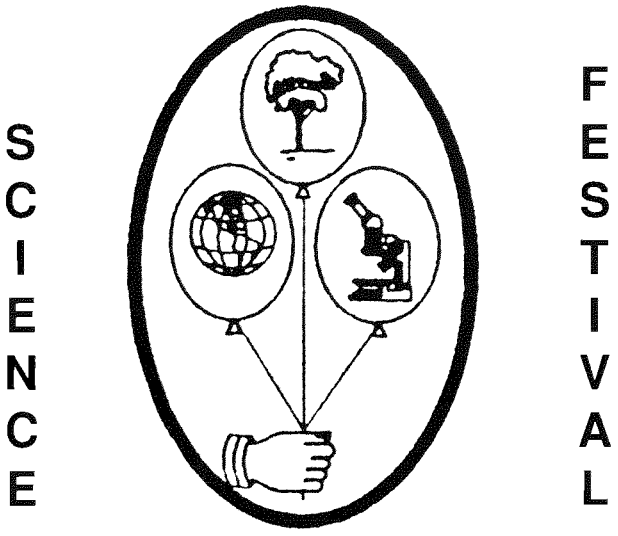
_____ 9. How can we help students feel more connected to an enlarged community, including all living and nonliving things?

_____10. What is the proper balance between achieving effective land use and achieving imum environmental quality?

_____11. How can we increase the depth and scope of our teaching staff's environmental ethics so they can be better models for students?

Why a Family Science Festival... ?

Mary Ann Young



In 1989 the Harrington PTA in Lexington, MA was looking for a science event for entire elementary school community (K-5).

We did not want a traditional competitive science fair, and we were not looking for a fundraiser. As a school community we decided to use the family science festival with the emphasis on hands-on-activities promoted by the Hands-On-Science Program in Rockville, MD.

BUT we did want to encourage the students to participate by displaying projects, explaining activities, and creating inventions. SO in addition to the hands-on-activities explained by adults, we asked the students to display their projects and inventions. And we just didn't judge the projects or give prizes. Everyone who participates gets a certificate.

HOW WE MADE IT HAPPEN...

The first year the PTA allocated $150 for the event. With about 25 volunteers for about two hours, we turned the school into a science center with no admission charge. We had 10 hands-on-activities, 20 Harrington students displaying projects, and about 10 guest inventors from another elementary school in Lexington.

The second year the PTA increased the budget to $300 and we added presentations by the science Discovery Museum in Acton, MA. Also many classroom science projects were displayed.

By the third year we had over 40 students displaying projects and we added a problem solving challenge. Over 44 fourth and fifth graders were given a kit with 50 popsicle sticks. Using only glue and the 50 popsicle sticks they were instructed to build the tallest freestanding structure they could.

Next year we are looking forward to another Family Science Festival that celebrates science! It is a community event that brings together teachers, students, and parents for an evening of discovery and fun!

ACTIVITIES FOR THIS YEAR'S FESTIVAL...

MAGNETS
PROJECTED MICROSCOPE IMAGES
CAMOUFLAGE
BUBBLES
HELICOPTERS
PAPERMAKING
COLORED SHADOWS
CONSTRUCTION
COMPUTERS
RACEWAYS

BIBLIOGRAPHY...

Family Science Festival from MCCPTA-EPI Hands-on-Science Rockville, MD.

Raceways by Bernie Zubrowski (A Boston Children's Museum Activity Book)

Science Snackbook by the Exploratorium in San Francisco, CA.

Mary Ann Young is a parent who volunteers her time and talents in the Harrington School in Lexington, MA.

Environment and Population Growth

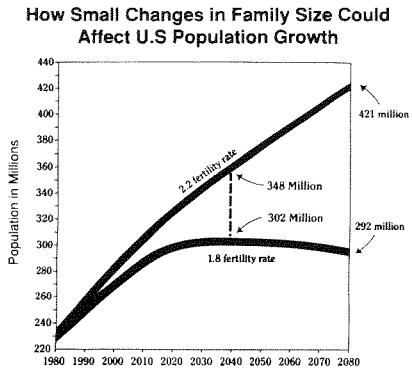
Martha E. Munzer

Environmentalists, and an increasing number of others, have a long list of growing concerns. Among them are water and air pollution, destruction of rain forests, soil erosion, acid rain, holes in the ozone layer, disposal of wastes - both ordinary and hazardous, and the greenhouse effect with the threat of global warming. Seldom among the list does one find population growth. Yet, according to Dr. Paul Ehrlich of Stanford University, his collaborators and followers, this too is not only a crucial but perhaps even one of the chief threats to our planet.

Dr. Ehrlich, in his most recent book published in 1990 "The Population Explosion", has some important and frightening facts to add to our list of concerns.

For most of human history, the population grew so slowly that there was an almost unnoticeable impact on earth. By 8000 BC there were 5 million people on the planet. By 1650 the number had increased to 500 million, doubling about every 1,500 years. In the early 1800's came the population explosion, for our numbers had doubled again in less than 200 years. Once more it doubled, this time in just over 100 years. And today it doubles in a mere 39 years, and is continuing to accelerate. If this trend continues, the growth in population could exceed 14 billion late in the 21st century.

This article will concentrate on the population predicament in our own country though, of course, it is a global problem. Currently, the United States population of 251 million is growing by more than 2 million each year. The Census Bueau projects that in just nine years we will reach the 268 million mark.



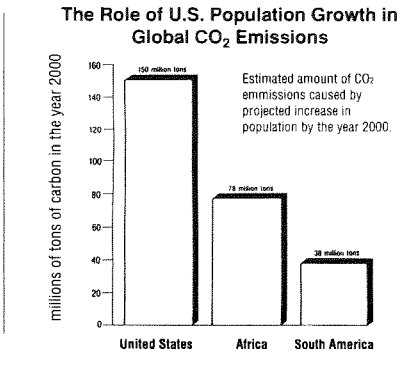
Although 90 percent of the growth of global population is today occurring in developing nations, we Americans place disproportionately greater demands on the resources of the world. Although we constitute only 5 percent of the globe's population, we consume 25 percent of the world's energy. Our growth in numbers will create more carbon dioxide emissions (the major cause of global warming) than the combined population increases in South America and Africa.

It is evident that as our numbers grow the demands for resources will also increase. This, in time, with the need for more energy, will be added to all the global problems of warming, acid rain, oil spills, and hazardous wastes. As more and more land will be needed to grow crops, there will be added deforestation and soil erosion. Furthermore, as increased amounts of land must be gobbled up for housing, roads, factories, schools and countless communities, our habitat will be lost to many of the other species with whom we share this planet.

Is our human society sustainable when it must consume renewable resources faster than they can be replenished?

Since many of our environmental concerns are grounded in this unprecedented population growth, is it not time for us to consider what's to be done in this area? Where do we, as supposedly enlightened citizens, come in? What can we do?

Here are just a few among many suggestions: First of all, family planning services and all that this implies need to be made universally available. If American couples would choose to have two or fewer children we would be doing our share. Adoption always remains a option for those couple wanting larger families. This means that young people need to be persuaded to have one or at most two children. Can we help to convince them? We can get many additional ideas from the organization called Zero Population Growth, 1400 16 St. N.W., Washington, D.C. 20036.



We can start right where we are to increase our efforts to save our planet earth, our habitat. Among the many efforts needed, each of us, in our own way, can include population growth as one of the important factors on our environmental agenda.

It is our own American philosopher, Ralph Waldo Emerson, who said, "Life is hardly respectable if it has no generous task, no duties or affections that constitute a necessity of existence. Every man's task is his life preserver."

Working to prevent overpopulation will indeed prove to be a "life preserver" in more ways than one.

Martha E. Munzer was the 1991 recipient of the Liberty Hyde Bailey award.

Martha E. Munzer

1991 Recipient of the American Nature Study Society *Liberty Hyde Bailey Award*

Martha E. Munzer, who will celebrate her ninety-third birthday this August, is working on her eleventh book, Friends of the Everglades. The first woman to graduate in chemical engineering from TAKES in 1922, she married, raised a family, and taught high school chemistry. In summers she worked in science camps, in the United States and Denmark.

In the 1950's a nephew asked her why she was not teaching conservation in the camps. She replied, "What's conservation?" She had never had a biology or natural science course in her life but she took up the challenge. She looked up conservation in the phone book and found the Conservation Foundation listed. Amazingly (she is an amazing person) she got through to Fairfield Osborn, and he set her on a course of awareness and learning.

Two years later she resigned from teaching chemistry. Her first book, written with Dr. Paul Brandwein and published by McGraw Hill in 1960 was Teaching Science Through Conservation. She then proceeded to write a series of six books for the Alfred Knopf Young Readers Series dealing with urban concepts like city planning, land and people, rebuilding neighborhoods, and careers: from solar science to land-use planning.

In addition to writing books and articles she has been busy lecturing & conducting workshops.

In the summer of 1991 she attended the ninth International Conference of Engineers and Scientists in England and delivered a lecture, "Engineers Are Becoming Environmentally Literate." Currently she is serving on the planning board of her town, Lauderdale-by-the-Sea, fighting to temper progress with knowledge, respect and care for the environment. She is also a member of a committee working to protect the Everglades from exploitation and destruction. She has been active in the Student Conservation Association ever since she discovered the interrelationships of the natural world in 1960, and is presently an emeritus member of their Board of Directors.

REPORT FROM THE SOUTH

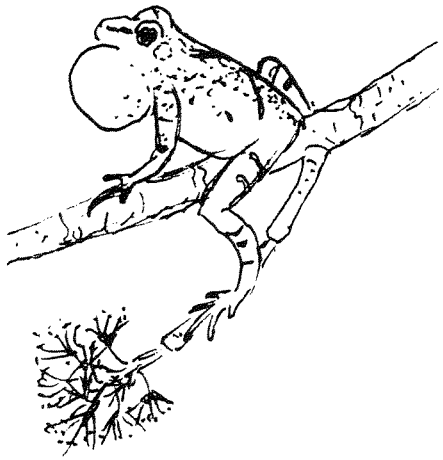
Robins are passing through in great abundance;
And of these we may expect a record crop.
Blue-birds in cobalt-winged, rosy-breasted flocks
Are heading North without a stop.

Pipers, those shy, sweet singers who first proclaim
Spring's coming to the inhabitants of bogs,
Have frozen thrice on chilly nights and now give way
To coarser choruses of frogs.

A delicate flush of green fringes all roads,
Brightening the sleeping land and follow fields,
Maples wear coral crowns against the sky.
Soon oaks, the slender elms, the quaking aspen.
Their bare austerity will yield.

Spring is assuredly on her way. All signs,
Augers and omens ...the basis of this report...
Prove the unassailable, delightful fact
That Winter's time is short!

Helen Chan



Gilbert White: A Naturalist's Naturalist

Margret Nathanson

The Columbia Encyclopedia (1975) has the following seven line paragraph:

Gilbert White: English naturalist. Served as curate at Selborne & nearby parishes from 1751 on. Recorded detailed observations of nature in letters to other naturalists. On these is based The Natural History of Selborne & The Antiquities of Selborne 1789. A classic in scientific writing noted for its literary style.

The brief entry about a man whose book with the unwieldy title of The Natural History of Selborne in the County of Southampton is the second most frequently printed book of people and the natural world and the fourth most published book in the English language!

It has been said that with the exception of Shakespeare, Milton, and Wordsworth, it is doubtful that another English man of letters engendered more comment and criticism. There are more than 100 editions in the British Museum and the Bodleian Library and almost as many papers relating to White.

200 editions appeared in 200 years. And editions continue to be published and come up at auction regularly to this day. (The Essential Gilbert White of Selborne edited by H.J. Massingham, David R. Godine, Boston 1985). Some editions leave out The Antiquities which seems wise since it makes for dull reading. It has been translated into many languages including French, German, Danish, and a number of Japanese editions.

Pen & Ink sketch of Gilbert White done by a classmate. circa 1743

The book was well received when first published in 1789 by White's brother Benjamin, a natural history publisher who owned a bookshop in London. One reviewer said of it, "The precision of a philosopher combined with the mark of a poet." Only a few hundred copies were printed and the title page did not bear the author's name.

The book consist of letters written over a period of fourteen years, 44 addressed to Thomas Pennant, renowned British zoologist, 64 letters to Daines Barrington, a barrister/naturalist whose idea it was that White publish his letters in book form.

Why has a work of such specialized character touched so many readers who knew neither England, much less that parochial village of Selborne? This question has baffled critics for ages and each one has different reasons for White's phenomenal following.

But first a look at White's life.

Gilbert White was born in 1720 at Selborne, a rural village of 600 inhabitants located 50 miles southwest of London. He was educated at Oriel College, Oxford and he received an MA in 1746. He became curate in a number of parishes near Selborne and finally at Selborne in 1751. He remained there the rest of his life.

White came from a large family, being the oldest of eleven children. He had 62 nephews and nieces many of who are mentioned in his book. He never married and except for smallpox, suffered no serious illness. In 1763 he inherited The Wakes, the house he had previously rented. His duties as curate allowed White enough time for traveling as well as continuing with his habit of recording his daily observations of the local flora and fauna. However, he felt frustrated by the lack of persons with whom he could discuss his findings. White loved visiting his brother, Benjamin, at his bookshop in London. Here White met other scientists and first met Thomas Pennant to whom the first 44 letters were addressed. Pennant's major opus, British Zoology was about to be published (1766) by Benjamin White. White's original letters were severely edited and often enlarged before publication. Many so-called letters were actually essays written in an epistolary style with a "Dear Sir" and "I am..." added at the beginning and end.

It was Barrington, another bookshop friend and lawyer/amateur naturalist, who in 1768 presented White with one of his Naturalist's Journals, a diary for nature notes in which White recorded his observations. And it was he who suggested to White that he write a Natural History of Selborne. Although White was not enthusiastic at first, he was encouraged by the publication in 1774 of his papers on the Hirundines (swallows and martins) in the Philosophical Transactions of the Royal Society. Eighteen years after Barrington's initial suggestion, in 1789, White's book was published.

As previously noted, it was immediately well received, but made no change in White's life-style. He continued the business of being curate, taking care of his pets, the dog Rover, and his tortoise Timothy, immortalized in his writings. Timothy's

shell resides in the British Museum! He continued his prolific letter writing and seeing his nieces and nephews. At the end of White's life his eyesight and hearing began to fail. One June 16, 1793 he made his last entry in his journal and wrote his last letter. He died at The Wakes nine days later, specific cause of death unknown. According to his expressed wish, his grave is marked by a small headstone bearing the initials G.W. and the date of his death.

So much for the bare facts of White's life. But what sort of man was he? What has attracted so many readers for generations?

White was totally without ambition. He turned down all promotions which would take him away from his beloved Selborne. He was a benign, modest man with a life-long curiosity about his surroundings. Everything interested him; no specialization for him. He faced nature head on, and without awe reported what he found. His experiments were simple. The notations on his observations, although scholarly, were never pompous. White was fluent in Greek and Latin and quotations from Ovid, Pliny, Milton and Chaucer are scattered throughout his writings. He neither anthropomorphized nor sentimentalized as was the habit of other 18th and 19th century naturalists. And although no poet, his pen sketched for the reader in short, graphic, Haiku-like phrases the feel, smell, look and sound of a place. Note the following entries from The Naturalist's Journal:

Jan. 8, 1786. Moles work. Cocks crow. Crows crie.

March 13, 1789. Snow in the night. Snow 5 inches deep. Snow melts.

April 1, 1789. Rain in the night, spring-like. Crocus make a gaudy show. Some little snow under hedges.

April 9, 1789. Brimstone butterfly. The tortoise comes out. Dog violets blow. Summer-like.

White showed no eccentricities. He performed his clergyman's duty adequately, but wrote ordinary sermons. He was neither a spendthrift nor acetic. He like his brandy as seen by numerous entries noting the "arrival from London of 3 gallons of the best French sort". He is remembered as pleasant and a quiet man. One rather ineffusive tribute to him reads "it is hard to find a flaw in the life he led." In short, White was remarkable only insofar as he was unremarkable.

Compared to great scholars of the past two centuries, White's contributions, although considerable, were hardly earthshaking. Yet, the noted zoologist L.C. Miall wrote in 1901, "Very few of his observations need correction more than 100 years after his death."

Gilbert White was a pioneer in behavioral science and field work which he pursued in a single, small region, Selborne. Taking the study of natural history "out into the field" unquestionably was his greatest contribution. He felt that many naturalists spent far too much time in the study. He strongly believed that the naturalist must study "the life and conversation of animals" and that he should make his own firsthand observations rather that relying upon the writings of others. This in direct contrast to his fellow naturalist who were traveling and botanizing around the globe (i.e. Captain Cook, Joseph Banks, Darwin, etc.) sending home specimens for classification.

White was one of the first to warn of extinction of species due to habitat destruction. He was very much aware of and reported on the impact of human activities. His all-encompassing curiosity and interest in all aspects of nature is shown by the following list of some of his contributions.

1. Important discoveries regarding the migration of swallows.
2. He was the first to recognize the harvest mouse, Britain's smallest mammal, as a separate species.
3. He added the noctule bat to the British list.
4. Observations on the habits of field, house, and mole crickets.
5. Noted aspects of local agriculture, folk life, weather lore, archaeology, geology, and astronomy.
6. Observations regarding protective coloration.
7. In ornithology he did not restrict himself to plumage description, but record bird behavior, habits and song.

Still, as a "Natural History" many feel the work is incomplete. The reader, however, tends to feel warmly towards this good-tempered author. White excels in sharing his pleasure in the pursuit of knowledge of his environment. It is this unique talent that had drawn amateur naturalists as well as others to him throughout the past 200 years and I suspect will do so for years to come.

White's influence on other writers and naturalists was extensive. During the 19th century many important naturalists made pilgrimages to Selborne. Among these was Darwin, who read The Natural History of Selborne at age 16 and wrote " The Formation of Vegetable Mold Through the Action of Worms" suggested much earlier by White.

Thoreau kept a copy of the book near him while writing Walden. He revered White's book virtually above all other books of science. Coleridge made marginal notes a la White in his copy. John Constable praised White for his "clear and intimate view of nature" and for a "serene and blameless life". James Russell Lowell called the book "The

continued to page 21

Outstanding Curricula

THE OUTDOOR WORLD LIFE SCIENCE CURRICULUM

The Life Science Teachers' Guide
by Outdoor World Science and Mathematics Project (OWSMP), 1988. Northern Arizona University, Science and Mathematics Learning Center/NAU Box 5697, Flagstaff, AZ 86001. Softbound, 351 pp. $24.

Environmental educators seeking meaningful activities would be wise to consider the curricula materials available from the outdoor World Science and Mathematics Project (OWSMP). These materials, developed with National Science Foundation sponsorship, are currently available through Northern Arizona University and are meant to teach traditional science and mathematics in a way that is meaningful to Native American students. One manual consists of 35 biology lessons; the other contains 22 math lessons. Both have been piloted and field-tested in fourteen reservation high schools and have undergone extensive field evaluation. While designed primarily for secondary schools, they can be modified for middle school science curricula.

The spiral-bound 351 page **Life - Science Teachers' Guide** includes student activities along with an extensive teacher orientation to using the Guide. The developers claim that the Guide can be used:

* As a bicultural supplement to the school's already established science courses

* As the exclusive curriculum in an advance science course

* As a model for other science activities and science curriculum development

* As a source for science fair ideas

* As a way to develop bilingual vocabulary

I totally agree with the developers and found the activities to be most relevant and inspiring. They presented "active" science, encouraged students to consider scientific careers, involved students in the traditional (native) culture, and made use of the local environment as an educational resource.

The first three sections of the Guide (Secret Agents I, II, and III) encourage students to obtain and research antibacterial agents found in the home. In doing so, students become immersed in various microbiological techniques. They prepare or extract various antibiotics and test their effectiveness on various bacteria such as *Bacillus subtillus, Escherichia coli,* and *Proteus vulgaris.* I especially enjoyed an activity where students gathered various saps and lichens and tested them for their antibacterial action.

The activities from these three sections fully prepare students for the next "mini-unit" on analyzing local drinking waters. This is an extremely relevant topic since reservation water is considered both technologically and culturally important to all Native Americans. Students begin this investigation with field trips followed by extensive lab work that includes testing for pH, oxygen content, carbon dioxide levels, and bacteria. Students also analyze and compare various water samples and water purification techniques.

Subsequent activities continue to engage students in meaningful science. One section encourages students to gather a "bicultural" plant collection. Another section titled "The Soap Opera" has students, under the guidance of an elder, collect and process yucca roots to produce traditional "yucca soap". Other sections investigate native foods, local dyes, land and water successions, freshwater ecosystems, and the physiological and behavioral effects of alcohol.

The activities, references, and general advice in this manual make it an outstanding sourcebook for all environmental educators and curriculum developers. Though developed primarily for Native Americans, all students and teachers can benefit from the contents. The developers of this truly fine publication can be proud of their efforts.

Philip R. Pankiewicz
Department of Biology
SUNY College at Cortland, N.Y.

THE LEOPOLD EDUCATION PROJECT (LEP):
A Curriculum and Instruction Concept Paper

Clifford E. Knapp

Describing the Project

In Oxford University Press's 1949 edition of A

Sand County Almanac and Sketches Here and There, Aldo Leopold introduced and attempted to integrate three main concepts: 1) That land is a community is the basic concept of ecology; 2) That land is to be loved and respected is an extension of ethics; and 3) That land yields a cultural (aesthetic) harvest, but this fact is often forgotten. The book is divided into three parts: 1) "A Sand County Almanac", 2) "Sketches Here and There," and 3) "The Upshot."

The Leopold Education Project (LEP), deals with Part I - the almanac which records observations and events throughout the seasons. This section chronologically guides the reader through the months of the year by means of 22 essays. They describe Leopold's activities at his Wisconsin farm where he and his family escaped the modern world of Madison. He stayed in their shack on the Wisconsin River during many weekends and holidays from 1935 until his death in 1948. The essays help people "read" the land through outdoor explorations. They learn about tracking animals in the snow, predator/prey relationships, local history correlated with the growth of an oak, returning Canada geese, river floods, spring flowers, bur oak ecology, woodcock mating rituals, upland plover (sandpiper) migration, trout fishing, watching daybreak arrive, and many other outdoor explorations.

Appreciating and Understanding the Land

Through reading about Leopold's recorded discoveries and participating in meaningful activities, students will expand their awareness and appreciation of nature and their ecological understandings. Leopold believed that people should learn how to discover beauty in commonplace events and places. He saw aesthetics as a measure of how we view the rightness or wrongness of our actions. He also believed that people were motivated to act by both beauty and duty in natural communities. When we view the components of land—soils, water, plants, and animals (including humans)—as members of the same community, we are more likely to make decisions which allow natural cycles to continue to renew themselves. He advocated a harmonious relationship between humans and the components of the earth as a way to achieve land health. When we extend moral considerations beyond humans to include soil, water, plants, and non-human animals, we develop a personal environmental ethic. With this type of ethic we are more likely to choose a lifestyle in which we continually re-examine our relationship to the land. By placing rational restraints upon ourselves, the critical earth cycles are more likely to continue.

Leopold believed that education was the primary method for achieving land health and earth-compatible values. He was convinced that people make the right decisions if given access to accurate information. He was critical of people who abused the land and educators who were ineffective in helping students learn ecological principles and appreciation for nature.

Educating For Environmental Values

The LEP was developed mainly for use by teachers of the upper grade levels, although other educational groups and private citizens can benefit from them. One major premise was that Leopold's writings are both sound science and excellent literature and that they could be used as springboards for meaningful environmental education. Whenever possible, students should experience the essays as part of each lesson—either before, during, or after the main activities. Although the overriding purpose of the lessons are to promote responsible decision-making regarding our impact on ecosystems, the developers do not advocate particular positions on value-sensitive issues such as hunting, using wetlands, applying pesticides and herbicides, or any other controversy. The LEP developers firmly believe there is a distinct difference between inculcating or indoctrinating specific values by limiting choices and information and educating for values development by promoting choices and access to information. The underlying premise of the LEP approach to controversy is that given a supportive classroom climate to study a variety of positions and viewpoints, students will choose responsible environmental values and act accordingly. Responsible values are those that sustain natural cycles, preserve plant and animal species, and exercise caution in changing ecosystems in major ways without careful study of future consequences. In our democratic society, we believe in educating citizens for environmental literacy. In later life Leopold made constant pleas for "less violent" changes on the land and for more consideration of ecology, aesthetics, and ethics, as well as economics.

Providing Direct Experiences

Another major premise underlying the LEP is that educators should provide students with direct experiences with the natural and cultural worlds outside the school. One way to accomplish this is to make greater use of the outdoors as a learning laboratory. The outdoors was Leopold's primary setting for problem solving, questioning, experimenting, observing and using other senses. Whenever possible, the developers recommend firsthand contacts with human and nonhuman nature. Modern learning theory supports an experiential approach that allows students to

construct meanings from their activities and develop concepts and skills based on their past knowledge. In order to promote critical thinking, teachers should provide students with opportunities to explore the world directly. Even in heavily populated suburban and urban areas, a wide array of useful resources can be found outside. Leopold believed that ". . .the weeds in a city lot convey the same lesson as the redwoods." Leopold was an advocate of alternative educational methods that expanded access to knowledge by going outside and exposing students directly to natural systems. When outdoor learning is not possible or feasible, indoor lessons are suggested."

Using Flexible Approaches

Leopold developed his essay on a land ethic by combining, editing, and adding to his writings on the topic during the last 14 years of his life. Just as his Land Aesthetic and Land Ethic changed to become more inclusive and internally consistent, the LEP curriculum is never final. As new approaches such as cooperative learning, whole language, multidisciplinary problem solving and community action projects become more accepted in schools, the curriculum should accommodate them. The developers encourage teachers to adapt the lessons to suit particular students, settings, and teaching/learning philosophies. In order to be effective, the LEP lessons must be viewed as flexible guides to important learning about how the world works and how we function on the planet. We encourage creativity and experimentation in using these lessons in a variety of subject matter areas.

Meeting State Learning Goals

The LEP is especially suited to helping teachers meet some of the goals for learning established at the state level. In the areas of science, mathematics, social sciences, fine arts, and language arts, the LEP lessons have direct application and potential for expansion. Leopold viewed all knowledge as interrelated. Although many of the LEP activities are based upon sound science concepts and skills, other disciplines can be taught effectively also. Through the LEP materials, a truly integrated curriculum can be taught by using these basic ideas as both a foundation and a springboard.

Caring for Ourselves and Our Children

The Leopold Education Project is an attempt to spread the message that caring for our natural resources is, in fact, an act of love towards ourselves and our children who must make their lives work with the environment we leave to them. What will their world be like? Will there be clean water, fresh air, fertile soils, and a diversity of plant and animal life to enjoy and care for? Will they respect their natural resources because we instilled in them the sense of value that good land stewardship is the foundation of morality? Teachers and students deserve to benefit from-Leopold's classic work because his message is just as important today as when it was written. At issue is our quality of life and our survival on this planet.

For further information about the LEP contact:

Dan Kane
Boone County SWCD
P.O. BOX 218
Belvidere, IL 61008

Clifford Knapp is professor at the Lorado Taft Field Campus of Northern Illinois University.

Gilbert White

continued from page 18

Journal of Adam in Paradise".

And finally, the book was responsible for saving Selborne, the village. Today much the same flowers bloom in the garden; swallows nest in White's stable at the Wakes, now The Gilbert White Museum. Of course there have been changes. The number of bird species has decreased; some have become extinct. But on the positive side, there is a project under way to restore the pond. Many of the birds listed by White are still to be found. And letter #41 still serves as a good guide to local flora.

A final and fitting note of interest: On the parlor walls of the Wakes hang portraits of White's family.....but none of Gilbert White. None exists. Only a simple pen and ink sketch of our author by an Oxford classmate. This is the sole remaining likeness of White. It was discovered inside the front cover of The Iliad, a set of which was presented to him by Alexander Pope upon his graduation from Oxford.

Suggested Reading:

White, Gilbert: The Illustrated Natural History of Selborne.
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More Nature and Environmental Education Tips

I. A BEE AND ME

Fran Ludwig

Curriculum Area: Science, Grades K-8

Rationale: Did you ever see a bee's knees? If you move slowly and quietly, you can. Not only that, but you can learn how bees help some of your favorite fruits form. Honeybees are readily available for study on warm sunny days wherever there are flowers.

Background Information:

Did you know there were no honeybees in the Americas before European settlers arrived? Except for bumblebees, all other native bees are solitary. Honeybees are the only bees that live in hives and produce large quantities of honey.

In a typical honeybee hive, there are 50,000 bees by the end of the summer. Most of the bees are females. Female bees are the workers. Workers change jobs as they mature. First, they take care of the hive and babies, then gather nectar and pollen and make honey. By the end of her 6-8 week lifetime, a worker bee may gather enough nectar to make about one teaspoon of honey. There are only a few males. They do not gather pollen or make honey. They have no stinger and cannot protect the hive. Once a year they mate with the queen. There is one queen. All the bees in the hive help to keep the queen comfortable so that she will lay more eggs.

By using her eyes and sense of smell to find flowers, a worker bee might visit 300-400 flowers on one trip from the hive. Each trip might cover a distance of 2-3 miles. It takes many thousands of such trips by thousands of bees to make one pound of honey. If you add up the distance flown by all the bees in the hive to make one pound of honey, the number would equal twice the distance around the Earth! And one hive may make 200 pounds of honey a year.

Activities

Beewatching

Honeybees sip nectar from flowers and they also collect pollen. Hairs on the honeybee's front and back legs act as brushes that sweep pollen from her body. At the top of her back legs, there are hairs that form baskets. The bee moistens the pollen with nectar and places the pollen ball in this basket.

A meadow full of goldenrod and other composite flowers is an ideal place to look for honeybees. Honeybees get most food for the least energy by visiting a large number of flowers in a small area. By gathering food from just one type of flower at a time, they save time in having to learn how that particular flower stores its nectar and pollen. Studies have shown that 97% of the pollen in a pollen basket is from just one type of flower. Plants benefit from this concentrated exchange of pollen.

Foraging bees can be safely observed if you are not close to the hive and avoid wearing perfume or hair spray. However, always check children and adults for allergy to bee stings before going on a bee-watching expedition.

Here are some questions you can answer yourself just by observing honeybees: 1. What kind of mouthparts does a bee have? How many wings (4)? How many legs? How many antennae? 2. Which of the flower is the bee interested in? 3. Which part of the bee does the pollen stick to? 4. Can you see the pollen baskets on the bee's back legs? How does pollen get into the pollen baskets? Are the baskets always full? What color pollen is she carrying? 5. How many flowers does the bee visit while you watch? Does it stay the same length of time on each blossom? Are all the flowers the same species? What color are the flowers? If the flower is a composite, in what order does the bee visit the tiny florets? 6. Do you see any other types of bees going to flowers? (Honeybees sometimes rely on bumblebees to bite through the bottom of long tubed flowers to get nectar.) Do you see any flies that look like bees? 7. How long is it before the bee returns to the hive?

A Bee Banquet

You can thank bees for many of our favorite foods. Assemble some of these foods for a bee banquet. Clover honey is found in any supermarket. Specialty stores may carry orange blossom, blueberry flower, or buckwheat honey. Can you tell the difference in color and taste? Display and sample fruits and vegetables that are pollinated by bees: apples, pears, cherries, oranges, peaches, watermelons, squash, strawberries, blueberries, raspberries, almonds, carrots, cabbages, broccoli, and onions. Compose a poem of

thanks to the bee!

See Like a Bee

Materials: deep blue cellophane, plastic "fly's eyes", screening squares, picture of flowers as viewed by bees (from What Does a Bee See? by Ipsen, or the Naturescope "Discovery Pac".), photos of insect eyes.

A bee's eyes are not like yours. You have two eyes, each with a lens in the center that bends light. A bee has two large eyes that cover the sides of its head. Each eye has over 4000 lenses. Dragonflies have many more. (Show photo of an insect eye) Some scientists think that insects with such eyes see many pictures, like you would in a plastic "fly's eye." (pass around fly's eyes). Others think the insect sees the world as if through holes in a screen (pass around screen squares).

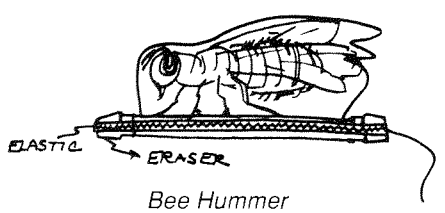
Bees eyes do not see color or shapes in the same way that you do. Bees can't see the color red at all. To them, red looks black. Other colors look like shades of blue, yellow or bluish-green. To a bee a white flower would look blue-green. Try looking through a blue cellophane to see what its like to be a bee. Look at a red object. What color does it seem to be?

Bees can also see a type of light that you can't see. Ultraviolet light is invisible to you (you can see its effects when a florescent poster is placed in "black light"). Some flowers that look ordinary to you reflect ultraviolet light from the sun. This makes them look like a target for a bee. Show pictures of a flower with a circular pattern that outlines the nectar source.

Draw a scene as you see it, with a black marker. Photocopy the picture. Color one copy in colors to show the scene as you might see it. Then color a copy of the scene as a bee sees it: red = black, orange = yellow, yellow = yellow, green = dull grayish yellow, white = blue-green, blue-green = blue-green, blue = blue, blue-violet = blue-violet

Hummm?

Bees buzz by beating their wings. A workers bee's wings can flap 200 times a second. Did you know that honeybees have a repertoire of buzzes? Buzzes range from soft hums when they fan their wings to cool the hive to an angry sounding alarm when the hive is disturbed. When bees dance, the buzzing isn't caused by wing motion at all, but by the vibration of the bee's flight muscles.



Bee Hummer

Material: popsicle stick, two rubber erasers (type that fits on the end of a pencil), 3" x 5" index card, markers, stapler, string, elastic band (about $2\frac{1}{2}$" long x $\frac{1}{4}$" wide), scissors.

Make a humming bee. Place an eraser on each end of the popsicle stick. On the index card, draw a large bee. Staple the card to the popsicle stick. Slip the elastic around the erasers. Tie the string to one end of the elastic, near the eraser. Hold on to the string and swing your bee-hummer over your head. Try moving the hummer faster and slower. Change elastic. Does the sound change?

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II. WEAR THE WOODS:

Changing Landscapes

Judy Isacoff Thomas

Curriculum Area: Botany, Social Studies / History, Language and Visual Arts, Ecology. Age 6 and up.

Rationale: To offer an interdisciplinary lesson that students hold in their hands, and to make something beautiful from plants that often make pests of themselves, is effective environmental education. Weeds used to make works of art afford discussion of raw processed materials; abundant endangered; wild domestic and native; naturalized species.

Background:

Stems of sumac *(Rhus glabra, R. typhina* and *R. copallina)* and elderberry *(Sambucus canadensis)* have long been used as spiles for maple tapping in early spring. An abundance of long, straight, $\frac{1}{2}$" -

- 3/4" diameter stems with a perimeter of strong wood around a pith that is large and soft makes it possible to effortlessly cut and bore out the needed tap "plumbing". Wooden spigots about 3" - 3 1/2" long are tapped into 2" deep x 1/2" - 5/8" diameter holes drilled into trees. A notch may be cut at the top of the spile from which to suspend a pail.

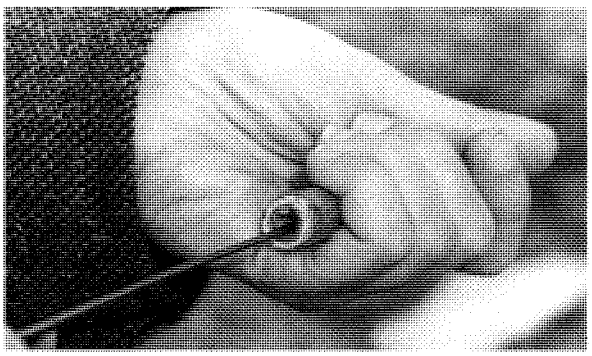

photo: Peter Carr

The development of methods of teaching suburban and urban populations moved me to adapt this traditional tool-making craft into a simple, decorative art. After demonstrating the making of the spiles needed for sugaring at maple festivals and with science classes, I cut 1/2" - 1 1/2" lengths of stem for everyone to hollow out woody beads. This proved to be an exhilarating activity and the epitome of "the teachable moment". My practice of offering Beads From Trees exclusively in springtime, associated with spile making, has given way to the discovery that the plant's characteristics and the context do change with the seasons, but like the audiences' enthusiasm, these trees are always an outstanding raw material.

Staghorn and smooth sumac are inviting roadside weeds in much of northeastern North America. Where elderberry or ailanthus *(A. altissima)* are weed species, use them instead or in addition. They are all easily identified and distinguished from any harmful species. Make sure to recognize the plant with full appreciation for its form, color, texture, place in the landscape and its life. Then, harvest with care, gratitude and awareness of what the ecosystem can afford.

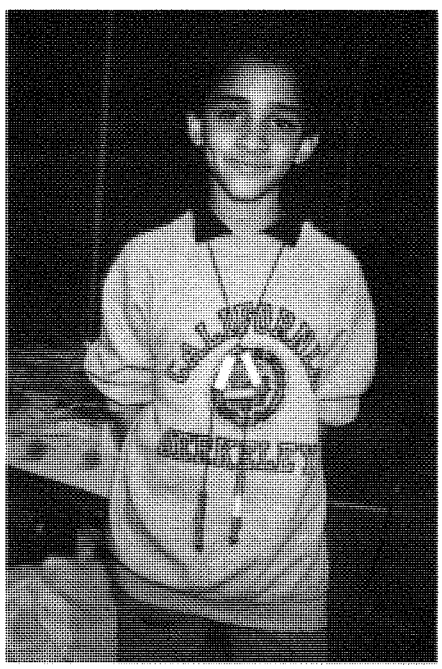

photo: Judy Isacoff Thomas

5th Grader from Cairo wearing a sumac ornament.

balance between an available natural resource and our appetite for it.

For young students and large groups, prepare pith pokers and cut quantities of 1/2" - 1 1/2" lengths of stem in advance. Pokers may be made from wire clothes hangers. Cut each hanger into five pieces; bend a loop on one end of each piece (as illustrated). Distribute these to students with wood. With potential bead in hand, students become effortlessly absorbed in a botany lesson. Guide them as they scrutinize their pieces of stem to find: details in the bark; sumac's heart-shaped leaf scar with a bud at its cleft; its oozing, sticky, white sap and soft, yellow pith. Instruct them to push the wire into the pith and work it through until it appears at the other end. Spongy crumbs fall out. Keep pushing and pulling the wire in and out until there is a clean hole in the center of the white wood. The diameter of the hole will be around 1/4". The basic bead is complete.

Now, using sumac especially, peel the papery brown-grey outer bark away to reveal the bright green inner bark and cambium layer. Then, pull vertical strips of this pure green matter away and see the white wood behind. That's three different bead possibilities. Peel the whole green layer away to make a bone or ivory-like bead. Given this introduction to exploring their pieces of wood, individuals discover new ways of carving or peeling beautiful patterns on the surface of their beads.

Stringing the beads provides another opportunity for artistic abandon, for improving manual dexterity and appreciating how human ingenuity can transform otherwise uninteresting or discarded materials. To wit, cut an 8" long section from a piece of old nylon rope; pull it apart into its strands; distribute these to be used as threaders (see illustration). Thread single or double lengths of yarn, one or two colors. Use knots and alterations of color inside and over the beads to create attractive designs. For necklaces and bracelets it is best to use ample yarn so that the ornament may be put on and pulled off without

Activities & Observations:

Whenever possible, involve students in the gathering of materials. To explore "where things come from" -- to find and become involved with objects at the source of creation -- is the primary task of environmental education. Tracking down bead trees provides an opportunity to nurture the sense of wonder, cultivate bioregionalism and self-reliance, and to illustrate how to effect a happy

having to undo a knot each time.

BEADS FROM TREES makes it possible to conduct meaningful lessons in otherwise difficult teaching situations. Classes of institutionalized teenagers, first offenders struggling with learning disabilities and emotional problems, are drawn into the hands-on immediacy of this science-art class. As part of a sixth grade environmental education overnight, a gathering of one hundred youths has been manageable, because the subject holds their interest. Allow one hour (or two one hour sessions) for classroom work. Add time if there will be a field component.

In the hands of students from kindergarten to post-graduate teachers, crafting with sumac, elderberry and ailanthus is sure to evoke wonder, curiosity, pride and enthusiasm.

Time: 1/2 hour to 2 1/2 hours, depending on whether there will be a field lesson / gathering component and the number of beads to be made.

Location: Where trees or shrubs grow stems with a large, easily removed pith. Locate such plants and bring your students to them to gather raw materials. Where this is not possible or time does not allow, this lesson may be conduct in the classroom.

Materials:

Determine quantities for number of participants and time allotted:

- stems with a large, easily removed pith (e.g. sumac)
- pruning shears
- rigid wire (e.g. clothes hangers) to cut up to use as pith pokers (I once straightened wire shower rings.)
- wire cutters
- pliers (if these have cutting blades, delete wire cutters) These are for bending a loop on one end of the poker.
- wool yarn
- scissors
- 8" length of recycled nylon cord or spool of wire thread

Judy Isacoff Thomas is an environmental educator who teaches children and adults in New York, New Jersey, and Massachusetts.

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III. SNAILS AND SLUGS

Helen Ross Russell

Curriculum area: Science, pre-school and up.

Rationale: Except for desert regions snails and slugs have an almost universal distribution. They are easily collected in the wild. Even in big cities they will be found under logs or rocks on vacant lots or in ponds and streams in parks. Children who live near the ocean or who go there for vacation will almost return with some snail shells that they have collected on the beach.

Any of these can provide a starting point for science observation and research. In a few areas where snails cannot be collected in the wild they can be purchased in pet shops or aquarium supply houses.

Background Information:

Slugs and snails belong to the group of Mollusks known as Gastropods. They get this name from the Greek words for stomach and foot. The action of this single muscular foot may be observed as the animal walks up the side of an aquarium or terrarium. When snails want to let go the foot is folded lengthwise. Eyes and tentacles are pulled inside the head. First one end of the body then the other is pulled into the shell. As students watch this process they will quickly discover which end is pulled in first.

Snails are hermaphroditic -- producing both eggs and sperm. Generally two snails mate and exchange sperm so that there is an inheritance from both parents. There is no problem in obtaining a pair, however, any two adult snails of the same species will do. Since none of the singular pronouns are appropriate some third grade students and I invented a new one. All snails are called SHIMS.

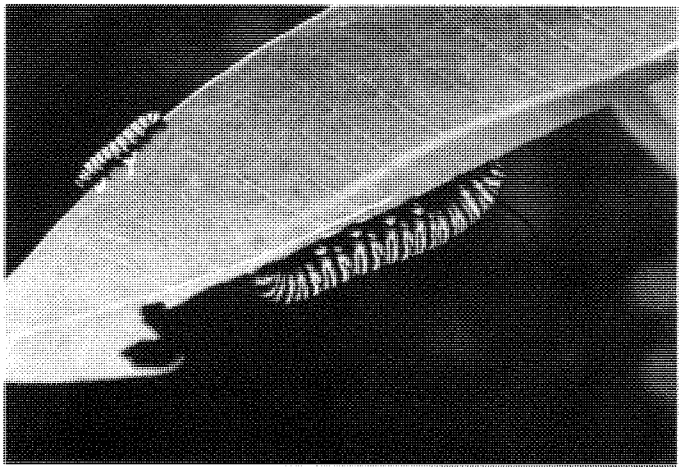
Some snails hold the eggs in their body until they hatch but most snails lay eggs. When the young snails hatch they have a shell that has only one whorl. In general pattern it is a miniature of the adult shape. As the snail grows it adds to the edge of the shell in a spiraling manner. Each spiral or coil increases in length and diameter. The shell also increases in thickness. When the snail has reached adulthood it frequently secretes a special flange or decoration around the edge of the shell. A few marine species like the cowries cover the entire shell with a smooth surface completely obliterating growth lines and burying the original miniature shell. The story of their growth can only be "read" by sawing the shell in half.

In other snails the small original shell is incorporated in the apex and the growth lines are

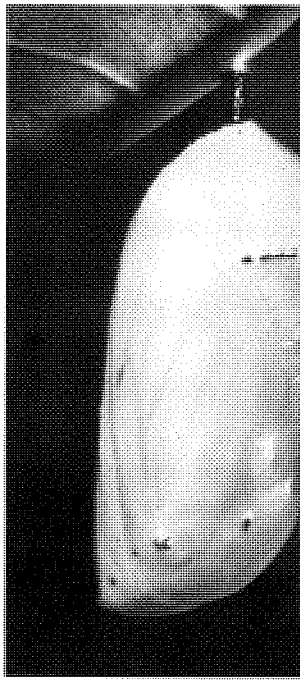
continued to page 28

Pictures That

Frank



Monarch caterpillers on milkweed leaf



Monarch chrys

Cut trees in a suburban neighborhood

Honey bee visiting a

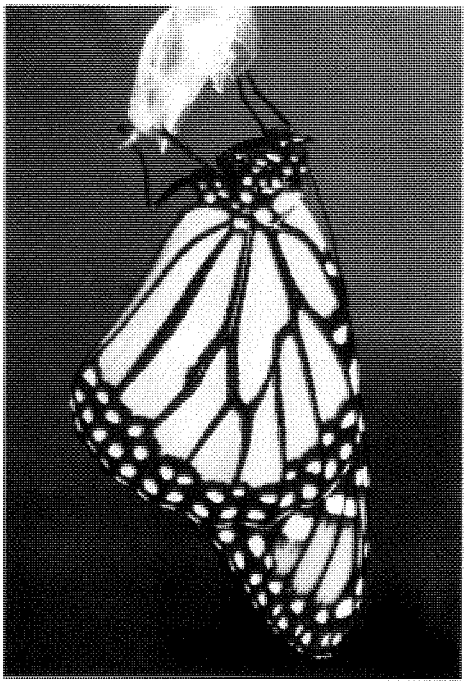
Suburbanization - Although a little more difficult than with a sequence of shots, a single illustration can tell a story. Do, however, consider your audience's viewpoint: in this example, the message is habitat loss to the environmentalist; progress and profit to the developer.

photos: Frank Knight

Tell Stories

Knight

lis



Monarch butterfly emerged from chrysalis

Metamorphosis - Picture stories are often easiest to tell with a sequence. Caterpillar to chrysalis to adult tells the monarch butterfly meta-morphosis story. For a more detailed story, simply add more pictures.

lower

Pollination - A photo of a mid-air bee by itself might sugest "honey bee, Apis mellifera", "flight", "Ouch!" A flower alone is simply that or more specifically, "horsemint, Monarda punctata". Combine the two in the same photo and the story is simply "pollination".

Rabbit chew and scat

Rather than showing what is, as with the other photos here, showing what was with some story-telling clues involves the viewer as a nature detective. With little else above the snow line to eat but the bark of shrubs, the animal browsed and left the remains of a previous meal to clearly identify which species of bark eater was at work - a rabbit.

all visible.

The shell secreted by the tough outer body-covering called the mantle, is formed without any thought or control on the part of the animal.

Most species of snails make shells that spiral in a clockwise direction. Shells with a clockwise spiral have the opening on the right side as the shell is held with its apex up. They are called "Right-handed" or "right spiraled". Counter-clockwise spirals produced a "left-handed" or "left-spiraled" shell.

In the evolutionary process snails have lost some of their paired organs. Thus they have only one gill or lung and only one kidney. Slugs lack a coiled shell but also have an assymetrical arrangement of body organs with only one lung and one kidney. This leads us to conclude that slugs descended from snails.

Another instance in which we can trace ancestry by bodily development is found among the fresh water snails. One group of fresh water snails has gills and breathes in the water. The other has lungs and must come to the surface for big breaths of air which it traps under its mantle cavity. While snails originated in the water the aquatic snails with lungs are descendants of ancestors that left marine waters to live on land.

Land snails and slugs have their eyes located on the ends of a pair of long stalks or tentacles. As snails move around they tip their stalked eyes from one side to the other , now up, now down, now straight ahead. With such mobile visual organs it would seem that the snail should have a good view of shims world. But a snail's-eye view is limited to distinguishing between darkness and light and its lack of interest in those who stare at him is partly lack of knowledge of their presence.

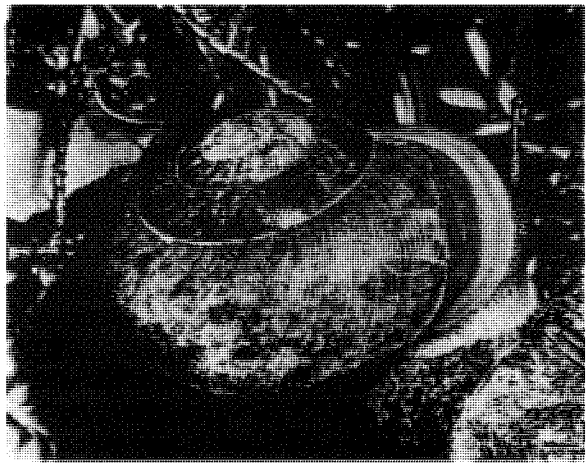
Some people object to handling the gastropods because of the mucus that they secrete. However, it is harmless and easily washed away. This mucus trail enables the snail to travel on smooth surfaces and to hang upside down with this heavy shell pulling on shims body.

It also protects the soft body from injury for it serves as a cushion between it and the material it is moving over. As a result, snails and slugs can move over broken glass, razor blades and other sharp objects. They leave a silvery road behind them. The "nature detective" can not only use the trail to reconstruct the animal's nocturnal wanderings but also to fix blame on the culprit that is eating holes in vegetables.

Slugs can frequently be collected by putting a board on the ground near leafy vegetables or other succulent plants. All land gastropods are extremely sensitive to drying out and shell-less slugs are particularly vulnerable, so they avoid light and heat.

Some snails not only retreat into their shells when the weather becomes hot and dry, but they also close the shell with a plug of mucus or mucus and calcium carbonate. Snails in areas that have a climate characterized by a wet and dry season aestivate during the dry season with their shells sealed in this way. Aestivation can sometimes be induced in the classroom.

This large grey slug is a common visitor to damp, decaying logs and stumps at night. By day it often remains hidden under bark or beneath debris where it is damp and dark. However, on windless, rainy days it may wander about, leaving a trail of slime behind.



The white-lipped land snail is a common resident of moist woodlands, where it moves slowly over decaying stumps and leaf litter. Its empty, partially nibbled shells indicate that shrews and other small animals have attacked it.

Activities:

1. It is easy to demonstrate snail vision to a class by having everyone close their eyes while someone flicks a light on and off. The amount of light that can be seen through the eyelids is comparable to snail vision -- no form, no color, no motion -- unless the motion throws a shadow and changes the light.

   Aquatic snails have the same type of vision but their eyes are located on their heads at the base of a single pair of tentacles.

2. After the students discover how little vision snails possess a logical series of questions arises:

"How do they find food?" "What senses are well developed?" "Do they respond to touch, odors and sound?"

These are only a few areas where students can devise their own experiments to learn answers to questions that the snails may lead them to ask.

3. Use a "Tell-Me-the-Answer-Gadget" to listen to snails' responses.

4. The rasping action of the chitinous jaws and the tongue may also be observed as the animals feed on algae on the side of an aquarium or terrarium. A snail's tongue is called a radula. It is covered with rows of horny teeth and functions like a flexible file. Sometimes the snail cuts a path through a green field of algae, at other times it clears one whole section. It is because of this feeding habit that snails are frequently sold to help keep an aquarium clean.

   The actual rasping action may sometimes be felt by rubbing lettuce or some similar vegetable material on your fingers then holding a land snail in your hand and if shim is hungry using your sense of touch as well as sight (what about hearing?) to learn about the feeding process.

5. Aquatic snails frequently lay their eggs on the sides of the aquarium. The development from single cell to young snail can be watched with a hand lens, and documented with dated drawings in notebooks or chart.

6. A collection of shells of one species can be arranged according to age and the preceding stages of shell development may still be seen in succeeding periods of growth.

   In studying this growth students may be given an immature shell and a small piece of modeling clay and asked to add the next section. To do this they will have to note the special proportions and angles involved to maintain the peculiar pattern of their specimen.

7. Aquatic snails may be used to demonstrate a balanced aquarium or a complete ecological unit. Little equipment is needed -- a tumbler, a sprig or two of Elodea or some other fresh water plant, scrapings of fresh water algae and a snail. Oxygen, carbon dioxide, nitrogen, and food cycles will be balance if there is enough plant material to start; as will the plant and animal processes.

   In fact, the unit can be set up in a test tube and sealed with a cork. If the balance is not correct one or more of the organisms will die. Even so, the experiment has not failed. The question is "why"? Was it over-grazing? Lack of oxygen? Would lack of carbon dioxide effect the story? What other factors might have influenced the biological community?

8. Strings of dried packets of whelk eggs can sometimes be found on ocean beaches. Open a packet. What is inside? How many? How many packets are there in the string? How many young would have hatched if the packets had not been tossed out of the water by the waves?

   If the eggs have hatched into baby snails compare their appearance to their parents. Use some of the small snail shells in an art project that brings art and science together. Use the pattern of the shell in making a design. Can language arts be part of this?

9. Snails in an aquarium, in a terrarium, or as visitors can provide many opportunities for observation, hypothesizing, and conducting experiments.

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IV. AN ALL YEAR TREE STUDY

Developed and child tested with hundreds of second grade children at Manhattan Country School in New York City under the direction of teachers, Cynthia Rogers and Junius Harris.

Curriculum Area: Science, art, language arts, arithmetic, geography.

Rationale: Trees are an excellent subject for on going study and research. They are important to the the health and well-being of Earth. They are interrelated with other living things and with non-living factors. Seasonal change (summer/winter; wet/dry) is reflected in tree activities. Watching and recording these relationships not only teaches young people about the interrelated world but it helps them develop research skills and appreciations. As one child said as she leafed through "her book" in June, "My tree changed a lot and so did I."

The idea of on-going observation can start as a group activity for "pre-school" children if a class adopts a single tree and makes monthly charts to depict its changes.

Background Information:

Green leaves of a tree are constantly taking up carbon dioxide and releasing oxygen. The roots hold soil, the tree itself slows down the impact of raindrops. Trees help cool the earth. Dozens of food relationships can be observed with trees. Birds gather insects for their young. Some insects pollinate tree flowers while they gather nectar.

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Classroom Activities

Tree Studies

Leaf Prints
Leaf Coloration
Collages of colored leaves
Insect studies
Vertebrate studies
Tree Uses
- -Survey of tree products in use in the classroom
- -All school survey of tree products in use in the building
- -Tree growth - with paper or clay cones
- -Study of a tree cross-section
- -Field trip to a museum, a park, a forest - a special tree
- -Street trees - kinds, problems, care
- -All school awareness project on use (and misuse of paper)
- -Paper making
- -Paper recycling project
- -Paper making wasps
- -Wood recycling = in nature
- -Raising money to purchase and plant a tree
- -Pretend you are your tree talking and tell or write a story about things that happen to and beneath you in a day, a week, a year.
- -An all-tree meal - fruits, nuts shopping for mangoes, papayas, green coconuts, plantains, bread fruit, etc., at a fruit store for temperate zone fruits and nuts, and at a grocery store for olive oil for frying, olives, prunes, etc. Cooking, eating!!
- -Other possibilities - measurement and temperature studies.

Outdoor Tree Study

September - Select a tree to adopt. Spend some time getting acquainted. Draw and color the tree on the first page of your book. On the opposite page write the date and at least two sentences about your tree. Mount a leaf with clear contact paper. If you can find a seed add that too.

October - Date your page - Draw your tree - Color it accurately - (This is the starting point every month.) Examine a leaf. Is it simple or compound? Make a leaf print or rubbing. Write two sentences about your tree.

November - Draw - Color - Date Examine the buds, where are they located? When leaves fall off they leave a scar. Pull a leaf off and examine the leaf scar. How are leaves and buds arranged? (opposite, alternate, whorled) Draw a twig with buds but no leaves. Write two sentences about the things you observed today.

December - Date - Draw - Color. Make a bark rubbing. Compare the bark on the top of the tree to the lower bark. How many colors can you find in the bark? Write at least two sentences about bark.

January - Date - Draw - Color. How does your tree affect the environment? Wind? Water? Snow? Sunlight? Find some microclimates. Write at least two sentences about your tree and the environment. How does the environment effect your tree?

February - Date - Draw - Color. Look for animal-tree relationships. What invertebrates or invertebrate evidence can you find on the bark, around the base, in holes etc. What animal tracks and other vertebrate evidence is there - feces, squirrel lookouts, nests, urine, sapsucker holes, squirrel twig feeding or cone dissection. Some buds may be opening now (Elm, Silver Maple).

March - Date - Draw - Color. Many buds will be opening. Collect one twig with a pruning shears and take indoors to ""force in a jar of water. Make a

drawing of a twig, with terminal and lateral buds. Color it carefully. Write two sentences about the state of buds on your tree. Look at the top as well as at lower branches. You may find flowers from your tree on the ground; if you do, add them to your report.

April - Date - Drawing - Color. What's happening? Tell all about it!

May - Date - Draw - Color. Report on the tree's progress. Look at plants beneath the tree. Are they the same as the ones away from it? Examine the soil. Does your tree help things grow, make it hard for things to grow, or both? Explain.

June - Final drawing and report . Do an Earthworm census. Tell two of your friends what is special about your tree. Visit their trees and listen to them tell about them.

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V. MAKING CEMENT AND VERMICULITE SCULPTURE

Robert S. Russell

Curriculum Areas: Art, Biology. Junior High through Elderhostel.

Rationale: Everyone who has ever sculpted an animal knows that perception is sharpened. Where do legs arise? How do they bend? What are the body proportions? How do I simplify my subject to make it fit the block while it gives the viewer a feel for the animal?

In addition , having been through the struggle, these persons look at all sculpture with a new appreciation.

Background:

Thirty five years ago someone discovered that cement and vermiculite could be combined to form a soft rock which can be sculpted with linoleum knives and similar tools, when it has set enough to be firm but not hard. This material is superb for first-time sculptors and even once-in-a-lifetime sculptors. A similar mix is sold commercially as Sculpt-Stone but it can be made much more economically by purchasing the two materials separately and combining them.

Making this kind of sculpture is an excellent nature center or camp activity. Without prior experience, participants can know the satisfaction of creating a piece of garden sculpture; of "freeing the animal locked in the block" by cutting away the extra material. Mammals, birds (like owls), and other chunky animals are appropriate subjects.

The material can also be used in beginning sculpture classes in high school or college. Because of its easily worked consistency, first time sculptors can have the satisfaction of producing a piece of sculpture without the frustration that often accompanies carving marble or other rocks. Once completely hardened, these "cemiculite" objects will last for years indoors or out.

Of course, the activity can go beyond first time sculpturing. One woman whom I taught went into business, sculpting for a garden center. As her recognition as an artist grew she was invited to be artist-in-residence for six months in a local elementary school and to sculpt a life size lion - the school's mascot. Of course, any sculpting project that requires more than a day may move out of the range of linoleum knives and into chisels.

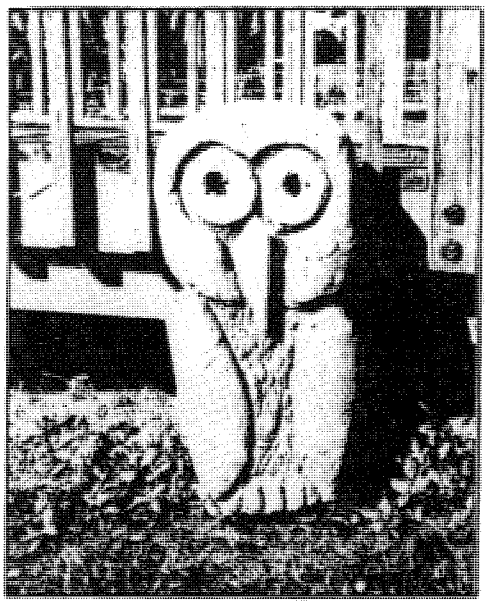

photo: Robert Russell

Materials:

For a class of 15-18
- 2 bags Portland cement.
- 2 bags Vermiculite (zonalite)- purchased in garden centers or hardware stores.
- Bucket
- Hoe
- Shovel
- Water
- Wheelbarrow or large tub
- Cardboard boxes - (Liquor store ones are good)
- Linoleum knives

Participants should provide:
- Paper, pencil, cotton gloves, and pictures of animals are helpful.

Activity:

The night before: mix the cement and vermiculite. This requires several people. Whenever possible these should be the would-be sculptors.

Using a bucket for measuring, combine 1 part of

cement and 2 1/2 of vermiculite in the wheelbarrow or tub. Mix dry using the hoe. Add water and continue stirring until the mixture is the consistency of oatmeal. Shovel it into cardboard boxes. (Ideal size of boxes is 24 X 15 X 15). Pat upper surface with shovel to remove air bubbles and set box aside.

The next morning: The mix should be firm and ready to sculpt. Remove the box. Look at your block of stone. Can you imagine something trapped in it?

Make some sketches. Remember that pictures you may be looking at are 2D -- but sculpture is 3D.

Use the point of your linoleum knife to outline your sculpture on 4 sides and the top.

Hack away excess material aggressively, freeing the image from the block.

Step back at times to get perspective.

Once the animal is roughed out proceed slowly and carefully in adding details.

When the sculpture is complete wash with hose and let it dry.

Enjoy it in your yard for years to come! Let it dry for several weeks before putting it on a table, a rug or the floor of your home.

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VI. THE TAY EQUIPMENT

Helen Ross Russell

Curriculum Area: Science; 4 years old and up.

Rationale: Learning to ask questions, to set up a hypothesis, to learn by observations, to draw conclusions and to keep records is an important part of science. Many pieces of information may be obtained by direct observation or by setting up choices and watching invertebrate animals respond. The equipment for this is readily made.

Background:

The best source of information about any animal is the animal itself. Since most invertebrates are silent or speak a language that requires interpretation, the person seeking information must be able to observe behavior. A good piece of equipment for doing this is a two chambered TAY (Tell About Yourself) Gadget.

By setting up different environments in each chamber, answers may often be obtained to questions like: Does it prefer light or darkness? What temperature is preferred? What foods does it prefer? How long does it take to find food? Does it find it by accident? Which senses does it seem to use? Why do you say this? Is it alto-tropic or geo-tropic?

Materials:

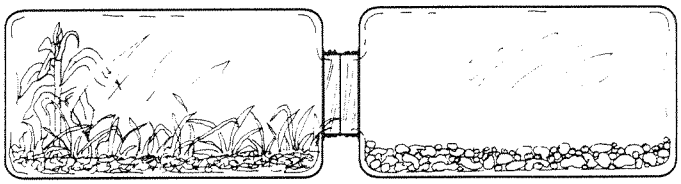
- 2 identical jars that take canning lids (mayonaise jars, "Mason Jars", etc.)
- 2 rings from the 2 part lids
- Tape (masking or the tough tapes required by Post Offices)

Some materials you may want to use in experiments:

soil
a piece of sod
water
hot water bottle
ice pack
black cloth or paper
various foods
dead wood
twigs

Activities:

To make a TAY gadget fasten the two jar lid rings together with tape. Screw a jar into each ring. Your equipment is ready.



Decide on the questions you want to ask. What choices are you going to give to your visitor? Remember to do the questioning several times, introducing the little animals first into one environment and then into the other.

If it consistently chooses one environment over the other (for instance, sod over bare earth), would that mean that sod was its favorite habitat or would you need to check other possibilities?

When you are not asking your small animal questions, put it into an insectory with air holes or a screened lid, or if you have finished and it is not a destructive creature such as a gypsy moth, return it to its natural environment.

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VII. CAST YOUR CLASS TO THE WIND

Joy Finlay

Curriculum Area: Cross curricular, multi-level.

Rationale: Traditionally a science topic for specific study, wind and weather are integral components that affect daily activities, life style, economics, health, history, conservation, and of course conversation.

Using activities to explore and predict the influence of wind, students apply skills and develop further interests, appreciations and understandings of relationships in nature and with themselves. Although the opportunity to practice cognitive and process skills is the immediate objective of a learning activity, developing deep understandings of concepts is the greater goal over time. After doing things with or in the wind, so what? What effect? What influences? What factors and what connections? What does it mean to me, to a tree, to an ant, to a rock, a stop sign? Today, tomorrow, and next year?

Background:

We live at the bottom of an ocean of air, the atmosphere, which extends about 80 kilometers above the surface of the earth. Like the ocean, air is in constant motion, moving in air currents as atmospheric pressure and terrestrial radiation change. At the earth's surface we experience moving air as wind. The day to day condition of temperature and precipitation and what we call weather are strongly influenced by ever changing winds. For example, the winter of 1991/92 ranked as the seventh warmest Canadian winter over a 95 year period of record keeping. Environment Canada's meterologists credit the above normal temperatures to the El Nino effect. El Nino is a phenomenon that occurs periodically in the tropical Pacific Ocean when warm surface water is shifted thousands of kilometers east of Indonesia. This causes a corresponding shift in the air currents, clouds and precipitation, affecting changes in the global atmosphere.

Weather is credited with being a topic we all talk about but don't do anything about. With concern about big issues such as climatic change, ozone depletion and acid rain, we are beginning to fear we have unwittingly done too much to the weather, and are now looking for ways to combat and reduce our industrial and individual consumer effect on the quality of the global atmosphere. Wind, for example, provides a topic for exploring locally first, then thinking globally from a meaningful base of first hand experience.

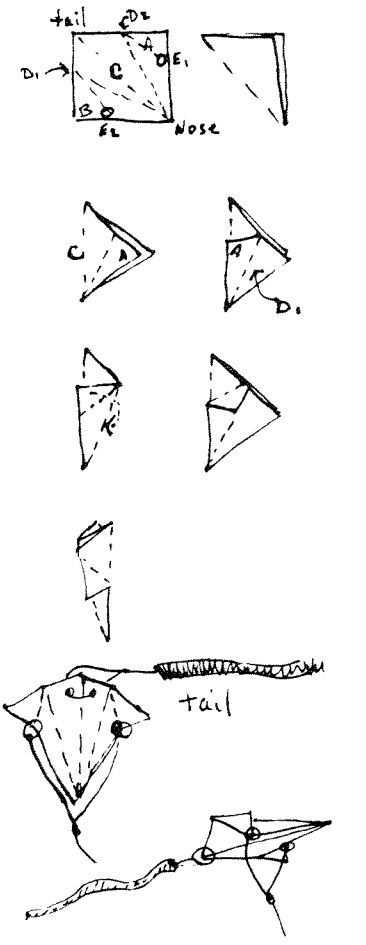
Activities:

Kites and Kids:

This paper folded kite is so quick and easy no one believes it will fly until they see it in action. Of course there are good, better, and poor conditions for flying a kite. Very light winds are best for this Chiringa Kite from California, but if gusts cause disaster, kites can be made almost instantly.

To make a Chiringa Kite, start with a square piece of paper. I have used pages from old calendars, glossy magazines and annual reports, as long as the paper will hold a crease where it is folded. With adults and older students, the hardest part is squaring up a rectangular piece of paper for the first step. With younger students, I provide the paper already in squares.

Diagrams for folding



Fold opposite corners A & B together to make a triangle. Bring corner A up to centre fold line C and crease on fold (D1). Do the same with corner B (D2). Now fold corner A back to second fold (D1) and crease, same for corner B. Punch holes at E1 and E2 and attach a bridle loop, just long enough to clear the nose of the kite. At the centre of the bridle, a balancing point, tie on the flying line.

For the tail, punch holes through both sides of the centre fold. Tie a loop through the holes and attach a crepe paper streamer for a tail.

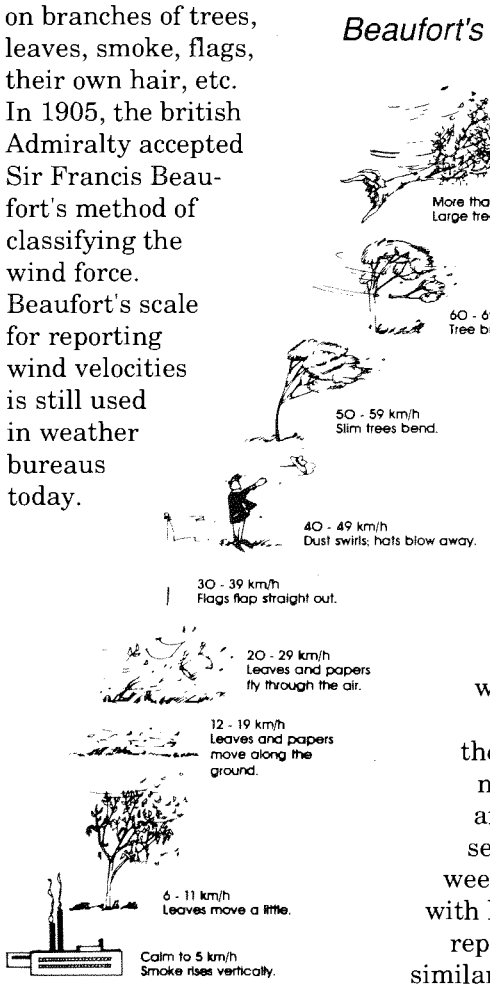
Students always ask how long the tail or tying line should be. After the test flight, they may have more ideas about the lengths they can go.

Now for a test flight. Noting the time of day and the wind conditions, briefly discuss some procedures for this test. Have students spaced well apart before launching, possibly in a very large circle. With lots of observations and questions about how kite, kids, and wind interacted or not, have students

spaced well apart before launching, possibly in a very large circle. With lots of observations and questions about how kite, kids, and wind interacted or not, have students begin compiling observations and conclusions for how best to fly a kite next time: What modifications are needed to make the kite fly well? Size? Length of tail? What time of day is best? What kind of wind? Safety tips? Besides wind, what are the forces acting on a kite? Gravity? Lift? Drag? Kite flying is like fishing - there is more to catching the wind that putting a kite on the end of a string.

Wind Force:

When is the best time to fly a kite? Student weather observers learn to estimate the speed of the wind by noting its effect on branches of trees, leaves, smoke, flags, their own hair, etc. In 1905, the british Admiralty accepted Sir Francis Beaufort's method of classifying the wind force. Beaufort's scale for reporting wind velocities is still used in weather bureaus today.

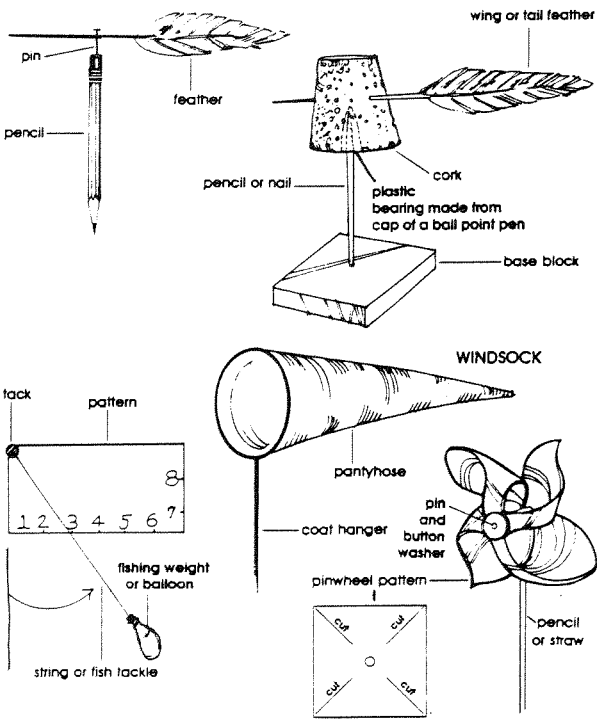


Try observing and recording wind direction and speed in the morning, at noon, and late afternoon over several days or weeks. Compare with local weather reports and note similarities and differences. And again, so what? What effect do winds have on us and what is happening around us?

More Windy Ideas:

- How strong are the upper winds? Compare the rate at which the air is moving near the ground with the observable speed at which a cloud is moving.
- It is a basic weather rule that the winds bring the weather. According to weather lore (for the northern hemisphere) "When wind is in the east, It's good for neither man nor beast". How can observing the strength and direction of the wind help in forecasting the weather? How can wind be used as an indicator of weather features?
- Wind is but one facet of what the weather is. What causes air to move? What makes the wind? The answer is easy to find in reference books, but original research in the school yard is profoundly empowering. For example, set up wind monitoring stations and map wind patterns in the school yard. How do standing objects (trees, buildings) affect wind direction? How does wind direction or speed vary with height above the ground? Or with temperature differences? Ground cover? Ground elevations or depressions?

Some More Wind Projects to try.



A Tie-up:

One way to bring observations and information together is to make a wind web. With a spool of thread or ball of string, have students hold the string in a circle. Then, just as is done for food webs, join each student's comments about wind and it's connections in our environment. The result should be a beautifully visual web of string, to represent wind in the context of interrelatedness and real-world workings.

Joy Finlay of Edmonton, Canada is president of ANSS.

VIII. NEIGHBORHOOD HABITAT INVENTORY

Darrell D. Young

Curriculum Area: Science, Elementary, Junior High.

Rationale: Developing an awareness of the local neighborhood builds understanding.

Background:

Plants and animals are found nearly everywhere. One merely has to open one's eye's to their existence to begin to appreciate the beauty of nature. One exciting way to appreciate this beauty is through an examination of the surrounding habitat. It matters little if the habitat is urban, suburban, or rural, life is there to be examined, observed, and appreciated. Teachers can develop or enhance this appreciation by having their students embark on a habitat inventory.

Materials:

Trip boards, pencils, paper, chart making materials.

Activities:

A habitat inventory may be developed by a class as a whole, which might be the best approach for the lower grades, or students may be divided into small groups or teams. The latter approach is preferable with older children. Teams may be general or specific in terms of their goals, they can all canvass the entire neighborhood or be assigned to a certain area. However, divided, the team(s) should have their goals firmly fixed in their minds before venturing out exploring. The basic information that the team must always keep in mind is that each living organism, in order to survive, must have access to shelter, water, and food in that order. Therefore, a preliminary discussion of these three items should precede any field investigation. The creation of a chart similar to the following example will be useful and will help to clarify the inventory problem.

Survival Characteristics

Food: Nuts, Berries,Grass, Insects, etc.

Shelter: Nests, Hollow Trees, Trees, Burrows, etc.

Water: Dew, Rain, Streams, Ponds, etc.

This list should be as comprehensive as possible and should always be open to new additions.

At the same time as your students are out gathering this data they should be on the lookout for any kind of animal life. Data on animals should include where they were when sighted and what it was that they were doing when seen. The time of day is also important, as animals vary greatly in their times of maximum activity.

The habitat inventory can now be expanded by the creation of another chart, which will attempt to relate each animal that has been seen to the survival characteristics listed in the first chart. Such a chart might be created to look something like the following:

Habitat Inventory Chart

_____ Season
_____ Date
_____ Time of Day
_____ Temperature

Animal: Bumblebee
Shelter: Nest (often mouse nest)
Water: Nectar
Food: Pollen, Honey, Nectar

It is important to note that any one animal may have several sources of the survival characteristics. Those which do are better able to survive and this in turn allows the teacher to introduce and discuss the concepts of Adaptation and Competition.

Still other important concepts that can be introduced and carried out with this activity are those of population density, food chains, food webs, the niche, and even the study of map reading and map making.

Further suggestions: Make this an on-going seasonal activity which will allow for the discussion of migration and hibernation. And as an added aid to their field study, have your students separate themselves and sit quietly in one location for a few minutes and have them record all that they hear and see. This is a part of the activity that can be constantly repeated at different times of day or year to see what changes have occurred. An individual journal may be the result of this with information shared to all. Library assignments may also be made with each student assigned an animal which has been observed in order that even more information can be added to the chart.

Dr. Darrell D. Young is Professor, Outdoor Science Education, State University of New York at Buffalo

IX. "Down the Drain": A REEP Activity

Laura Lee Linck

Curriculum area: Science, Social Studies

"Down the Drain" is only one activity from the regional Environmental Education Program, REEP. Originating in southeast Pennsylvania, REEP, a teacher training and curriculum dissemination project, has now spread throughout Pennsylvania and New Jersey. Built on the concepts of CYCLES, ADAPTATIONS, ENERGY FLOW,and COMMUNITIES, the curriculum and its activities lead learners through an environment "awareness", to "concept", to "action" format. "Down the Drain" is suitable for middle elementary classroom, nature center, or outdoor school setting.

Rationale: Water problems are close at hand. Observing problems growing out of familiar materials and activities is basic to bringing about changes in attitudes and behavior. In the end responsibility must shift from "them: to "us".

Background:

Human communities have an impact on water quality. Read completely through the activity before going any further. You may choose to do part in the classroom, and then go outside for the second half. You may also find this activity works best as a teacher/student demonstration lesson.

The materials for this exercise can be found in any kitchen or home, and other substitutions can be made. This will necessitate minor changes in the story line.

Caution should be used in mixing some ingredients, such as cleaning solutions. The authors recommend using food or biodegradable substances to aid in disposal of the used materials at the conclusion of the activity. (This also increases the awareness of alternative substances that can be used in the household that are less harmful to the water system.)

Materials:

glass jar or container (quart size is fine)
small amounts of soil
cooking oil
garlic powder
food coloring
black pepper
styrofoam cup
coffee filter
strainers
detergent
cotton
straw or dried grass
paper towel
cloth
soil
sand
pebbles
funnel
other see-through containers capable of holding water.

Activities:

First half of activity:

1. Fill the large container one-half full of water.
2. Hand out pollution samples to students and assign parts: (soil - farmer, cooking oil - mechanic, food coloring - factory worker, garlic powder and black pepper - homemaker, pieces of styrofoam cup - teacher).
3. Tell the students that you are going to read a story and that when they hear their character named, they should come up and put a small amount of their pollutant into the water (see story following).

Water Problems are Close At Hand

A Participation Story

This is the water available to the community of Newtown. It's clean, clear and germ free. Early this morning Farmer MacDonald plowed his field. It rained this afternoon and some of the soil washed into the water supply (student puts soil in water). At the local gas station, one of the mechanics poured some oil down the drain at his gas station (student puts oil in water). The local clothing factory uses special dyes to color its cloth. As the employees wash the equipment, dye goes down the drain (student puts food coloring in water). Mr. Baker is preparing supper for the family. As he washes the cooking dishes, some of the spices he used filter into our water supply (student adds garlic powder and black pepper).

This evening (teacher's name) fifth grade class went on a picnic and some children noticed litter in the creek in the park (student adds pieces of styrofoam cup). Look what happened to our clean, clear water!

What can we do to clean it up?

Second half of activity:

4. Have on hand a filter, strainer, detergent, cotton, papertowel, cloth and straw or dried grass, gravel, soil.
5. Let the students come forward in small groups to try to get the water clean using

continued to page 40

Books for Young People

The Natural World of the Turks and Calicos

Text and Illustrations by by Katherine Orr
McCollum Press, Inc. 1983

This is an interesting teaching tool developed especially for teachers and children in the middle grades in the Caribbean.

Twenty-one pertinent topics are included and many of them are presented in question form such as; "What are our islands made of?" , "How are mangrove shores important?."

The topics included are presented on two-pages opposite one another with brief informative statements on the subject as well as very special colored drawings by the author. Also included are several pages of colored photographs of children of the region and scenes of the area relating to the topics presented.

Included in the book is a Table of Contents.

In my opinion this book would be excellent for the Caribbean but have limited use in other parts of the United States and Canada.

L.R.

Leroy the Lobster

by Katherine Orr
Macmillan Caribbean - 1985

Shelley

by Katherine Orr
Macmillan Education, LTD - 1990

After discovering that Katherine Orr treated both the Lobsters and the Queen Conch as people, I decided not to prepare a review on these books.

In the science books I have used with children or reviewed, this approach has not been used for many years. In my opinion it is unfortunate that Orr decided to use this approach, as the subject matter is worthwhile and the illustrations are excellent.

L.R.

Sea Turtles Hatching

by Katherine Orr
Simon and Schuster, 1990

This is a delightful presentation of the life history of Sea Turtles. It is one of the books in the Discover Series.

In the book the young reader learns that the mature female sea turtle returns to the beach dune where she was born and lays her eggs. The reader also learns how the young turtles develop within the eggs, hatch and return to the sea. They learn about the enemies of the hatchlings and in this account how some of them went towards a street light and the disaster that follows.

In this story one of the hatchlings is discovered in the morning by a newsboy who plans to be a Marine biologist. He takes the hatchling to a park ranger who cares for sea turtles until they are ready to be placed in the ocean. When ready each hatchling is tagged with a number for later identification and taken to the same beach and placed on the sand facing the sea.

Eighteen years later the special hatchling returns as a mature female sea turtle to the same beach to lay her eggs and is discovered by the newsboy, now a Marine biologist.

The illustrations are very fine colored drawings which add a great deal to the content of the book.

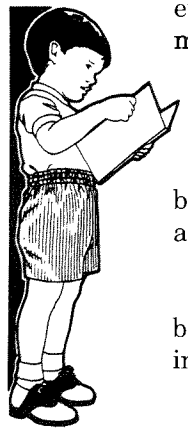
L.R.

My Grandpa and the Sea

by Katherine Orr
Carolrhoda Books, Inc. Minneapolis, 1990
Suggested Grade Levels: Second, Third, Fourth

The setting for this story is the island of St. Lucia in the Caribbean. With the author's background this is a very appropriate setting. Lila is living with her Grandpa and Grandma. Her Grandpa is a fisherman who is still using the "old fishing techniques" of the islanders. New ways are introduced and the supply of fish gradually declines to the point that Grandpa can no longer make a living fishing. He discovers that he can grow sea moss, which is in demand for food on the island, and still make a living.

Grandpa's philosophy is summarized in this statement he made, "If we give back something for everything we take we will always meet with abundance." This concept may be difficult for young children to comprehend.



The colorful illustrations are outstanding and are assumed to be by the author. The pictures add a great deal to the book's content.

The science content is limited.

There is a religious focus in the book that could make it inappropriate for public school use.

L.R.

Coloring Books

The Coral Reef Coloring Book - 1988
Shells of North American Shores - 1989

The Naturencyclopedia Series
Stemmer House Publishers, Inc.

Both coloring books in my opinion are more appropriate for older people who have a special interest in marine life than for young children who may have difficulty with the vocabulary. A friend who is interested in art as a hobby enjoys doing coloring books of this type. She looks for them at marine exhibits. An artist indicated he uses them to help him with detail on a particular species.

They may have use in advanced classes on marine life to give background information and aid in developing identification skills. However, unlike Roger Tory Peterson's bird coloring books, both of these books each have colored models to copy.

In the book on Coral Reefs the author presents several topics on Coral with descriptive paragraphs on each topic. On the opposite page is a full page pen and ink drawing on the topic to color. There is an identification guide to the illustrations with the common and scientific names of each species included.

In the coloring book on **Shells of North American Shores** the author includes descriptive material and coloring activities on "What are Seashells/Some Common Terms" and "Major Shell Groups." Also included are several activities on different shell groups such as shells of "Eastern Mudflats and Marshes," "Southern Sandflats and Sheltered Bays" and "Mid-Atlantic Rocks and Oyster Bars."

These shell activities consist of pictures to color of several different shells of the particular habitat, descriptive material on each shell and a full-page habitat picture to color including the shells of the area.

Included with both books is a Table of Contents and an Index. There are limited comments in the descriptive material which could aid in coloring.

Louise Ritsema, a retired teacher, has been the chairman of the Eva L. Gordon Award Committee for the past decade.

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The Sun, the Wind and the Rain

by Lisa Westberg Peters
Illustrated by Ted Rand
Henry Holt and Company, Inc. New York, 1989
$12.95

Yesterday I read this book, seated on the floor of the Delaware County Art Center, to seven children ages three to five. Our tight little circle made it possible to study each illustration as it related to the text of the little book. The story tells of two mountains, one made by "earth", the other by Elizabeth, on the beach, in her yellow sun hat. These "inland" children weren't sure they had actually seen a mountain, but they each related to making a very small mountain on the beach in their sand boxes. The comparison of the evolution of a real mountain which took more than the "sun, the wind, and the rain" and many centuries to make, with the little pile of sand was clear enough. The vivid illustrations caught the attention of the children, one little boy even recognized the hot lava comprising the interior of the earth mountain. The earth "shifted and the rock of the mountain slowly rose" is a statement which deals with the mountain-making process and plate tectonics in a mostly abbreviated manner but it does at least allude to the tremendous revolution of thought regarding earth processes which has in itself evolved in the last fifty years of my lifetime. There is no allusion to the importance of freezing and thawing in the erosion process which wears down the big mountain. Some of the drawings do portray the majesty of mountains and the children really studied them. Elizabeth's climb up the mountain and her view of her own creation intrigued them greatly.

This simple little book leaves much geology to yet unfold for these little children, but it is a good beginning. Seeing the grains of sand in a piece of Ohio sandstone by means of a hand lens reinforced the concept of seashore originating from rock. Geotimes, the scientific journal of the American Geologic Society, in an editorial a few years ago, raised the question: Should we teach plate tectonics in kindergarten? Their answer was yes. It was a challenge without a doubt. That book is yet to be written.

Ruth W. Melvin

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A Walk in the Rainforest

by Kristin Joy Pratt.
Dawn Publications. Nevada City, CA, 1991
Softback $6.95. 32 pp.

Kristin Joy Pratt, the 15 year old author-illustrator created this book out of her belief that "Environmental awareness at a very early age, is the key to preserving our world. When young children gain a knowledge and respect for nature they in turn love and protect it." The language,

artwork and storyline all combine to help children develop an expanded sense of environmental awareness while assisting the child in developing alphabet recognition. Presented as an alphabet book, each page consists of an original, full-color illustration of a different rainforest species, together with a paragraph of intriguing facts about the lifestyle and habitat of the plant or animal.

The best test of a book's ability to reach the intended audience is to give a copy of it to the child and his/her teacher or parent and ask for their reactions. Teachers are always looking for new and stimulating methods to introduce and teach the alphabet to students of all ages and cultures. With the increase of multicultural students in many classrooms, the need to teach the basic skills has become a tremendous task and challenge. The book, A Walk in the Rainforest meets that need!

The book's colorful and interesting illustrations fascinate younger children, while older children are interested in the illustrations of unusual animals and interesting bits of information. Erica, a second grader, was asked to review the book. Initially she found the A B C concept somewhat juvenile. Once she read a few pages, however, she realized that the book was not geared to just the younger child. She loved the pictures, their designs and the colors used. Erica found the information quite interesting and, in fact, learned lots of tidbits of information that she shared with her teacher at school.

An intermediate Resource Room class (ages 10-12) read the book and commented, "The book was very nice and the pictures was very osom and cute." "I like the flowers, I like it". Their teacher exclaimed, "The adjectives used to describe the alphabet words were wonderful. The pictures were vibrant and colorful; pleasing to the eye. My class enjoyed the book and were amazed that it was written by a fifteen year old."

A first grade class that stresses whole language made these comments: "I liked the rhyming at the end." "The way the author used the same letter was good." "I liked the colors and the animals." The teacher particularly like the additional information provided. She said, "It can be used as a reference book as well a story.

Most of the parents and teachers who read the book share the feeling of the teacher who said, "This book was wonderful! We should get it for our school library."

Katherine E. Flynn, Professor of Special Education
Fitchburg State College, Fitchburg, MA.

Volcanoes and Earthquakes

By Mary Elting
Illustrations by Courtney.

Living Monsters

by Howard Tomb
Illustrations by Stephen Marchesi.

The World's Most Dangerous Animals

by Susanne Santoro Whayne
Illustrations by Ebet Dudley.

These Simon and Schuster Books for Young Readers are published by Simon and Schuster, New York, 1990. Unpaged (approximately 40 pages). $9.95 each.

All of these books are large (10 by 12 inches) and beautifully illustrated with full color paintings. They are aimed, I would say, at readers 8 to 12 years old, but younger children -- and adults, too -- can enjoy the pictures and learn things that they didn't know about volcanoes, and earthquakes, dangerous animals, and insects.

VOLCANOES AND EARTHQUAKES is a particularly timely book, for the devastating eruption in June, 1991, of Mount Pinatubo in the Phillippines, as well as recent earthquakes in many parts of the world, are still fresh in our minds. Unfolding in a series of fascinating stories, the well-written text and vivid illustrations reveal the geological and historical facts about volcanoes and earthquakes through a number of individual accounts: the formation of Mount Paricutin in Mexico in 1943; the deadly eruption of Mount Pelée on Martinique in 1902; the awesome eruption of Mount St. Helens in Washington in 1980; the worldwide effects when the island volcano of Krakatoa in the East Indies blew its top in 1883; the burying of the Italian city of Pompeii some 1900 years ago when Mount Vesuvius erupted; and others.

After a clear and concise discussion of tectonic plates, the text explains how their shifting and sliding past one another causes volcanoes and earthquakes. The hows and whys of earthquakes are explained, and the stories of some of history's most famous and devastating earthquakes are told, including the San Francisco earthquake of 1906 and the most recent one in that city in 1989.

The well-researched and action-filled illustrations add a great deal to the authoritative text, which was reviewed by Professor Marty Godchaux of Mount Holyoke College, and others.

Although I dislike the title, LIVING MONSTERS - THE WORLD'S MOST DANGEROUS ANIMALS, the fact-filled text is generally interesting and reliable, and the illustrations by Stephen Marchesi

are outstanding. Each two-page spread shows one individual species or group of animals and deals with its natural history and dangerous qualities in a short, well-written essay. Some of the animals covered are poisonous jellyfish, sea wasp, cone shell mollusc, army ants, scorpions, ticks, stone fish, king cobra, crocodilians, vampire bat, and last -- but not least -- humans. In discussing the king cobra, the author states that "In order to 'milk' them, lab workers walk right into cages containing dozens of the deadly animals." Where? -- I ask myself.

The text of THE WORLD OF INSECTS begins with a general discussion of insects, their place in the world, the secrets of their success, and a short review of metamorphosis. Various groups of insects are discussed -- ants, honeybees, beetles, crickets, butterflies, moths, and others. The author dots her text with statistics and a number of general or sweeping statements. She occasionally uses wording with which I would disagree: "The pupae of other insects, like butterflies and some ants, spin themselves a silken hideout called a cocoon." Describing the Monarch butterfly's springtime journey northward, she states that the second generation "...after emerging from cocoons, continue their parent's journey." One of the sweeping statements that I doubt is the assertion that "As a caterpillar, it (the luna moth) eats 8,000 times its own weight in forty-eight hours!"

Illustrations are generally accurate and beautiful, but in several spreads the text and pictures are confusingly positioned or misleading. In one spread, for example, the text discusses the Red Admiral, the Aphrodite Fritillary, the Painted Lady and the Monarch butterflies, but the pictures show the Painted Lady where the Red Admiral (which is not pictured) should be, the Painted Lady and Monarch text is illustrated with another species entirely -- a New World tropical butterfly which is not identified. Occasional lapses such as these could have been avoided if the text and pictures had been reviewed by a knowledgeable person before publication.

Robert M. McClung

Down the Drain

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these above items. Or, divide the childreninto groups and see how each group tackles this problem. (You might want to go outside for this part.)

6. After the students have tried to clean the water, discuss other ways we might get it clean and, time permitting, try them (boiling is one possibility).
7. Please note: You most likely won't get the water clean enough to drink. That is not the point of this activity. However, ask the children if they would want to drink this water. Do they see anything? Do they smell anything?
8. Is there any other way to clean water? Students might mention adding chlorine.
9. To dispose of the materials you have developed, remove all pieces of styrofoam and paper and discard. Disperse the liquid outside on the ground. If you have used only organic pollutants, this will not harm the soil and will be decomposed by the soil micro-organisms.
10. After discussing how difficult it is to clean our water, you might visit your local water treatment facility or have a representative come visit the class.

Follow-up:

Homework

Have the children place a list near their kitchen sink and have all their family members list all the substances that they wash down the drain. Have students read labels of some of the substances that were put into the water system and write down any of the ingredients they do not recognize. Do this over a weekend. On Monday compare what has washed into your water system and the list of mystery ingredients. Most likely the unidentifiable ingredients are complex chemical compounds that are human-made chemicals. Have the group brainstorm less harmful substitutes for the more harmful substances. For example: using baking soda as a cleaning powder, and using biodegradable shampoos and hair lotions.

Objective:

The student should be able to list five possible pollutants that an average person adds to the water cycle. The student will also give two ways that water purity may be achieved or protected.

Byrd Baylor-1992 Gordon Children's Science Literature Award Recipient

Eva Gordon would be delighted with the addition of Byrd Baylor to the list of Eva L. Gordon Children's Science Literature Award winners. Before coming to Cornell in 1931, Dr. Gordon had co-authored two books for primary grade children with Jennie Hall. Entitled Spring and Autumn, they were based on her observations in the outdoors and her knowledge of the primary grade children she taught in Milwaukee. Instead of telling, as books in the 20's were prone to do, they invited children to learn by doing and by observation. Her plans to write other children's books never materialized, but she spent a lifetime reviewing them and she prepared three extensive bibliographies. One was for the revised Anna Botsford Comstock Handbook of Nature Study,and one consisting of material she was preparing for a doctoral dissertation became a Cornell Rural School Leaflet (one of those many times when she laid aside her plans to fill the demands of the University and the department). Her last one was another Cornell Rural School Leaflet published in 1950. In it she reviewed books written by almost every author who later received the Eva L. Gordon Award between 1964 and 1981. Her excitement when Millicent Selsam's Play with Plants arrived for review spilled over to the entire department, and when she attended the ANSS meeting that December she said, "I must meet Millicent" and she did, and taking her out to dinner was a high point of the conference for her.

The award winners of the last decade were not writing when Eva's plans to use her retirement years writing books were cut short by her untimely death. But what a wonderful diverse delightful group of human beings they are! Yet in their diversity, what commonality of writing well, of caring for Earth, and for young people! The addition of Byrd Baylor to this list is most appropriate. Her books are short. One can be a bedtime tale, or a greet-the-day-story, or a let's-rest-and-move-into-another-world-in-the-middle-of-a-busy-day story. One can be used to close a class or a conference. They are short but are like a drop of rain on a cactus flower as the sun streaks the eastern horizon.

The best way to appreciate them is to get them and read them. Then read them again to a child, or maybe to a whole class, or even a grown-up who needs to stop awhile and rediscover the simple - but oh, so complete, world! If your library doesn't have Byrd's books ask the librarian to order them or make a gift of one of them and others will follow. And in the meantime the best way to sense the beauty of these books is to let Byrd herself tell you about them.

Meet Byrd Baylor

Maybe everybody has some small part of the world where they feel most at home, some place that comforts them and holds them.

The southwest desert is like that for me. I feel at home with cliffs and mesas and rocks and open skies. I'm comforted by desert storms.

I want to know the things that hawks and horned toads know. I want to follow coyote trails wherever they go. I like to talk to people who remember sunsets that they saw five years ago, and to people who can tell you all about a certain purple cactus flower that they walk across a mountain every spring to find.

photo: Jim Ambrose

Of course the desert keeps its secrets hidden and only lets you in on a few of them, but I learn what I can, and that is what I write about.

Finding bits of ancient Indian pottery in the desert gave me a book I called WHEN CLAY SINGS, and watching sunrises gave me THE WAY TO START A DAY.

THE DESERT IS THEIRS was my way of honoring people who live peacefully with the land, and DESERT VOICES was my way of honoring the animals who live here too and who I believe have as much right to the land as I do.

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Good Reading

The University of California Press in Berkeley has done it again. Three new books in its California Natural History series were published in the past two years. Each one is an excellent resource for naturalists, teachers, students, and the general public. Whereas each is useful and attractive on a library shelf, it is also compact enough to fit into a hiker's pack. Each is a useful educational tool for natural science or environmental studies classes on almost any educational level.

Esther Railton-Rice

Lichens of California

by Mason E. Hale, Jr. and Mariette Cole
University of California Press, 1988
Price: $38 cloth; $14.95 paper
261 pages
1989

Horse lettuce and rock tripe are not entries in a cookbook but are common names for certain lichens found in California. Using this field guide, Lichens of California, an amateur botanist will be able to identify common lichens. The guide describes the appearance, habitats and ranges of over 350 species. An interesting comprehensive introduction precedes a key.

This introduction defines a lichen as "two entirely different organisms, fungus and alga, growing together in a symbiotic or mutually beneficial union." Although much is still unknown about lichens, Hale and Cole describe the way some lichens have been used for drying baskets and wood, perfume, food, and folk medicine.

The lichens are grouped into three major growth forms: foliose, fruticose, and crustose. A dicotomous key is well organized; however an amateur naturalist may initially be hindered by the scientific structural terms which are defined in the glossary. Each species is described in detail as to structure, growth forms, vegetative characteristics, chemistry and habitats.

The color photographs are excellent, but many of the black and white ones are dark, making it difficult to distinguish specific characteristics. County distribution maps are given for forty of the more common species. An extensive reference lists provides many suggestions for further study of lichens.

Jean Fahy

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California Mammals

by E.W. Jameson and Hans Peeters
$24.95 hardcover
188 pages
1989

Beginning with mammal ecology, this book describes a myraid of animals giving a complete descriptions of physical characteristics, habitat, foods, reproductive habits, and migration patterns. Some color photographs and detailed skull and teeth drawings illustrate the book. Useful keys accompany the drawings.

Because many of the species are nocturnal and therefore difficult to observe, the authors suggest using hearing aids and infra red lights or spotlights covered with red plastic to get close to the animals without frightening them away. Most of the animals communicate through odors and high pitched sounds which are virtually undetectable by humans.

The book is practical and impressively designed.

Maryetta Golden-Henderson

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Marine Mammals of California

by Robert T. Orr and Roger C. Helm,
illustrated by Jacqueline Schoneweld.
$35 cloth, $9.75 paper
261 pages

Newly revised, Marine Mammals of California is well written and easy to understand. The illustrations are beautiful, accurate and detailed. The photographs allow the reader the opportunity to see the animals in their natural habitat.

In the first chapter, the authors outline the best areas of California to observe marine mammals in their natural environment as well as the many aquariums and ocean theme parks. The remainder of the manual gives detailed information about the natural history of the animals by species, descriptions of their physical characteristics and behavior. The chapters are organized according to order and family and include a description of the major features and understanding of these animals.

Kathleen Wells

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Grizzly Years

by Doug Peacock
Henry Holt & Co. New York -
$22.95
288 Pages

High School and Adult

This is the story of one man's effort to save the Grizzly Bears in the wild back country of the American Northwest. These true life adventures of tracking and photographing the bears in their native habitat are combined with the author's search for his own self after his return from the Vietnam war.

The new method of tranquilizing bears and then attaching radio collars has given researchers more information on the habits and travels of these large mammals. The knowledge obtained helps to show the way they fit into the larger ecological picture of their wild habitat.

The 13 color photographs in the center of the book supplement the well written text.

Reviewed by Bob Russell

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While You Wait: A Sportsman's Guide to Nature

by Cliff Hauptman
drawings by Michael DiGerrgio,
Stone Wall Press, Washington D.C. 1984,
205 pp.
$9.95

There are 90 individual one page chapters each accompanied by a full page drawing in this unusual field guide that turns attention to the natural world that surrounds a fisherman or hunter, or for that matter, a hiker, a photographer, a boater, a canoeist, or anyone else who moves through waterways, woods, open fields, and wetlands.

Included are topics like ballooning spiders, night insects, leaf homes, dragonflies, donacia beetles, ichneumons in the bark, daylight periodicity, tree blossoms, springtails, owl castings and others that illustrate the variety of life in quiet habitats.

Each chapter consistently goes beyond identification to point out behavior and relationships. Certainly the guide will enrich a hunting or fishing trip but I can't think of a better single guide to tuck in a knapsack as one sets out for a canoe trip or a leisurely hike along stream and meadow.

The book is organized by seasons and indexed by subject and by habitat. Seven chapters deal with birds, 51 with insects, 5 with mammals, 22 with miscellaneous topics.

While this is only a sampling of the world of nature in quiet places, it is enough to add luster to a trip a-field and to invite the discoverer to turn to other research sources.

HRR

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The Nature Notes of an Edwardian Lady

(1905) by Edith Holden,
Arcade Publishing, NYC, 1989,
192 pages,
$22.95 - hardcover

Beautiful water color sketches alternate with a text that is largely composed of dated field notes on the English countryside. These are supplemented with seasonal quotes from poets and short comments on seasonal history and lore. This is a coffee-table book but could be an excellent introduction to journal keeping and to outdoor observations. It could be used as an example of techniques and variety of composition and layout in a watercolor class.

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"The Clean Air and Clean Waters Acts: Balancing Environmental Needs and Federal Legislation"

by Laurel Knight which was published in ENVIRONMENTAL CELEBRATIONS, the Nature Study Journal Volume 44 Number 2 and 3, was one of 680 articles selected Nationwide in 1991 to be republished in the Social Issues Resources Series, Inc. Boca Raton, Florida

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Images of Nature

Clifford E. Knapp

Curriculum Areas: Science, Language Arts, Philosophy, Psychology

Rationale: Humans have been trying to understand the meaning of nature and their relationships to it for thousands of years. Nature means different things to different people. By finding examples of a variety of nature images that are reflected in quotations, we can begin to grasp the complexity of the term "nature." After going outdoors and finding examples of these different perceptions, we can enter into discussions with others which may clarify and expand our understanding of the term.

Background:

The word "nature" comes from the Latin "nasci," meaning "to be born." This word derivation suggests that one perception of nature relates to the way things are from the beginning. However, the words "nature" and "natural" have since taken on a variety of meanings.

Webster's Third New International Dictionary of the English Language Unabridged lists 20 definitions for the adjective, "natural" and 13 definitions for the noun, "natural." These many definitions, may result in most writers trying to explain the meaning of "nature" and "natural". Perhaps they assume the reader knows what they mean by the term or are content to allow the reader to apply his or her own definition in understanding the meaning of the writing.

Bill McKibben, (1989, p. 96) in writing about the end of nature, defines the term as "...that world entirely independent of us which was here before we arrived and which encircled and supported our human society." This definition assumes humans to be separate from nature and as we shall soon discover, this is only one of several images of nature.

Whether or not we view humans as a part of nature or separate from it, we may never completely resolve the issue. Philosophers and other thinkers will probably argue that question for a long time. There are other questions that center around the meanings of nature to humans. Finch and Elder (1990, p. 28) ask three: "How does the human mind make sense of nature?" "How does human meaning in general derive from natural phenomena?" "And what, ultimately, constitutes the perennial attraction of and need for things natural in our lives?"

Kaplan and Kaplan (1989, p. 3) conclude that "it is clear that whereas the concept of nature is very much part of the human experience the language for discussing it is neither rich nor precise."

Activities

To investigate the many images of nature, I analyzed a collection of 67 nature quotations. To do this, I wrote each quote on a card and then categorized them into piles according to similar interpretations of the term "nature." Nine categories emerged and each was labeled with a descriptive phrase. The nine images were:

1. Nature as Something to Control for Good or Evil.
   Example:
   Our attitude toward nature and the environment has been much the same as our approach to each other; we strive for conquest and domination, not cooperative coexistence. (Paul Wachtel)

2. Nature as Wisdom
   Example:
   Never does Nature say one thing and wisdom another. (Jovenel)

3. Nature as Healer and Source of Joy
   Example:
   . . . I firmly believe that nature brings solace in all troubles. (Ann Frank)

4. Nature as Creative Force.
   Example:
   Now it never seems to occur to these far-seeing teachers that nature's object in making animals and plants might possibly be first of all the happiness of each one of them, not the creation of all for the happiness of one. (John Muir)

5. Nature as Separate from Humans Example: *How can we reenter the first world of nature, from which we have alienated ourselves? (Loren Eiseley)*

6. Nature as Human.
   Example: *All who achieve greatness in art...possess one thing in common: they are one with nature. (Basho)*

7. Nature as Connected to All Life Example: *Man is*

as truly a part and product of Nature as any other animal, and [the] attempt to set him up on an isolated point outside of it is philosophically false and morally pernicious. (Edward Payson Edwards)

8. Nature as Feminine
   Example:
   We cannot command nature except by obeying her. (Francis Bacon)

9. Nature as Teacher
   Example:
   Come forth into the light of things. Let nature be your teacher.

In order to promote connection-making between the language and the world outside the classroom, I developed the following activity:

Explain that the word "nature" means different things to different people. Illustrate this by reading a quotation from each of the nine categories or images identified. Ask the participants if they can think of any other images not listed. Sometimes they suggest the image of Nature as Male, but quotations to illustrate this view are difficult to find. Sometimes I pair the participants and randomly assign an image to them. At other times, I permit them to select an image before giving directions to them. A guide sheet with the nine images listed is sometimes helpful to the participants.

Directions: Using one of the images of nature assigned or chosen, find at least one example of it in the surrounding area. You will be given 10 minutes (or more) to find one or more examples of the image.

When the group is re-assembled, we share examples of each image and then talk about some of the points raised in the discussion.

Possible Processing Questions:

1. If you actually held the nature image you investigated, how would your behavior be reflected in your lifestyle?

2. Was it difficult to find examples of your nature image? How did you feel about your search for examples?

3. Of all the images discussed, which one do you prefer most? ... least?

4. Did you discover any new categories? If so, what?

5. Have you changed your perception of nature in any way? If so, how?

6. Did this activity prompt any new questions? If so, what are they?

7. Can anything we find on earth be considered to be unnatural?

8. Are humans a part of or separate from nature? Can we be both a part and separate?

9. How is human nature different from nature? ...Same as nature?

10. How do people's experiences affect their image of nature?

Other related questions and activities suggested by one of the 78 cards in the Essence I set (American Geological Institute, 1970) are:

1. Go out and find positive evidence that something natural happened.
2. Do it again within the context of the natural scientist.
3. What are some negative, positive, neutral aspects of each happening?
4. What happenings are completely positive? completely negative?
5. Find evidence that is so strong that everyone agrees about what happened.
6. Are man-made happenings natural?

Supplementary Information:

Nature as Something to Control for Good or Evil

Each generation has fought nature. Now...we must become the protector of nature. (Jacques Cousteau)

The most important truth about ourselves, our artifacts and our civilization is that is is all borrowed...We are forever borrowing from the environment to create and maintain the totality of our way of life. Everything we transform eventually ends up back in Nature after we have expropriated whatever temporary value we can from it . (Jeremy Rifkin)

The 'control of nature' is a phase conceived in arrogance, born of the Neanderthal age of biology and philosophy, when it was supposed that nature exists for the convenience of man. (Rachel Carson)

Nature, insofar as it is noticed, is only a convenience - or a temptation - with no positive value in itself. (Marston Bates)

Our attitude toward nature and the environment has been much the same as our approach to each other; we strive

for conquest and domination, not cooperative coexistence. (Paul Wachtel)

Man is everywhere a disturbing agent. Wherever he plants his foot, the harmonies of nature are turned to discord. (George Perkins Marsh)

Nature as Wisdom

Never does Nature say one thing and wisdom another. (Jovenel)

The goal of life is living in agreement with nature. (Zeno)

Now I see the secret of making the best persons: it is to grow in the open air and to eat and sleep with the earth. (Walt Whitman)

Nature as Healer and Source of Joy

To a person uninstructed in natural history, his country or seaside stroll is a walk through a gallery filled with wonderful works of art, nine-tenths of which have their faces turned to the wall. (Thomas Henry Huxley)

. . . I firmly believe that nature brings solace in all troubles.
(Ann Frank)

Climb the mountains and get their good tidings. Nature's peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you, and the storms their energy, while cares will drop off like autumn leaves.
(John Muir)

The house is a prison, the school room's a cell; leave study and books for the upland and dell. (Joseph Green)

My heart is turned to the quietness that the stillness of nature inspires. (H. I. Khan)

We need to demonstrate our acceptance of the natural world, including ourselves; we need the spiritual refreshment that being natural can produce. (Wallace Stegner)

In defying nature, in destroying nature, in building an arrogantly selfish, man-centered, artificial world, I do not see how man can gain peace or freedom or joy. (Marston Bates)

This curious world we inhabit is more wonderful than convenient; more beautiful than it is useful; it is more to be admired and enjoyed than used. (Henry D. Thoreau)

Glorious intoxication of the soul is the reward of all who seek it in the bosom of nature. (Kahlil Gibran)

Nature as Creative Force

Nature is both benign and terrible, but consistently creative in the larger patterns of her actions. (Thomas Berry)

Nearness to nature. . . keeps the spirit sensitive to impressions not commonly felt, and in touch with the unseen powers. (Ohiyesa)

Now it never seems to occur to these far-seeing teachers that nature's object in making animals and plants might possibly be first of all the happiness of each one of them, not the creation of all for the happiness of one. (John Muir)

Nature is the unseen intelligence that loved us into being. (Elbert Hubbard)

Nature as Separate from Humans

The major problems in the world are the result of the difference between the way nature works and the way man thinks. (Gregory Bateson)

Civilization says, 'Nature belongs to man.' The Indian says, 'no, man belongs to nature.'
(Grey Owl (Archie Belaney))

Most people are on the world, not in it — have no conscious sympathy or relationship to anything about them —undiffused, separate, and rigidly alone like marbles of polished stone, touching but separate. (John Muir)

How can we reenter the first world of nature, from which we have alienated ourselves? (Loren Eiseley)

How can we analyze the problems of man's relations to man as we have analyzed the problems of man's relationship to nature? This was 'the question that sets us free." (Margaret Mead)

As scientific understanding has grown, so our world has become dehumanized. Man feels himself isolated in the cosmos, because he is no longer involved in nature and has lost his emotional 'unconscious identity' with natural phenomena. (Carl G. Jung)

True conservation means not only protecting nature against human misbehavior but also developing human activities which favor a creative, harmonious, relationship between man and nature. (Irene Dubois)

Nature as Human

...We can never speak of nature without, at the same time, speaking of ourselves. If we believe in this organic relationship of the knower and the known, we would create a classroom practice that would teach us, not to rearrange the world, but to learn its intricate relationships. The knower would become a person whose destiny is not to rule, but to raise to consciousness the interrelated quality of all of life, to enter into partnership with nature, history, society, and ourselves. (Parker Palmer)

If the mind is indigenous and integral to nature itself in its unfolding, and operates in nature's ways and under nature's laws, we must seek to understand this creative aspect of nature in its implications for the human mind. (Loren Eiseley)

What we know of ourselves 'inside' is ultimately what we will allow ourselves to know of nature 'outside,' for nature is also us. (Theodore Roszak)

Man is not himself only. . . he is all that he sees; all that flows to him from a thousand sources. . .he is the land, the lift of its mountain lines, the reach of its valleys. (Mary Austin)

We love the birds and beasts that grew with us on this soil. They drank the same water as we did and breathed the same air. We are all one in nature. Believing so, there was in our hearts a great peace and a willing kindness for all living, growing things. (Luther Standing Bear)
All who achieve greatness in art...possess one thing in common: they are one with nature. (Basho)

Man is incomprehensible without nature, and nature is incomprehensible apart from man. (Hamilton Wright Mabie)

So with consciousness: the thoughts and emotions, the social forms and rituals of the human community, are as much 'earth' as is the soil and rocks and the trees and the flowers.
(Thomas Berry)

Earth pours through us, replacing each cell in the body every seven years. Ashes to ashes, dust to dust, we ingest, incorporate and excrete the earth, are made from earth.
(John Seed and Joanna Macy)

Nature as Connected to All Life

A human being is part of the whole called by us "universe"...a part limited in time and space. He experiences himself, his thoughts and feelings, as separate from the rest—a kind of optical delusion of his consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest us. Our task must be to free ourselves from this prison by widening our circle of compassion to embrace all living creatures and the whole of nature and its beauty. (Albert Einstein)

He [Thoreau] repeatedly referred to nature and its creatures as his society, transcending the usual connotation of that term. ...He regarded sunfish, plants, skunks, and even stars as fellows and neighbors - parts of his community. (Roderick Nash)

Man is as truly a part and product of Nature as any other animal, and [the] attempt to set him up on an isolated point outside of it is philosophically false and morally pernicious.
(Edward Payson Edwards)

The Indian has always seen the world of nature as animate - night and day, wind, clouds, trees, the young corn, all alive and sentient. (Frank Waters)

We are obliged, therefore, to spread the news, painful and bitter though it may be for some to hear, that all living things on earth are kindred. (Edward Abbey)

When one tugs at a single thing in nature, he finds it attached to the rest of the world. (John Muir)

One touch of nature makes the whole world kin. (William Shakespeare)

This we know. The earth does not belong to man; man belongs to the earth. This we know. All things are connected like the blood which unites one family. All things are connected. Whatever befalls the earth befalls the sons of the earth. (Chief Seattle)

The patterns scientists observe in nature are intimately connected with patterns of their minds; with their concepts, thoughts, and values. (Fritjof Capra)
So the present is linked with the past and future, and each living thing with all that surrounds it. (Rachel Carson)
Nature includes all of the universe and man is not only a part of nature, he is in it up to his neck. (N. J. Berrill)

Nature as Feminine

It is blessed to lean fully and trustingly on nature, to experience the infinite tenderness and power of her love. (John Muir)

We cannot command nature except by obeying her. (Francis Bacon)

Nature will not accept ignorance of her laws as an alibi. (Fairfield Osborn)

To him who in the love of nature holds communion with her visible forms, she speaks a various language; for his gayer hours she has a voice of gladness, and a smile and eloquence of beauty, and she glides into his darker musings, with a mild and healing sympathy, that steals away their sharpness, where he is aware.
(William Cullen Bryant)

The twentieth century has eliminated the terror of the unknown darkness of nature by devastating nature herself.
(Thomas Berry)

There is a love of wild nature in everybody; an ancient mother love ever showing itself whether recognized or not, and however covered by cares and duties. (John Muir)

Nature never did betray the heart that loved her. (William Wordsworth)

Nature as Teacher

Just as reading a book is a process of interpreting signs and recreating a world in imagination, so nature is an open and ever present book for those who can read her signs and who possess an active intelligence. Why should not education consist as much in learning to read the land as in learning to read books? (J. Baird Callicott)

The views of nature held by any people determine all its institutions. (Ralph Waldo Emerson)

Come forth into the light of things. Let nature be your teacher. (William Wordsworth)

Many lessons in nature, as in life, are learned by looking at the underside of the leaf. (Anna Mae Phillips)

Let nature teach them the lessons of good and proper living, combined with an abundance of well-balanced nourishment. Those children will grow to be the best men and women. Put the best in them by contact with the best outside. (Luther Burbank)

But in those hours of freedom, let him be taught by nature rather than by you. Let him fully realize that she is the real teacher and you, with your art, do nothing more than walk quietly at her side. (Pestalozzi)

Journal Review: Wisconsin Academy Review* Volume 34, Number 1 (December 1987) (Aldo Leopold Centennial Edition) Clifford E. Knapp

This special centennial issue of the Wisconsin Academy Review celebrates Aldo Leopold, a prominent figure in the fields of ecology and nature interpretation. He wrote extensively, but is known most widely today for his classic, A Sand County Almanac published in 1949. The journal issue contains articles by three of Leopold's University of Wisconsin students, McCabe, Hammerstrom, and Zimmerman. Other articles by Leopold biographer, Meine, Professor Schoff, and Charles Bradley, Leopold's son-in-law, round out the collection. Bradley's article, "Doctor of the Land," consists largely of a photo essay showing how Leopold's Wisconsin farm changed over the years.

As many professionals in the outdoor/environmental education field already know, Aldo Leopold made profound contributions to our field. This centennial issue provides further insights into the questions of how and why he was a significant figure. Especially important are the vivid impressions Leopold made on his students and those who came to know him through his writings. The following quotes expand our understanding of Leopold--the person and the teacher:

> Aldo Leopold's interest in cycles never flagged, but he was aware that the "how and why" were in his day supported only by theory and logical supposition and that research data were lacking. Nonetheless he said, "as for conservation, the question of population levels is the very core of it."
>
> Robert A. McCabe, "Aldo Leopold and The Biological-Cycle Dilemma" p. 6

> Aldo Leopold's effectiveness in his own time, and the endurance of his legacy into our own, can be attributed to the same causes: the unity of his thought, the grace of his writing, and an uncommon ability to translate ideas into action.
>
> Curt Meine, "Aldo Leopold and The Biotic View of History" p. 24.

> In one of his favorite metaphors, Leopold described land as a history book, the components of which constituted only the most recent page. To read it, one need only become literate in the ways of its plants and animals.
>
> Curt Meine, "Aldo Leopold and the Biotic View of History" p. 25.

> One of the anomalies of modern ecology is that it is the creation of two groups each of which seems barely aware of the existence of the other. The one studies the human community as if it were a separate entity, and calls its findings sociology, economics, and history. The other studies the plant and animal community, [and] comfortably relegates the hodge-podge of

politics to "the liberal arts." The inevitable fusion of these two lines of thought will, perhaps, constitute the outstanding advance of the present century.

Aldo Leopold quoted in Curt Meine,
"Aldo Leopold and The Biotic View of History" p. 26

If Leopold were to question students today about plant birthdays, would they give better answers than the students of forty years ago? What would Leopold urge his graduate students to work on today? Would his own dream of a land ethic take on a new, harder outline when he saw the burgeoning millions of the earth's dispossessed?

Gretchen H. Schoff, "Leopold Among the Students" p. 31.

Among several influential teachers, Aldo Leopold changed my life the most. Leopold not only broadened my interests from botany to wildlife and ecology, he instilled in me a missionary drive to encouraoge others to involve themselves in the planetary ecosystem, for pleasure and profession.

...Leopold always was eager to learn, and these were new fields both for him and for science in general. I became a keen observer of nature, with Leopold, who took great pleasure in this pursuit, as my role model.

James H. Zimmerman, "Impressions of Aldo Leopold:
A Student's View" p. 33.

Botanist Norman Carter Fassett once described Leopold's mind as one whose gears would be set to grind relentlessly away by each new piece of information. When Leopold found a place where the new puzzle piece fit into his evolving scheme of things, he would brighten and, with obvious excitement, try out his explanation on others.

...Leopold's gift was, I believe, a special spark of kinship made up of intellectual and emotional enthusiasm for all things, including people. Like a skilled campfire builder, he would fan each person's spark into flame.

James H. Zimmerman, "Impressions of Aldo Leopold:
A Student's View" p. 34.

The December, 1987 issue of this journal should be part of all educators' libraries--especially the readers of Nature Study.

*This issue is now out of print, but is available in photocopy form for $5.00 from Wisconsin Academy of Science, Arts, Letters, 1922 University Avenue, Madison, WI 53705 (Add $2.50 for postage and handling)

RICHARD J. BALDAUF

MARCH 28, 1992

Former president of ANSS and long-time environmental educator and activist, Dr. Richard Baldauf, died on March 28, 1992 after a short illness. Dick served as ANSS president in 1976, and was an ardent supporter of the Society. He was a recognized authority on amphibians, and was an outstanding photographer - his photo essay on the development of toads and frogs is an all-time favorite, published in Nature Study in 1971. He will be remembered also for his wit in verse and song - at the National Congress for Environmental Education in Burlington, Vermont in 1983 he enthralled us with his "Ballad on ANSS' 75th Anniversary", an early example of what is now popularly called "rap"!

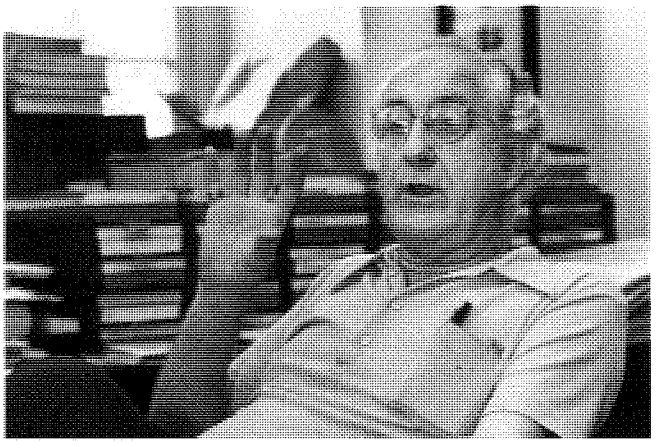


photo: John D. Simmons

Dick hailed from Texas, where most recently he served at the Houston Museum of Natural Science in its Office for Environmental Education. Early in his career he was professor in the Department of Wildlife Science at Texas A&M University. During the '80's, he was the moving force in the development of the Museum of Science and History in Little Rock, Arkansas, where he wrote, produced, and hosted sixteen 30-minute programs for state-wide educational television titled "Listen To The Earth", designed for adults. He was selected as the 1982 Conservation Educator by the Arkansas Wildlife Federation.

As photographer, writer, lecturer, musician, poet, and biologist, Dick was truly a "Renaissance Man" who maintained his dignity and marvelous sense of humor to the very end. His legacy will continue through the Baldauf Scholarship Award for Graduate Excellence in Ecology at Texas A&M University.

Meet Byrd Baylor

continued from page 41

IF YOU ARE A HUNTER OF FOSSILS was written after I had been fossil hunting, but of course it is also about the connection we feel to every other creature and every other time.

I wrote THE OTHER WAY TO LISTEN after I had been listening to the hills and corn fields all through one summer. And I wrote EVERYBODY NEEDS A ROCK after I had picked up at least a thousand beautiful rocks.

THE BEST TOWN IN THE WORLD was made of things I remember my father's telling me about the little canyon town where he grew up like how all the best chocolate cake cooks in the world lived there, and all the smartest dogs too, and how it had the best swimming holes and the best Fourth of July speeches. At first I thought I'd write it for a present to my own family, but after it was finished I decided maybe other people would like it too.

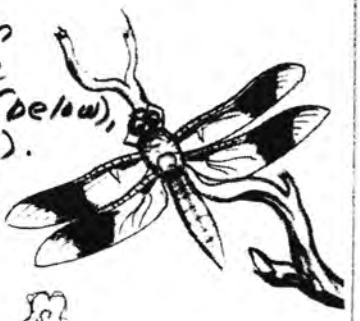
All my books are like that—full of places and people I know. I think of them as my own kind of private love songs to my own part of the world.

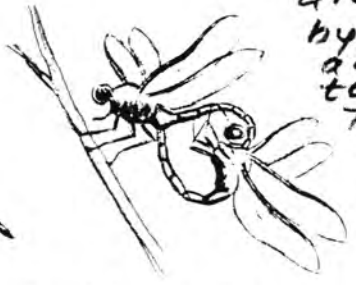
ANSS President Joy Finlay receiving the Bailey Presidential Gavel from past president Frank Knight at ceremonies in March '92 at the Pocono Environmental Education Center. They are holding the Presidential Scroll, on which ANSS presidents have signed their names through the years.

Naturalist's Notebook

Dragonflies and Damselflies, hunters at the pond.

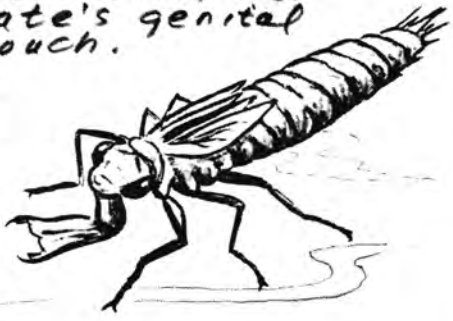
Three big dragonflies commonly seen around meadow ponds are the Green Darner (left) the Ten-Spot (below), and the White-tailed (right). The Black-winged Damselfly (lower right) a close relative, has a much narrower abdomen. It keeps its wings closed when resting, while its dragonfly relatives keep their wings spread wide. All of these insect-hunters, pursue flies, mosquitoes, and other insects.





After courtship the male dragonfly seizes the female by the neck with claspers on his abdomen, and the two fly together, the male in the lead. The female fertilizes her eggs by looping her abdomen under and forward, and taking sperm from her mate's genital pouch.

The dragonfly nymph (right) captures prey with its hinged lower lip. So does the damselfly nymph (left), which has three featherlike gills at the tip of its body.



Fully-grown, the dragonfly nymph crawls out of the water. It's skin splits down the back and the adult dragonfly emerges.

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