

# Nature Study



An Invitation to All ANSS Members: A Call to Keep Current  
John Serrano  
New scientific discoveries often have a hard time making it from the laboratory to the nature walk, but with the presence of (2)

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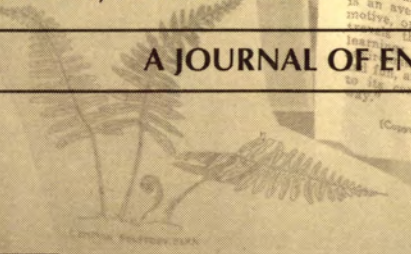
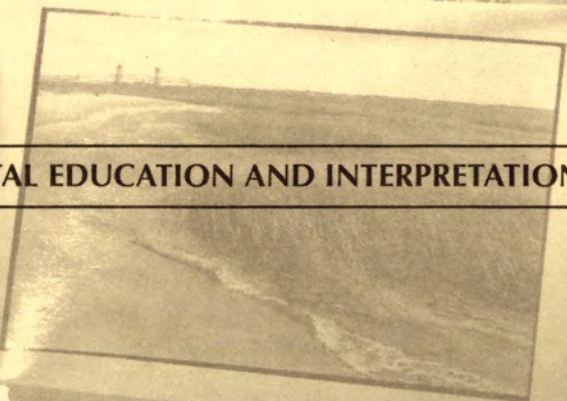
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"The mountain trail is a part of earth's most influential environment, an avenue of interest. It provides motive, opportunity, and desire to learn the truth, and desire to improve the mind, and the traveler just develops all these conditions and develops all these things."  
—Enos A. Mills  
Copyrighted by Mrs. Enos A. Mills, 1922





# *President's Message*

Paul Spector

An editor's job is a difficult one as anyone who has had the responsibility will attest. Perhaps the most trying part of the job is rounding up enough usable copy for each issue. Often, this involves countless phone calls, polite requests, and sometimes, humble begging. Once in a great while, the editor finds himself in the enviable position of having an extra article that just doesn't quite fit the theme of the issue or the space available. This then goes into the file to be used at a later date.

Fortunately, for the American Nature Study Society and for our editor Helen Ross Russell, our members and friends share their writing talents on a frequent basis and Helen's "to be used later" file continues to grow. This issue of Nature Study is the product of this generosity and, as you will learn for yourself, it offers the same excellence that ANSS members find in each and every issue. Helen's dedication to the Society and her skill as an editor surfaces in the publication of each issue.

The variety of articles that you will read on the ensuing pages are a reflection of the diverse interests of the American Nature Study Society and our membership. For over 80 years, our efforts have focused on excellence in the writing and

teaching of natural history. The blending of both results in the quality which has been evident in the journal since its inception.

Interestingly, the publication actually pre-dates the American Nature Study Society by three years. It was founded in 1905 as the Nature Study Review by Columbia University professor Maurice Bigelow. His intent was to provide teachers with accurate, usable materials that dealt with natural science, physical science, and techniques for sharing both with students. Hundreds of ANSS members have contributed to this goal over the years and have enabled Nature Study to set standards for excellence in nature interpretation.

Liberty Hyde Bailey wrote "Nature-study ought to revolutionize the school life, for it is capable of putting new force and enthusiasm into the school and the child." While Bailey was not making reference to the publication Nature Study, his statement would certainly hold true for it. Nature Study continues to be a shining example of the commitment of ANSS and its membership to share our concern for the natural world, for people, and for education.

*Paul Spector, ANSS President, is Director of Education at the Holden Arboretum, Mentor, Ohio.*



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# A Call to Keep Current

John Serrao

Many of us in ANSS are involved in some aspect of the interpretive profession. Our job is to communicate to the general public and/or children, via slide presentations, videos, nature walks, lectures, or the written word, the wonders and interrelationships in our natural world. We may specialize in interpreting individual parks and sanctuaries, or specific natural communities like forests or salt marshes, or the natural history of certain groups of living things like insects, birds, or trees. Or we may be more involved with interpreting regional and global environmental problems like acid rain, endangered species, or toxic wastes.

Whatever our sphere of interpretation, we all realize that new discoveries are constantly being made. What we learned as graduate students or interns may not be totally accurate anymore. Are we certain that what we are telling our audiences is still essentially correct? Do we still marvel at the "mutualistic" relationship between algal and fungal partners in a lichen, when it has now been shown that the fungus in most cases lives off the alga in a one-way, controlled parasitic relationship? Or do we still describe the zig-zag decoration in the center of an *Argiope* spider's web as a stabilizer ("stabilimentum") when research has recently suggested that its function may be to advertise the web to birds who would otherwise accidentally fly into it and destroy it, causing the spider unnecessary labor? (More recent research has shown that this silken zig-zag also reflects ultraviolet light, attracting insects to the spider's sticky snare). I've been on walks in National Parks and sanctuaries where professional interpretive staff members made pronouncements that

made me wince (e.g., decapitated snapping turtles remain alive and kicking until dusk), and I can only hope that none of my lectures have ever embarrassed my peers.

New and fascinating facts are being discovered about animal migration and navigation, bird songs, soil mycorrhizae, plant physiology, and countless other natural phenomena -- information which we all could use to make our interpretive programs more educational and current. By using such interesting tidbits from current natural science research, we add an extra dimension to our programs. They become more credible and professional, more relative to our audience's everyday lives, and more likely to invite people to return for future programs. Some of those who attend our programs may very well be familiar with some of these nature-news items through their own readings, courses, or PBS nature programs. Wouldn't it be much better to see these people nodding their heads in approval during our presentations than shaking their heads in disbelief that they know more than we do? And besides, it makes our jobs as interpreters much more stimulating if we constantly update our material instead of spouting the same jaded facts and concepts year after year.

If you're like me you're already up to your necks in magazine subscriptions and find it extremely difficult to keep up with all the reading. [Audubon](#), [National Wildlife](#), [Natural History](#), [Wilderness](#), [Nature Conservancy](#), [Science News](#), [World Wildlife Fund Focus](#), [Nature Study](#), and the publications of several state and county wildlife agencies are all on my coffee table reminding me to take the time to catch up with my reading. There's no way in the world

I could ever add to my list the more specific journals in the fields of entomology, ornithology, or ecology, even though I'd love to if I had the time (and money). And then there are the updated textbooks, containing lots of new and fascinating material for our programs.

So what's the solution to our dilemma? I try to devote a specific block of time each month during which I read my literature, take notes, and then clip out the more appropriate articles for my files. I have found that the publications most useful to me in terms of revealing new, pertinent information for my programs are [Natural History](#), [Science News](#), and the science section of [The New York Times](#). But even if I accomplish this each month, I realize that there's a lot of information that escapes my detection, much of which I could use to spice up my lectures and walks. Here's a suggestion. Why not incorporate into this [Nature Study](#) journal a regular section abstracting many of these news items -- items which our members come across in readings or course work in their own specialties. There are undoubtedly some ANSS members out there who read magazines, scientific journals, or books that most of us haven't been able to digest, the information from which would benefit all nature interpreters. Some of you may be affiliated with a university where the library provides easy access to journals of entomology, botany, and other disciplines. By combining our efforts, we can cover much more material in far less time. If several of us volunteer a little of our time in this effort, we can all continue to grow as professionals and avoid stagnation.

Send me the items from your  
***Continued to page 7***



# Mycorrhizae: An Underground Alliance of Fungi and Green Plants

James Nardi

The affair between green plants and fungi has been a well-kept secret. Beneath the leaf litter of the forest and the grass of the meadow, roots of plants and hyphae of fungi have developed an intimate relationship, crucial to each other's well-being. Like all good relationships, this one involves sharing, cooperation, and commitment; it is hard to say who benefits more -- the green plants or the fungi.

Most mushroom hunters have probably noticed that certain mushrooms can often be found under certain trees, but they probably never suspected that mushrooms and trees might be on particularly good terms. Towering pines and stately beeches alike have each made their own pacts with fungi. Trees transport the sun's energy from their leafy canopies to their fungal partners. The fungi will eventually use this energy to form their mushrooms. And with their far-reaching hyphae, fungi help the trees thrive in soil where they might never have survived on their own.

Trees aren't the only plants that have developed a special, symbiotic relationship with fungi. The relationship between certain algae and certain fungi is so intimate that when they join together the result is a unique group of plants with properties distinct from those of either algae or fungi; these plants are the familiar lichens that encrust rocks, trees, and soil. Shrubs such as rhododendron, vines like trailing arbutus, and those most elegant of flowers, the orchids, also are intimate associates of fungi. And not only flowering plants but also conifers, ferns, and even mosses are partners of fungi. Obviously the fungi have something very important to offer many members of the plant kingdom. In fact, the roots of almost all green plants intertwine with the hyphae of fungi to form mycorrhizae (*mykes*, fungi; *rhiza*, root); and new associations between plants and

fungi are continually being reported.

Fungal hyphae and root cells can interact in a variety of arrangements. Tree roots that associate with mushrooms are each ensheathed by a network of hyphae. Many of these hyphae wind their way between cells of the root, but they never enter individual cells. In most other plants the fungal filaments not only pass between cells of the root but they also penetrate individual root cells to form *arbuscules*. The name means "little tree", and this is exactly the shape that the highly branched tips of the invading hyphae assume inside a root cell. Whatever is exchanged between hyphae and root cells is assured a large surface area across which it can pass.

Although some fungi that form mycorrhizae with roots of trees can lead independent lives of their own, others simply do not survive in isolation from their partners. This feature is true of the majority of fungi involved in mycorrhizal relationships as well as those fungi that join with algae to form lichens.

Fungi are not the only dependent members of mycorrhizal partnerships. Certain green plants such as orchids seem to be completely dependent on their fungal associates for at least a portion of their life cycles. Orchids

germinate from extremely tiny seeds - so tiny that they contain only small embryos and virtually no food stores to see the seedlings through their earliest days. Until an orchid seedling is able to photosynthesize on its own, it is dependent on its fungus for nutrition. For the fungus this is no trivial accomplishment. Although many orchids are able to fend for themselves by their second year, some orchids, such as certain ladies' tresses orchids, do not even begin photosynthesis until their eleventh year. What the fungi provide for other hosts has been graphically demonstrated by growing certain green plants in the absence of their fungal partners. When the growth of these plants is compared with that of plants grown in the company of mycorrhizal fungi, the difference is striking. Plants with fungi almost always grow faster. If their uptake of elements such as nitrogen, phosphorus, and potassium is measured, mycorrhizal plants generally surpass green plants of the same species that are unassisted by fungi.

Where mycorrhizae really star, however, is mineral-poor environments. Soils of strip mines and peat bogs are not only acidic but also low in soluble nitrogen and phosphorus. Roots alone of most green plants simply could not extract enough minerals from these poor soils to make survival feasible. But in combination with long, thin hyphae of fungi, the roots of these green plants can extract enough minerals to meet the demands of living on nutrient-poor land. It is not that hyphae are necessarily more efficient than roots of green plants in tapping the limited resources of these soils; the long hyphae simply create a larger surface for mineral absorption than the roots of green plants could ever achieve on their own.

Mycorrhizal fungi bless green plants in ways that have only recently been realized. Not only do



The charcoal and ink drawing shows mushrooms (*Lactarius*) under a beech tree.



the fungi supply plants with a rich source of minerals from the soil, but they also protect the roots of plants from drought as well as from nematodes and harmful fungi. All the time mycorrhizal fungi are performing these services for green plants, they are also secreting natural growth substances -- auxins, cytokinins, and gibberellins -- that are believed to promote root growth and may account, at least in part, for the unique and distinctive forms assumed by tree roots after they have taken on fungal partners. It should come as no surprise then that roots with mycorrhizal fungi survive longer than roots that live alone.

Green plants repay the generosity of their partners below ground by providing them with a rich supply of sugars manufactured above ground. Once these sugars are passed on to the fungi, a good percentage are quickly converted to sugars that only fungi can use. A one-way transfer of many nutrients is thus assured from leaves to fungi.

While photosynthesis and the production of sugars are at their peak in the spring and summer, fungi store up those nutrients that are passed down from the leaves. After leaves begin to fall, the stores of sugars in the hyphae are invested in mushroom production. The autumn sprouting of those familiar and colorful mushrooms of the forest floor -- *Lactarius*, *Russula*, *Amanita*, *Boletus*, *Tricholoma*, *Cortinarius* -- is fueled by sugars first formed high above the ground in the forest canopy.

Fungi living with the roots of one plant can also join with the roots of nearby plants -- of the same species or of other species. One can envision a complex web of interactions beneath the forest floor. Plant physiologists have shown that radiolabeled carbon can be transferred from one plant to another only if the two are connected by underground hyphae. Tiny seedlings in the shadows of towering trees need not be doomed once they link up with a fungal-tree network along which an abundance of nutrients are being exchanged.

Like the many seedlings that find themselves in the deep shade of tall trees, Indian pipes have also joined forces with mycorrhizal hyphae to tap the sugars of tree roots. Without

any chlorophyll of their own, these pale, ghostly plants have no pretensions about being capable either of photosynthesis or of forming their own sugars.

Although the importance and general occurrence of mycorrhizal relationships has only recently been appreciated, mycorrhizae have been around for at least 400 million years - an impressive record by anyone's standards. In Devonian fossils from the Rhynie chert of Scotland, fungi have been found in association with some of the earliest land plants. The development of mycorrhizal partnerships may even have been a critical step in the initial colonization of land by green plants. Whatever secrets remain in the fossil record, however, the enduring nature of the relationships between mycorrhizal fungi and green plants remains undisputed.

#### For a closer look at mycorrhizae

Mycorrhizal relationships are so common that the roots of almost any green plant that you examine will be living in a symbiotic relationship with fungi. Roots of many flowering plants, conifers, ferns, and even some mosses are known to intertwine with mycorrhizal fungi.

The presence of these fungi can be demonstrated with a simple staining procedure. The supplies required can

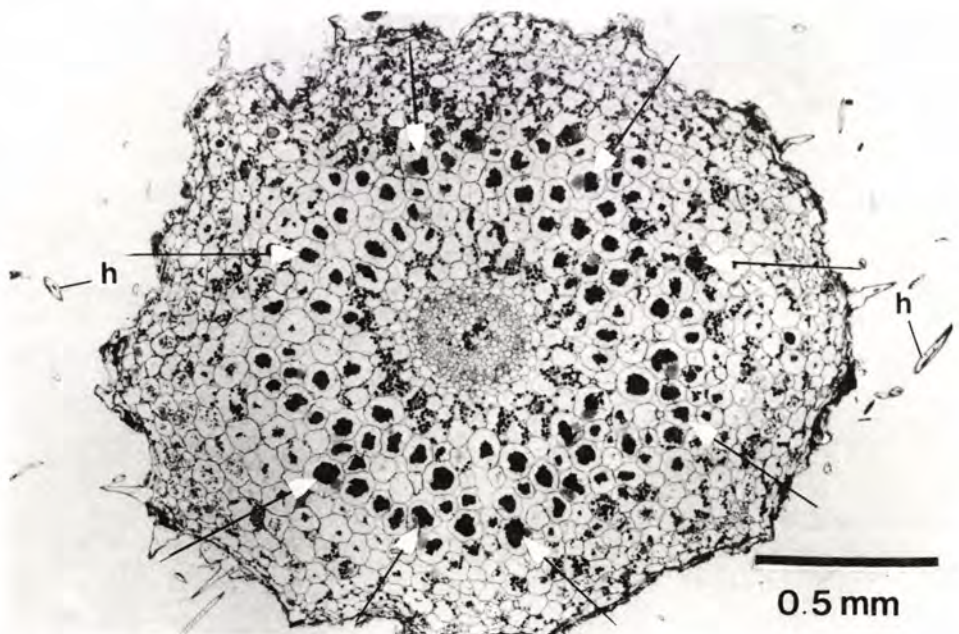
be readily obtained from a high school biology or chemistry laboratory.

Portions of large roots, or even the entire roots of small plants, should be washed free of soil and then placed in 10% KOH (potassium hydroxide) at 90° C for 30-60 minutes. This treatment will make the root tissue more transparent and easier to view on a microscope slide. The root tissue should then be rinsed in distilled water and transferred to the staining mixture whose ingredients are listed below.

Phenol crystals	20 g
Distilled water	20 ml
lactic acid	
(specific gravity 1.21)	20 g
Glycerol	40 g
Trypan blue	0.05 g

First dissolve phenol crystals in warm water and then add the other three ingredients. After mounting root tissues directly in this lactophenol mixture, fungi will stain blue and their association with the roots can be examined closely with a microscope.

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*Many cells observed in this cross section of an orchid root are occupied by arbuscules (arrowheads) formed by the highly branched tips of hyphae that initially entered the root through root hairs. Hyphae lying within root hairs of the orchid are indicated with h.*



# Fern Folklore

John Padalino

What's all this fuss about ferns? The fern fraternity is distinct in that it is not only one of the smaller (fewer in number - about 4,000 species in the world), but also among the older plant groups on earth. Legends about the ferns have been a long and lively curiosity. We now know with confidence that ferns have neither flowers nor true seeds, facts that exasperated early observers. Hence, not knowing much of the fructification of ferns contributed to fanciful legends loaded with myth and mystery.

For the nature study fanciers with out-of-doors, down to earth penchant there is excitement in seeking and finding ferns in fields, forests, and fens. This article focuses on some fact, fiction, and fables about ferns.

Thoreau wrote that "Nature made ferns from pure leaves, to show what she could do in that line." Dubbed nature's lace work, fern fronds are essentially complete in the bud. These graceful and delicate leaves are mainly the result of a process of uncoiling, unrolling, and expanding. Nature's pattern for fern and its bud is the spiral. This coil posture, circinate vernation, is the one attribute members of the fern group hold common. The whole plant-fronds, pinnae, pinnules-each of the remotest divisions is rolled toward the next largest, then in toward the rachis, and then beginning at the apex, rachis and stipe are rolled down to the crown.

Ferns bear no flowers yet "fern seed" is still as elusive and uncertain today as it was during ancient times. Fern fanciers ascribe mystical and magical powers to the ferns by replacing fact with fiction and science with superstition. Many absurd notions were put forth

regarding the fern's lack of flowers and seeds. As somewhat of an extension of the "Doctrine of Signatures," it was assumed that since the "seed" was invisible, it would enable its possessor to be invisible also. Fern seeds in your shoes could make you invisible as the seeds themselves. They could enable you to see into the past and the future, to find lost articles and hidden treasures. They could grant health and the great gift of eternal youth. Ben Johnson in his *New Inn* stated, "I had no medicine sir to go invisible. No fern seed in my pocket." During the Middle Ages popular tradition associated St. John the Baptist with numerous marvels of the plant world. It was believed that he was born at midnight and a host of magical things were said to have happened on the eve of his birth precisely at twelve o'clock. An anonymous medieval poet recorded the fable:

"But on St. John's mysterious night  
Sacred to many a wizard spell,  
The time when first to human sight  
Confest, the mystic fern seed fell."

Another legend was that the fern seeds could only be collected on St. John's Eve by a barefoot seeker in a religious frame of mind. The popularity and acceptance of the mystic power of fern seeds was featured by Shakespeare in the play *Henry IV* (Act II, Scene I) - Gadshill states:

"We steal as in a castle, cock-sure;  
We have the receipt of fern seed —  
we walk invisible."

The shepherd Chamberlain  
responded:

"Nay by my truth, I think you are  
more beholding to the night than to  
the fern seed for your walking  
invisible."

What did fern flowers look like and why did they "blossom" only on St. John's Eve? The mystery remains. However, their colors reported ranged from dark red to blue.

If you lived in the Ukraine and were able to gather the fern flowers you would be endowed with supreme wisdom and realize all your dreams. And in Poland it was believed that it thundered when the fern flowers were picked. Celtic and Germanic people considered ferns sacred and auspicious plants. Rites and ritual abounded throughout Europe regarding, "watching the fern," as the practice was called. Too much black art (mysticism) was in it to suit the Church, hence in France a Synod condemned all who should gather ferns or fern seeds on St. John's Eve.

One legend accounting for the fern's lack of flowers reveals that all ferns bore flowers until the Nativity. In honor of the event, the plants that were invited with straw in the manger blossomed. The ferns alone did not, therefore were condemned for ever afterward to be flowerless.

The "doctrine of signatures" as a theory was probably fathered by Paracelsus in the sixteenth century. According to Friend in 1884, nature had, in giving particular shapes to leaves and flowers, thereby plainly taught for what diseases they were especially useful. Thus a heart shaped leaf was for heart disease, a bright eyed flower for the eyes, and a foot shaped flower or leaf would certainly cure the gout, and so on. Ed Frankel noted that the medicinal merits ascribed to a particular fern was based on a mixture of "...fact, fiction, fantasy, and fable, to which were added liberal amounts of fraud, fakery, and falsehood." The state of medieval fern medicine and art,



characterized by mysticism, necromancy, demonology, mythology, alchemy, astrology, and wortceremony (the art of using magic herbs), were blended in varying amounts with botany, medicine, pharmacy, and scientific study in deciding the leading properties of ferns.

Among the better known ferns is bracken, a cosmopolitan weed of the world that grows in diverse habitats. It is a tough rugged plant with resilient rhizomes that enable it to outgrow its competitors. Bracken has inspired many of the more interesting fern fables. It earned a place in botanical pharmacy as a vermifuge, worm expeller. Culpepper wrote in his *Complete Herbal* (1653), "The roots being bruised and boiled in mead and honeyed water, and drunk, kills both the broad and long worms in the body, and abates the swelling of the spleen." Botanist Carl Linnaeus saw a "spread-eagle" in the the cross-sectional cut of the lower stem. He gave the fern its species name *aquilinum*, Latin for eagle. Additional reasons for calling bracken, "eagle fern" are the claw-like crosiers and broad fronds like eagle wings.

There are many superstitions about bracken. Again, in cross section higher up the stem one may see an arrangement of vascular bundles that looks like the letter C. This fern was good for protecting one

from goblins, witches, and werewolves, "because it bears the initial of Christ." Some thought they saw the mark of the devil's hoof where the fronds divided on the stem. There were also those who subscribed to the myth that one could find the initial of one's sweetheart in the cut of the stem. The cross section of the bundles in the stem was also thought to resemble an oak tree: King Charles in the oak, for the story is told how Charles II escaped enemies by hiding in an oak. Mary Isabella Tomkins summarizes the tale:

"Have ye to learn how the eagle fern  
Doth in its heart enshrine  
An oak tree that which the hunter  
Hearn  
Haunted in the days of "lang syne?"  
An oak tree small is repeated all  
Complete in branch and root,  
Like the tree whereunto King Charles  
did flee,  
When pressed in hot pursuit."

Additional ferns in fable and folklore include some of the following:

Spleenworts: for tired spleens;

Wall-Rue: a wort for all seasons and reasons, especially to combat baldness;

Maidenhair Fern: a curative for many maladies from A to Z;

Male and Female Ferns: symbolic

of sex;

Polybody: performer of many pharmaceutical feats;

Royal Fern: regal remedy for tooth decay in place of fluorides;

Adder's Tongue: virtuous remedy for snake bite;

Moonworts: alchemists prize for turning "quick" into real silver.

Source of many of the fern's fables is their lack of seeds and flowers. Folklore focused on the "invisible" fern seeds which afford their finder magical and supernatural power as well as to be invisible. Ferns in medicine rose and fell with the Doctrine of Signatures. Among the more famous ferns in folklore are the ubiquitous Bracken. Maidenhair Fern has failed to prevent baldness; Male and Female Ferns may have been more successful as vermifuges than as aphrodisiacs; Royal Fern doesn't prevent tooth decay nor is Adder's Tongue an antidote for snake bite; and those magical powers ascribed to Moonwort border on lunacy.

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## ***A Call to Keep Current***

Continued from page 3

readings which you think would be useful to those of us engaged in interpreting natural history and ecology to the general public. Concentrate on items which you think the general public will find interesting and relevant -- subjects they are likely to see on nature walks, such as insects, herptiles, birds, mammals, plants, natural communities and general ecology. Please send copies of the original pages in which

the news items appeared if possible, so I don't have to rely on secondhand information. I will report on these items in each issue of ANSS so all of us can remain abreast of the latest discoveries about our natural world. Finally, if you have any favorite publications of your own which you believe can do an outstanding job of presenting the newest information, please let us know. I hope I'm not biting off more than I can chew, but I

look forward to receiving your information, sharing it with other ANSS members in this journal, and using it in my interpretive programs.

*John Serrao is a naturalist, author and photographer. His address is L-3 Pocono Country Place, Tobyhanna, PA 18466.*



# Our Habitat: Dominion or Partnership?

Martha Munzer

What is our relationship to our habitat--the world in which we humans live? All cultures and civilizations from ancient times have tried to find an answer to this question.

Native Americans, original inhabitants of our land, tell this story, varying somewhat from tribe to tribe. In the beginning, the Great Spirit made this world, piling up mountains, tracing rivers, scooping out lakes, planting forests. And to dwell in the world of His making, He created fish, reptiles, insects, birds, beasts and people all of one flesh. Each and all are His children, the Indian concluded, and humans are only a bit higher than the animals because they have a greater measure of understanding and knowledge of the Great Spirit. Human beings, in other words, are but one of the parts of the totality of nature.

This philosophy found expression in a number of ways: for example, no one owned the wood of the forest or the waters of the rivers, or the soil of the land. Each particular territory was shared by all the people of the tribe. Gold and silver were only elements of art. Money and money prestige were nonexistent; the only material value was land and everybody shared that.

The Indians' attitude toward inanimate parts of the world is illustrated by their behavior. When breaking up camp, for example, after days in the wilderness, they diligently cleaned up their leavings by burning or burying them. They refused to sully the land or to destroy its beauty. Highly developed land conservation was a religious obligation.

An Indian of today, Frank Tenorio, former governor of the San Felipe Pueblo, said this in a speech delivered in the spring of 1986 at a Southwestern Water Conference:

"Pueblos do not look at water as an isolated or unconnected thing.

Water is an essential part of our body. The land is our flesh, the culture is our soul, and water is the blood that sustains our life. For the body of our peoplehood to survive, we must have all of these...For Pueblo People, water is not a secular thing, or a secular thing with religious dimensions; it is a spiritual thing... How do Pueblo People view water? The answer is simple. The water is alive."

When Europeans landed on our shores, they brought a completely different religious philosophy from the natives--the Judeo--Christian faith.

"In the beginning..." his Bible declared, in the words of the King James version, "God created the heaven and the earth." After which He brought forth light, the firmament, the dry land and the seas, the produce of the earth, the sun, moon and stars, the fish and fowl, the cattle and creeping things and all other beasts. And last of all man, "in His image and likeness: and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth."

This outlook inspired the settlers to clear the land, to move on when it had been exploited and exhausted, to wrest new lands from the Indians, to open up the entire continent for growth and development; all this without thought for the eventual outcome of their energy, daring, conquest, and God-given behest to "subdue" the earth.

Yet throughout our history there were words of warning from those who realized that something had gone amiss; lone cries from which only a few have been selected for quoting.

Thomas Jefferson, our third President, said, "The indifferent state of agriculture among us does not

proceed from want of knowledge merely, it is from our having such quantities of land to waste as we please."

James Fenimore Cooper, whose material for his Leatherstocking Tales was drawn from his contact with the Indians of upper New York State wrote, "The air, the water and the ground are free gifts to man, and no one has the power to portion them out in parcels. Man must drink and breathe and walk, and therefore each man has a right to his share of each."

The Vermont farmer, politician, and scholar, George Perkins Marsh, wrote these words well over a century ago, in his book Man and Nature or Physical Geography as Modified by Human Action. "...soon your fertile valleys might be converted from smiling meadows into broad wastes of shingle and gravel and pebbles, deserts in summer and seas in autumn and spring... Man is everywhere a disturbing agent. Wherever he plants his foot, the harmonies of nature are turned to discord."

Henry David Thoreau's contribution to our awakening is perhaps best known. In Walden he wrote: "Flint's Pond! Such is the poverty of our nonmenclature. What right had the unclean and stupid farmer, whose farm abutted on this skywater, whose shores he had ruthlessly laid bare, to give his name to it?... I respect not his labors, his farm where everything has its price... On whose farm nothing grows free... Who loves not the beauty of his fruits, whose fruits are not ripe for him till they are turned into dollars. Give me the poverty that enjoys true wealth."

Perhaps the first of our countrymen to explain clearly the idea of the interrelations to be found in the natural world, was Gifford Pinchot, a forester by profession, and twice governor of Pennsylvania in the early



part of this century. He describes in Breaking New Ground his sudden insight into the interconnections of nature's resources, while riding through a park in the nation's capitol.

"Here were not isolated and separate problems. My work had brought me into touch with all of them. But what was the basic link between them?"

"Suddenly the idea flashed through my head that there was unity in this complication--that the relation of one resource to another was not the end of the story. Here were no longer a lot of different, independent, and often antagonistic questions, each on its own separate island, as we had been in the habit of thinking. In place of them, here was one single question with many parts. Seen in this new light, all these separate questions fitted into and made up the one great central problem of the use of the earth for the good of man."

This flash of insight ushered in a new concept of resource use--conservation. The movement itself was officially born at a White House Conference called by President Theodore Roosevelt on May 13, 1908. A commission was at once appointed to make an inventory of the nation's resources, its waters, soil, forests, and minerals.

Once the inventory was completed the President said of it, "As it stands, it is an irrefutable proof that the conservation of our resources is the fundamental question before this Nation, and that our first and greatest task is to set our house in order and begin to live within our means."

Such ideas were by no means popular. There were many individual owners of property to whom the concepts of Teddy Roosevelt and his conservationist "fanatics" were not only "legally absurd but socially immoral." Yet to these "fanatics" do we owe our national parks, forests, wildlife sanctuaries, wilderness areas--each a protected part of our national heritage.

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During the time that this change in our thinking and acting was under way, biological scientists were busy developing the principles of ecology, the discipline that deals with the interrelationship of living things and their environment.

In 1952, as a scientist trained in physics and chemistry but illiterate in the field of the natural sciences, I first heard the term. Puzzled, I asked, "Ecology--what's that?" Today, let us hope that every school child can answer the question. We have, in truth, come a long way, which doesn't imply that we've by any means arrived.

The "long way" has included the formation of all kinds of conservation and environmental organizations such as back-up groups for various defense funds, other action organizations, each oriented to the preservation of some portion of our planet.

And the "long way" also includes the federal government's Environmental Protection Agency, known as EPA; completely powerless, however, unless it is provided with the funds necessary to do its job.

Environmental protection is of course not solely the concern of our own country, but is rather an international obligation. The United Nations some time ago, through several of its agencies, defined conservation as "the rational use of the earth's resources to achieve the highest quality of living for mankind." To foster conservation throughout the world--for every country on earth must be involved--is by no means a simple or a speedy task. Conflicts of interest are ever present and are extremely difficult to resolve. National defense, economic development, the opening of entirely new fields of endeavor, the creation of additional job opportunities, are all parts of today's and tomorrow's urgent concerns

To illustrate with a single example: in 1964, authorized by the U.S. congress, construction on the Cross Florida Barge Canal was started. The

canal was to bisect the northern Florida peninsula from the Atlantic Ocean to the Gulf of Mexico. Its purpose was to provide a short-cut for commercial barge traffic as well as to open up new opportunities for recreational boaters.

In 1971, when less than half complete, work on the project was halted. By that time it had become abundantly clear that the canal would cause severe environmental harm, especially to Florida's already precarious fresh water supply. Due largely to the political clout of several of the state's congressmen, the abandoned barge canal nevertheless clung to life. Finally, however, in the very last days of the 99th Congress, in October, 1986, the project was deauthorized. Thus the Barge Canal is dead at long last!

There is to be a happy ending to this tale of clashing interests--economic, environmental, and political. The land earmarked for the misguided project is to remain in the hands of the Federal Government, managed by the State of Florida, and designated as an inviolate national refuge.

Will we continue to find the means of resolving the conflict between economic growth and ecological principles mixed as they are with political concerns? Are we going to be willing to pay the extra monies involved for values that are hard to assess in terms of "cost effectiveness?" What monetary price can be assigned, let us say, to the beauty of a piece of preserved landscape, to a glimpse of open sky?

The native Americans, before we had arrived and conquered their land, did not face the dilemmas with which we are now forced to deal. They had land a-plenty. They were ecologically oriented by instinct and by faith.

Somehow, through the leadership of our own visionaries, only a few of whom have been here identified, we've begun to rethink what it means to have "dominion." We are slowly



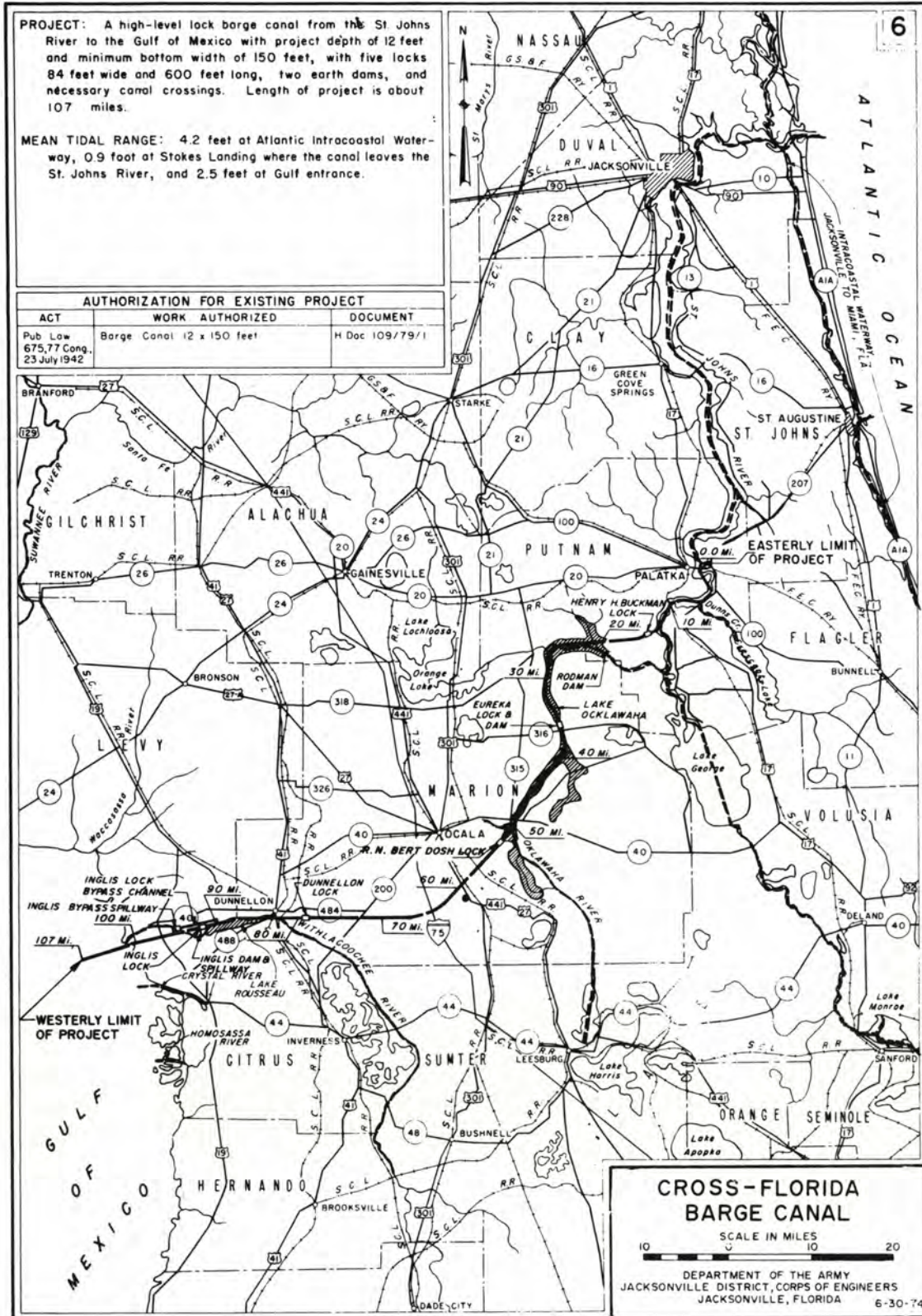
coming to recognize a fact that the Indians always knew--namely that we humans are but one part of a seamless web, whose destruction cannot but mean humanity's eventual destruction, too.

But, assuming that we avoid the

far more imminent threat of nuclear annihilation, and furthermore, that we are determined to act, to the best of our ability, to honor the seamless web, it is quite possible that we would be preserving not only ourselves and our fellow creatures

but the very future of a living planet.

**The author Martha E. Munzer lives at 4411 Tradewinds Avenue, East Lauderdale by the Sea, FL 33308.**





# Earth Day 1970: Some Lessons Yet Unlearned

Michael J. Cohen, author and photographer

Earth Day, April 22, 1970 found me visiting Dixie State College in St. George, Utah some thirty miles south of Zion National Park. Devoid of graffiti, the College looked like the 60's never happened; students and faculty sported the outlooks of the fifties or perhaps were decades ahead of the world, couched in Reagan era styles and thoughts.

On that first of all Earth Days, the rallying Dixie College faculty and students cheered an authority who claimed that "The energy used by all the hair dryers in the United States equals the total energy output of the Nuclear Power industry. If we stop using hair blowers we can stop Nukes and their radioactive pollution". Another leader offered facts and figures showing monumental environmental and social gains if the public merely ceased eating meat. Again applause shook the auditorium.

I was neither student nor faculty at Dixie College. My presence there was a geographic circumstance. St. George was where my traveling environmental school - "Our classroom is Wild America" - had come to use a library and do laundry. The laundry was urgent after our three day backpack above Zion's Great West Canyon and a muddy, freezing trudge through the awesome Narrows of the snow melt Virgin River.

The Dixie College Earth-rally participants soon discovered my school's presence there and our year long commitment to environmentally and socially responsible hands-on education. We received a round of applause, being hailed as pioneers in what Education should be.

And today? Today our society more intensely than ever thrives on hair blowers, meat and traditional classrooms, accompanied by soaring pollution, violence, acid rain, crime, toxic waste, armament, teenage suicide, habitat loss, water shortages, child abuse, rain forest depletion, radioactive waste, rape, species extinction, ad nauseum. We are environmentally aware but behaviorally destructive. Our culture's bias makes our awareness miss the point.

The point is that our problems are unique to modern civilization. They don't exist in nature or in nature-bonded peoples.

Sometime, somewhere in the ancient past, modern society disconnected from the wisdoms of the natural world. We replaced our reverence for nature's ways with our society's laws. Today, that replacement separates modern people from nature's balancing energies, energies which prevent any single species from running amuck.

Detached from nature's harmon-



*Nature connecting activities catalyze with earth*

ics, modern society strays uncontrollably. It is as if we invented a car without brakes. Our global and

personal problems result from the difference between the way Nature works and the way modern thinking programs each new generation.

Since 1970, while constantly living outdoors throughout the seasons, I have slowly come to realize that I was brought up insensitive to the natural world. My early upbringing civilized me and modern civilization is at war with nature.

Living in nature, I find that bonding with the natural world, not band-aid technology, creates civilized, environmentally sound stability. For example, without bonding many of us who formerly elected to drive energy-efficient, minimally polluting cars, today once again drive excessive gas guzzlers.

Lower oil prices have nullified our desire for solar energy.

Each of us remains a guinea pig for thousands of untested chemicals which disrupt nature's balanced ways.

The energy we conserve today we fritter away on some new technology tomorrow.

The environmental battles we win we must fight over and over again.

Chemicals become dependencies for artificially inducing nature's peace into our lives.

The natural bonds holding individuals, families and species together have broken asunder.

Our warped prejudice against nature applauds our conquest and management of the natural world. We're trashing Alaska now as we trashed the wilderness a century ago.

Overwhelmingly, studies show that



most people feel horrible about our destructive impact on nature and each other. But the state of the earth shows that without bonding to the natural world *environmentally, people are unable to act off how they feel.* Unlike our permanent bonding to our money, religion and name, without bonding to nature, sound long-term social and environmental relationships escape us.



*"One touch of nature makes the whole world kin"*

Bonding to nature inhibits excessive exploitation of the natural world and people. It is a vital ingredient for responsible living.

There are new, potent activities which catalyze bonding. They consist of sensitizing ethics, role plays, writings, exposures, transferences, projections, exercises, analyses, poems, imageries, games, postures, personifications, reinforcements, meditations, songs, readings and thoughts. In natural setting these come to light since that first Earth Day:

1. Giving people information by itself does not change behavior. Most people who actively care for nature gain that sensitivity from direct contact with the natural world, not from isolated classrooms or teachings.

2. In order to be part of the global life system, or any system, any entity - including a person - must be in communication with the system, otherwise that entity destructively may go its separate way from or through the system.

3. Planet Earth acts like a living organism. In concert the global life community organizes, perpetuates and regenerates itself by generating at least 53 tension and relaxation relationships. People and other sentient beings experience Earth's tensions as hunger, self, thirst, color,

moods, sound, trust, touch, suffocation, place nurturing, excretion, reason, community, etc.

4. Sensations and feelings are facts; there is a large body of feeling behind our every thought and action. Neither scientists, religious figures nor politicians invented sensation and feeling. Nature did. They are nature. Without feelings we'd each be lifeless machines or formulas.

5. Nature is Earth's intelligence in action. It is a shared global survival wisdom which with training, modern people can sense as a felt logic.

6. Nature is illiterate. Natural survival tensions and senses, not language, delicately balance Earth's life communities locally and globally,



*We must communicate with system in order to be part of it*

sub-atomically and climatically. Unlike indigenous peoples, modern people learn to subdue, not culture their inborn senses. But our senses are nature, a seamless living continuum of which we are part.

7. In order for humans to be integral members of the global life community, each natural sense connects nature within us to the natural world surrounding us. For example, thirst and excretion feelings enable us to share Earth's waters in mutually beneficial ways. Similarly, hunger and excretion feelings connect us to minerals and energy; suffocation sensations connect us to the atmosphere, as we breath air, the global life community breathes us. Each of our 53 or more senses contribute to maintaining personal and global balance.

8. Average Americans spend most of their lives using only four senses: rationality, language symbols, sight and sound. By ignoring our many other senses we disrupt nature's balance within and without.

We spend more than 95% of our lives indoors, excessively separated from nature. Home, school and work imprint us to our abstract artificial world, not to nature's ways.

Our excessive indoor quantifying, qualifying, and symbolizing imbues our thinking. It isolates us from nature's global communion. It prevents us from thinking with our heart as do environmentally sound peoples

9. Our removal from the natural world's sentient guidance produces our greed, runaway technologies and violence. Normally as children, mainstream rips us from our inborn balancing bonds with nature. Our craving to reduce the angry, fearful hurt from this separation overwhelms our rationality and we excessively bond to tranquilizing but often





*To connect with nature, create moments that let earth teach*

destructive security substances like chemicals, money, cigarettes, power, and euphoric technologies.

10. "One touch of nature makes the whole world kin." To attain environmental and social balance, modern people must reconnect with nature's ways.

Earth-connected people seldom cause modern stress, pollution and violence. For this reason, World Peace University, a Center of the University for Peace, United Nations, commissioned me to write from my outdoor experiences a **Field Guide to Connecting With Nature**. The Guide is an Earth-bounding technology. It offers 110 time-tested activities which let nature within and without restore its balance. It empowers people to scientifically and spiritually know nature as nature knows itself.

**The World Peace University Guide to Connecting With Nature** validates, reinforces, and builds trust in natural senses and ways. It enables any caring person to repair the destructive relationships we have neglected since that first Earth Day.

*Michael J. Cohen, Ed.D. is a World Peace University Professor of Integrated Ecology and Founder and Director Emeritus of the National Audubon Society's graduate and undergraduate college, the Expedition Institute. He is the author of HOW NATURE WORKS: Regenerating Kinship with Planet Earth his new book, The World Peace University Field Guide to CONNECTING WITH NATURE: Creating Moments That Let Earth Teach (\$10.95 including postage) is available from the University at P.O. Box 10869, Eugene, Oregon, 97440.*

## Rapping to the Environment

Joyce Kutaka Kennedy

Singing environmentally aware songs has been a popular teaching tool for many years. Today's children are exposed to a new medium which combines the rhyme and meter of poetry with the musical rhythms of "rap", the grandchild of what used to be called "Soul Music" in the sixties. A rap can be likened to a chanted poem or a rhyming stream of consciousness accompanied by non-instrumental musical sound affects created by the performer(s). Sound affects might include rhythmic clapping, vocalizing or movements which accentuate the rap. Like poetry, the subject or themes of rap can cover anything.

Very popular in current pop culture, rap seem to have more performance appeal to kids than traditional singing does. Teaching with rap is especially useful to teachers who do not particularly enjoy singing. Because anyone can do it and have no concern about carrying a tune or singing off key, students who moan and groan about singing often willingly volunteer to use the same lyrics performed in a rap format. In addition to the fun of rapping are benefits such as learning

reinforcement and demonstration of conceptual mastery.

Although any song or poem will do, it's most fun to write one's own rap as a culminating celebration (and reinforcement) of a unit of study. Paying careful attention to the musical meter of the piece, design a catchy refrain. Search for meaningful rhyming statements about whatever is being focused on. A punchline ending adds to the final polish of a rap. While creating the rap, share, edit and revise many times. Once rehearsed with students, revise it again to fit the students' needs and the rap's total sound.

Once the rap is set in its final form, students begin rehearsing to master their lines. Have students learn portions of an entire rap by using the "jigsaw" technique from cooperative education. Dividing the class into a specified number of groups correlated with the number of verses in the rap, assign certain verses to each group. If the rap has a refrain, assign non-English-speaking students to deliver those lines. Everyone has a significant role to play in the performance, and each person's input affects the teams



*Photo by Robert Gurbo*



performance.

Students are challenged to not only memorize their lines but to also physically express the meaning of their verse through some type of movement or pantomime. In essence, they develop dances to accompany their rap lines. When all of the groups join together, the class gets to enjoy their own and their classmates' creative performance of the rap. To add a further dimension of excitement and relevance, make sure the students perform before a real audience of another teacher's classroom or the school community. With the upped ante students reach for excellence in themselves and encourage and support each other.

The following raps have been successfully used with the author's class. Try them with yours..

### HABITAT IS WHERE IT'S AT!

REFRAIN

Habitat is where it's at!  
Habitat is where it's at!

Now listen my friends and you will see  
Just how important you can be.  
Come with us and you will learn  
That habitats die when we build and  
burn.

(REFRAIN)

If you wonder where your're at  
The answer is easy, it's a habitat.  
A habitat is a place to live  
Food and water and shelter it gives.  
(REFRAIN)

A forest is a home for many to be  
Well don't you know it's a lot more than  
trees!

So many things in a forest we need  
Like wood and paper and nuts and seeds.  
(REFRAIN)

A desert is a place that's hot and dry

If you don't bring your water, you could  
die.

Lizards and snakes at night move around  
Eating what food that can be found.  
(REFRAIN)

A pond's all wet and animals swim  
Above and below the water that's dim.  
Getting small fishes that they can eat  
Or munching on water plants that's their  
treat.



Photo Courtesy of NPS

(REFRAIN)

In the vast ocean are animals' homes  
All kinds of wildlife there do roam.  
Big fishes swim in the deep blue sea  
Providing good food for you and me.  
(REFRAIN)

The seashore's a place called the  
intertidal zone  
It's a good place to visit when you want  
to be alone. Listen to the waves come  
crashing down  
Watch hermit crabs go scurrying around.  
(REFRAIN)

We need habitats for us to live  
Food and water and shelter it gives.  
It also provides us with space to grow  
And animals need it badly you know.  
(REFRAIN)

So next time you're in a habitat  
Look for animals who know where it's at!  
Leave them alone and let them be  
So they can continue to live wild and  
free.  
(REFRAIN)

So take care of Earth, she's our friend  
Remember if you don't, it'll be the end.  
The end for you, the end for me  
The end of us all for eternity.

Habitat is where it's at!  
Habitat is where it's at!  
Habitat is where it's at!  
Habitat!

- 0 -

**ZAP!!!**

Energy is what makes us  
run.  
Energy first comes from the  
sun.

Energy can come from the  
ground.  
That's where fossil fuels  
can be found.

Fossil fuels are coal, oil  
and natural gas.  
If we waste them, they  
won't last!

Energy can come from the  
air.  
We use wind to blow us  
here and there.

Windmills turn around and  
around  
making energy for your  
town.

Electricity comes from running water.  
It can make us cooler or hotter.

Electricity is a kind of energy  
That we have to make. It's not free!

Energy, if we use our brain,  
Should last so our lives can stay the  
same.

So when you're at home, remember to  
conserve.  
We'll have the energy that we deserve.

ZAP!!

**QUAKE, ROCK 'N ROLL**

When the earth starts shaking all around,  
You know that a quake is hitting the  
ground.

You know what you've got to do to stay  
alive,  
Find somewhere safe and under it dive.

(REFRAIN)



It's going to quake, rock and roll  
 It's going to quake, rock and roll  
 It's going to quake, rock and roll  
 So listen up, children, to what you're  
 being told.

When a quake comes, don't be scared.  
 Keep all your marbles way up there.  
 Keep your head cool, and you'll be  
 alright.

Know where to meet your family at night.  
 (REFRAIN)

If you're outside, move to where it's clear.  
 Anything that can fall, don't be near.  
 If you're in a car, pull over and sit tight.  
 Stay away from overpasses with all your

might.  
 (REFRAIN)

If you're in a building, check it out.  
 Where's the best place for you to hide  
 out?

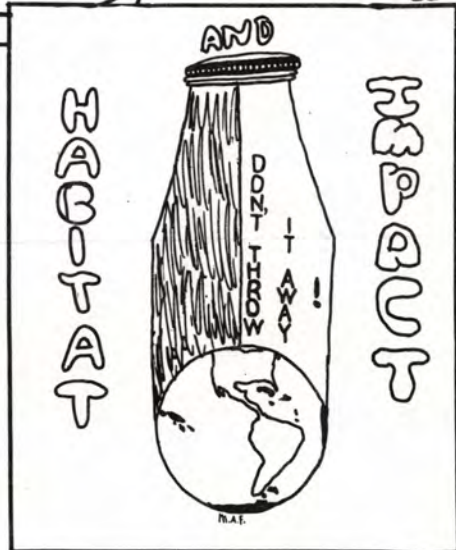
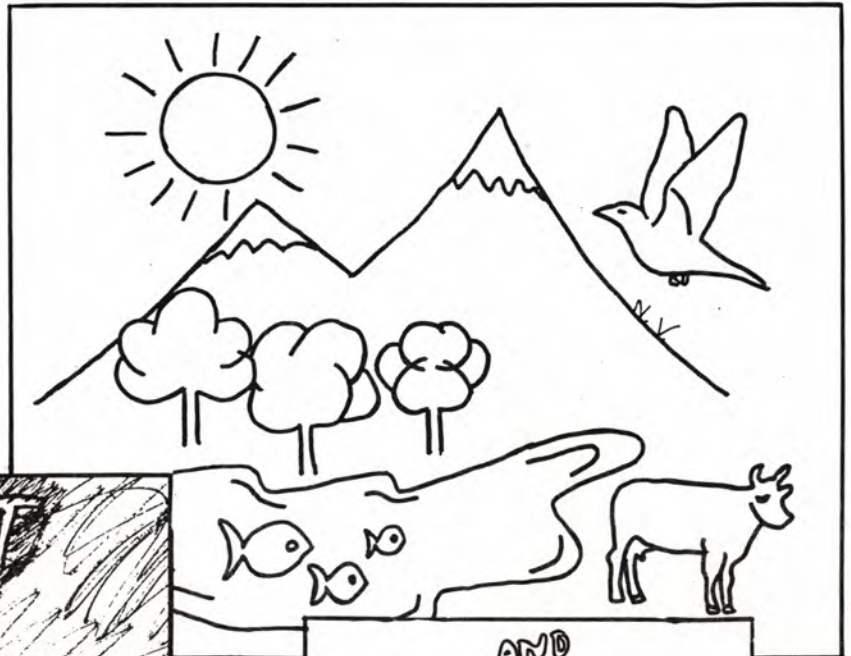
Is there a desk or a table for you?  
 Don't forget a doorway also will do.  
 (REFRAIN)

THINK yourself safe, and you'll come  
 through.  
 You don't have to live with earthquake  
 blues.  
 Keep your head together, and you'll see  
 Earthquakes aren't that bad for you and  
 me.

It's going to quake, rock and roll.  
 (Remember.)  
 It's going to quake, rock and roll.  
 (Remember.)  
 It's going to quake, rock and roll.  
 (Remember.)  
 So REMEMBER, children, what you've  
 been told.  
 YEAH!!!

**Joyce Kutaka Kennedy teaches  
 at Highlands Elementary  
 School in San Mateo,  
 California. The illustrations  
 are student - produced logos**

**A Few Illustrations - Student Produced Logos**





# "A good way of summarizing & reporting experience"

## GATEWAY NATIONAL PARK RAP

### "A BEAUTIFUL CHANGE"

by Mischa Edwards & Yolanda

"It was fun  
On day one  
Playing in the sun  
Taking strolls right along the beach  
Observing things to be seen in weeks  
We attempt  
To do the very best  
But we yet  
Have yet to be seen  
A brand new scene  
Not that junk on your T.V. screen  
It's something all new and pure  
To be adored  
And to be recognized  
As the dopiest sight,  
Now am I right  
Or am I wrong?  
As I continue with the two hype song

Now the G stands for good  
As I could  
and would  
and should  
and that I am  
Redefining the principles of man  
That have yet to be learned  
and earned  
And fought long and hard - you see  
(light voice) So don't try to pollute me

Word!  
Cause we all have learned and learned  
and learned  
Not to turn  
Away from our duties & obligations  
We owe it all  
To the big big backyard  
Know to all  
As a gift of God

(Serious nerdy voice)  
Nature is a very good thing and  
can't be explained  
That's not true  
So please allow me to continue

On day two,  
All was new,  
As we once again saw the deep deep  
blue sea  
rippling against the shore  
It was pictures galore I'll tell you y'all!  
As we slipped, slided  
and yearned  
For the perfect look  
to be took  
But hey what's a story  
without an end  
My friends  
But to end,  
I'll stop by saying  
We'll be back  
Time and time and time again.  
But P.S. Please don't forget  
And please just try to remember  
That what is seen in July  
May not be seen in December

Things of nature will always change  
And range  
On different levels of the  
Most profoundest wonders

That we seem to react more and more  
fonder  
Of its art  
This can't be bought  
But can be fought for  
If we all are  
of the fact that  
things do change  
A Beautiful Change  
Change  
Change  
Change  
Change  
Change ....

\*\*\*\*

Gateway National Park was much,  
much fun,  
We didn't want to leave when the day  
was done,  
We felt the weather, saw beach heather,  
the first time was  
better, not wetter, we brought our  
umbrellas,  
we wore sweaters,  
Now let's talk about the goodness  
about our trip,  
We visited the beach on the rocks you  
can slip,  
We felt the sand, on the grass we ran,  
we had to watch our  
hands, cause somethings we couldn't  
take, so don't make that  
mistake, because it took nature a long  
time to make, the birds and the trees,  
the waves from  
the seas, from the flowers the seeds, so  
could we please,  
take care of the land, give the rangers a  
hand,  
throw away your cans not on the  
ground, where we walk around,  
cause there's bound to be, dead  
animals you see, no honesty for  
the bees, no crabs from the seas, we  
better get down on our  
hands and knees, so the land can be  
free, and so that we can  
give the park more maturity, now let  
me explain, not hard but  
plain, but about our humane society,  
now we explored the  
earth, the sea, and the sky, where the  
sun must shine and the  
birds must fly, and then it was time to  
say goodbye, bye, bye

by Yolanda



## What's So Great About Enos Mills' Way of Nature Study?

Enda Mills Kiley

The Enos Mills Story begins in 1884, when at the age of 14 he left the family farm near Prescott, Kansas, with his parents' blessings, and took the train from Kansas City to Denver, an eager and alert young man ready for adventure. With his belongings he carried a math book and a grammar book and surprisingly a journal. This journal and others would be filled with observations, questions and comments-actual experiences-for at least the next twenty years.

After several months, working on a ranch north of Denver, he rode a horse from the plains up through the canyon and on, turning south at the Estes Park region up to the 9,000 ft. Longs Peak Valley at the foot of Longs Peak, the highest mountain in what is now Rocky Mountain National Park. This area would be home for the rest of his life and it was here he started building the log cabin where he would live 20 years or so - the "dearest spot on earth", Enos said. This cabin - the Enos Mills Cabin - is now open to the public.

Enos soon became a different kind of a pioneer, early deciding not to hunt, trap or



*Enos Mills*



*Enos Mills on a Beaver Walk with Librarians*





*Enos Mills and his dog Scotch*



*Mills home town,  
Longs Peak,  
Colo.*



*Elizabeth "Bess" Burnell*

lumber (after the cabin was built), instead watching and enjoying the wildlife; especially the beaver and grizzly bear. He was a "bump on a log" observer - non-threatening - and he said, "Many times I was outwitted but never was I attacked by any wild animal."

Since Enos didn't live off the land he supported himself by mining a little in Colorado, at the Anaconda Copper Mine in Butte, Montana, where he worked himself up, through the years, from tool boy to foreman of the night shift. Butte had one of the best libraries in the West (supported by the Anaconda) and Enos would say, "To step from a mine into a library was to step from darkness to light, from madness to reason." It was a great place for him.

By working in Butte just a few months there was time each year for a stay at his cabin and for travel. He said that "he had camped alone in every state", and in addition he was in Alaska, Scotland and several other countries, still keeping journals of his adventures. These journals would be the heart of many magazine articles, 15 books and nationwide "Trail Talks" - all true accounts, all told with a flair: experiences which came alive.

Often, when he traveled to a new place, he would seek out an expert on the particular features of the area - a geologist, an archaeologist, or a frontier guide. Some of the frontier guides were disappointing in their lack of interest in natural history, although at least one he had was excellent.

It was these experiences that started Enos thinking of qualities which a good guide should have and it was from this his nature guiding was created and evolved. It was perfected through the early years, an innovative way, a new way of guiding.

#### Enos Mills Nature Guiding guidelines

- Based on sound learning principles
- Emphasized facts
- To stimulate interest; arouse curiosity
- Flexible - respond minute by minute
- Everyone is an explorer, a discoverer
- Understandable language
- Featured nature - not nature guide
- First hand experience

Enos Mills said nature was "more inspirational than informational".

From Adventures of a Nature Guide (Enos Mills - 1920) he would say, "In the course of a trip the nature guide must play many parts: athletic instructor, pack animal, photographer, counselor, physician and clown! He must explain miles of geography, talk botany, quote poetry and above all, give intelligent answers to unintelligent questions, subtly controlling the group's safety so that all may have a most thoroughly enjoyable trip - a memorable one. The better the nature guide knows human nature the more successful he will be."

All this in a low key and a down to earth way. Several times he mentioned that a nature guide is not a teacher, but is there to spark observation, slowly looking and looking again. To quote Enos, "The biography of a single tree, plant, bird or animal is more interesting and useful than a list of 20 names." The aliveness, personality, characteristics, life style, differences were the focus, not identification. Using senses - feeling a leaf, smelling a tree's bark, listening for bird sounds, seeing shapes and textures of flower petals. What a surprise the many kinds and varieties are. Ten kinds of yellow flowers but each with different looks and life styles.

Perhaps questioning was one of Enos' most useful techniques - how does the beaver protect himself when he is out on land?

(With his nose - his keen sense of smell warns of danger.) His nature guiding was unstructured, with a natural and spontaneous flow of ideas. Here's another quote from Adventures of a Nature Guide: "During my years as a nature guide I added a touch of romance, poetry and adventure to the wonderful stories which nature, through the ages, had given to every flower and tree, bird and animal, seed and soil."

Nature guiding was in a way a "how to" motivate, continuing self discovery of nature, as well as fostering an understanding of the great need for preservation of natural life.

To reach more people with these ideas, he bought a ranch just across the valley from his cabin and was to begin his Longs Peak Inn where scenery and nature were the features, and where nature guided trips were the main activity. This was in about 1901. However, as Longs Peak Inn grew he saw the need for more nature guides and began to train others in his methods (which gave him a unique position with all other naturalists). These concepts are important in the training of interpreters today.

In a few years the inn had a huge room of nature exhibits, a library and an extensive program for children and young people. It was called the "Trail School" but school it was not. Everyone was an explorer and a trail was "an avenue of adventure".

Nature guides were not teachers but subtle leaders. It is probable that these programs were the foundation of school outdoor activities today.

But of all that Enos Mills did, encouraging women to be nature guides was the most amazing and farsighted. "It doesn't take muscle to be a nature guide!" He found women followed his format with expertise and enthusiasm and quickly they became "hits" at Longs Peak Inn. One of the most remarkable women nature guides was Elizabeth "Bess" Burnell (later Smith) - a college physics professor who came with her sister Esther to stay at Longs Peak Inn in 1916. (They had heard a program in Cleveland by Enos.) Before 1918, Elizabeth and Esther were licensed nature guides in Rocky Mountain National Park. Esther's nature guiding career was cut short after she and Enos were married in 1918 and a daughter Enda was born in 1919. Here is an



excerpt from an article Elizabeth wrote: "The incentive supplied and the momentum given by Enos Mills to all who came in contact with him will never be measured. He had an unbounded belief in the healing power of nature and the outdoors. His patience was inexhaustible, his sense of humor was boundless and his enthusiasm never quit." He credited nature with recharging him. It was the source of his dynamic drive, his enthusiasm and energy. When he said, "The outdoors bursts with entertainment, refreshment, challenge and surprise", it covered a whole range of benefits.

So this in part answers "What's So Great About Enos Mills' Way of Nature Study?" and how he popularized it. Enthusiasm was the magic thread running through his writing, his speaking, his Inn and his nature guiding. He was a bridge between people and the outdoors. And then his nationwide conservation stemmed from his concern about the destruction of forests, wilderness, wildlife and the environment. The fight for Rocky Mountain National Park took six years and many trips to Washington, D.C., and around the country. Everywhere he spoke he urged the saving of special places to make parks. Unfortunately, Enos died in 1922 at the age of 52 from blood poisoning from an infected tooth but he left Esther and Bess - two knowledgeable and dedicated ladies - to continue his works. Esther ran Longs Peak Inn, kept his books and photographs in print and Bess did the nature guiding and nature activities at the Inn and was to take his ideas to California schools. Esther and Bess have a great story of their own.

All of the historical materials - i.e., clippings, articles, manuscripts, and data - were saved and protected. They are available for our use today. We opened the Enos Mills Cabin to the public in 1966. It is filled with displays that tell his story; also his writings and photographs. We have protected the Enos Mills Nature Preserve and have Enos Mills nature discovery walks and are continuing with his conservation philosophy and are teaching why it's important today. In addition, there are many schools which participate in our programs. And as time goes by, more and more of his 15 books will be back in print. Enos Mills keeps us busy eight days a week.

### Books by Enos A. Mills

Wild Life on the Rockies  
The Spell of the Rockies  
In Beaver World  
The Story of the Thousand Year Pine  
The Rocky Mountain Wonderland  
The Story of Scotch  
Your National Parks  
The Grizzly, Our Greatest Wild Animal  
The Adventures of a Nature Guide  
Waiting in the Wilderness  
Watched by Wild Animals  
Wild Animal Homesteads  
The Rocky Mountain National Park  
Romance of Geology  
Bird Memories of the Rockies  
Enos Mills of the Rockies by Esther B. Mills  
Paperback reprints:  
Early Estes Park  
The Grizzly, Our Greatest Wild Animal  
Wild Life in the Rockies  
The Thousand Year Pine

**Enda Mills Kiley is Enos and Esther Burnell Mills daughter. She was named for Enos' friend, Edna Ferber, but the letters were interchanged on her birth certificate.**



*Part of the Nature Room*



# Putting America Behind You on Cape Cod

Richard F. Fleck

It was my first visit to the Cape off season. After hoofing along the sands for an hour or so, I happened to look back at my receding tracks; amazingly, they were as natural as those of the shore birds as they appeared marvelously wobbly. Beyond Nauset Light blinking white and red in the misty air, I sat on a piece of driftwood for a moment or two as waves thundered in, hissing with foam, sometimes violet green in color, and pungent with brine scenting the entire beach.

Each incoming wave possessed a distinct characteristic: some crested high like cobras; others rolled in sluggishly to be absorbed by larger waves which in turn were double or triple decked; still others flopped with a hollow sound and turned brown with churning sand. All waves had one thing in common. As my young daughter Michelle once said of them -- they are "movelish." Their incessant movement and roar would challenge any practicing orator, Demosthenes, Daniel Webster, or New England Sachem Passaconaway included. But more than that, this giant, moving sea puts humans on terms with their planet, for here we are all immediately made aware of cosmic power. As each wave thunders shoreward, it is as though a million years are erased in foam.

I arose from my driftwood and proceeded along the beach for several miles until I reached the high dunes laced with scarlet oaks. Toward the bayside of the Cape, I felt like one of those pilgrims in 1620 searching for fresh water or like Henry David Thoreau two hundred and thirty years later in search of the primal essence of the sea. Piping plovers skirted back and forth over mudflats as gulls circled like hawks above the groves of pine and oak. Strands of mist hazed the air just enough to create the feeling of French Impressionism only on a far

vaster canvas. This juxtaposition of two worlds in such proximity--stable vegetated dunes, calm bayshore flats so close to a roaring, thundering sea front--constitutes one of the reasons why, I believe, Thoreau wrote that here one can put all of America behind him. The Cape is a paradoxical world of its own quite apart from a settled and industrialized East Coast.

Here one must, as Thoreau did (as well as Henry Beston during his year at his outermost house), confront the essential facts of life and death. Part of the Cape's essential life is the sea's indestructible wilderness. Unlike forests, the sea cannot be stopped or dominated. Thoreau wrote in Cape Cod that,

*"The Indians have left no traces on its surface, but it is the same to the civilized man and the savage. The aspect of the shore only has changed. The ocean is a wilderness reaching round the globe, wilder than a Bengal jungle, and fuller of monsters washing the very wharves of our cities and the gardens of our seaside residences. Serpents, bears, hyenas, tigers, rapidly vanish as civilization advances, but the most populous and civilized city cannot scare a shark far from its wharves."*

And what of death? Any visitor to the Cape must confront death. The night before my trek on Marconi Beach, I checked into a small inn at North Truro on the bayside. My innkeeper said that a small whale had washed ashore the previous evening, and already its bones were bare. I hurried down to the shore in the dusk to see droves of gulls feeding on its carcass. They flew off as I approached, and there it lay with its elegant white bones bare to the

universe. All the glitter of distant Provincetown's lights could not erase the bare fact of death. These whale bones had been equalized by the sea. They were not mere bones but something more; those lean and white bones had merged with the very universe itself.

Herein lies the paradox of the sea. It furnishes us with a sense, even in death, of mergence which gives further meaning to life. The sea is indeed a totality which balances unique individuality with universal commonality. We are enabled to see life as a part of a continuum beyond life. Bone fragments help make sand.

I left the sheltered coves of the bayside to cut across the wild dunes. The roar of the surf again filled my being as I hopped down to the lower beach. Nauset Light blinked like Argos through veils of mist. As I edged my way northward, the protruding dunes of Marconi Beach ever so slowly took shape. Even though my footprints were, perhaps, as wobbly as Thoreau's, they had indeed helped put all of a computerized, space age America behind me.

**Richard Fleck teaches in the English Department of the University of Wyoming, Laramie.**



Photo Helen Russ Russell  
Glossy Ibis



## NATUREQUEST PRESS RELEASE

The National Wildlife Federation announces the 1990 NatureQuest workshop calendar.

NatureQuest's goal is to train instructors and youth leaders throughout the United States and assist them in educating youth about the environment. The workshop is designed to provide participants with training, resources, and a model to develop their own nature program. Participants attend a three day training workshop led by NWF staff who are experienced in training, using nature education curricula, and creating "hands-on" nature programs. Participants receive individualized instruction and develop a ready-to-use nature education program for their camps and/or youth programs. The NatureQuest benefits are staff training, certification, accreditation, promotion, enhanced environmental stewardship, and a conservation education network. The curriculum materials provided at the workshop include: NatureQuest Leadership Training Manual, Ranger Rick NatureScopes, Project Learning Tree, Sharing Nature With Children, and The Nature Specialist.

NatureQuest is celebrating its fifth year of training nature instructors and youth leaders. During this time 318,825 children and 19,980 adults have been reached through the NatureQuest program.

### NatureQuest Training Sessions for 1990 will be held:

National Wildlife Federation  
Laurel Ridge Conservation Education Center  
Vienna, Virginia  
March 22 - March 24

Tennessee Valley Authority  
Land Between the Lakes  
Golden Pond, Kentucky  
March 30 - April 1

Presbyterian Conference Center  
Pacific Palisades, California  
April 6 - April 8

Hulbert Outdoor Center  
Fairlee, Vermont  
April 20 - April 22

Princeton Education Center  
Blairstown, New Jersey  
May 3 - May 5

For more information call Susan Johnson, Manager, Youth Programs, at 703/790-4369.



# Environmental Education Tips

## The Use of Journals in Nature Study and Field Science

Duane R. Pierson

The keeping of a journal is a nature instructor's or science teacher's oldest, most highly effective, and often neglected instructional tool. Where else can we find an instrument that students can enjoy, that employs creativity, is highly interdisciplinary, lends itself to various degrees of rigor, has an alternative value as an evaluative device, and which is not expensive?

When it comes to developing a love of nature or building enthusiasm for the study of science, I believe students must pass through a series of sequential developmental stages. It is best to take students back to the field's very beginning, having them find their own way (with our guidance of course) through to the complexities of modern science. They will actually journey through the historical pathways that lead to science as we know it today. All too often students are plunged directly into very complicated science without ever having enjoyed basic experiences. Often they are subjected to sophisticated biological concepts, such as recombinant DNA, with very little exposure to basic biology and without having ever observed nature or having done any field study. It is no wonder so many students are frightened, bored and turned off by science.

To remedy this situation we must get students when they are first introduced to science and let them share the excitement of experiencing nature from whence all science emanates. How better to do this than to place them into the shoes of the old time naturalists. These venerable figures are the ones who first investigated nature and began to unravel all its mysteries. Frequently they were themselves amateurs who worked at other professions while they studied nature at their leisure. In their day, the study of science was pretty much unknown and virtually

everything remained to be learned. They had to discover, observe, classify, categorize, theorize, and think without assistance. I believe this is a good route toward success for all students as they are introduced to science through nature study and then proceed on to progressively more advanced study.

Of course, these old time naturalists all kept journals. They wrote down all they observed. Their thoughts were entered. Sketches were made to assist their memory and to record what they saw. And, they accumulated data. Nothing was to be ignored or lost as nature was a great puzzle to be unraveled. It is important to stress to students that this process continues and remains applicable through to the complexities of modern laboratory science.

You may offer the common robin (*Turdus migratorius*) as an example. Though this bird has probably been observed and studied as much as any species known, there are certainly things we do not know about it and there will always be more to be learned. One of our students may observe behavior or a characteristic never before noticed. Even without new discoveries, it is great fun to rediscover the known and make original interpretations. The best place to record these observations and to record interpretations is in one's own journal.

The following are some assertions about the use of journals in nature study and science:

**They Are Original** All journals reflect the personality of their author. A teacher may insist upon a particular style or format but journal entries are nevertheless the owner's work.

**They Are Creative** The best journals come about when the teacher instructs students to be creative, to let their thoughts flow, to

make entries even though they may seem fatuous at the time, and to make graphic entries such as sketches. Students often are quite inhibited when first asked to keep journals, fearing a need to be exact and correct. A good teacher will strike a balance in these areas, letting students be aware that good standards should always be expected but that it is important that thoughts, ideas, observations, etc. be recorded and preserved. I have found that with some students it is best they keep a field journal which is later transposed to a more permanent one permitting elaborations and expansions. Unfortunately, time restraints do not always lend themselves to this technique.

**They Can Be Interdisciplinary** A good journal brings together science, math, language arts, art and even a smattering of social studies. The amount of interdisciplinary expression can be up to either the student or the teacher. Generally I have found most students enjoy format approaches which include sketches in their journals. Conversely, such a requirement can very much frustrate those who perceive they lack talent in art. One of the best approaches when students are hesitant is to explain what can be included in a journal while emphasizing there may be other approaches and that uniqueness is welcome. Stress that it is up to the students themselves to strive for their own mode of expression and toward excellence. You as a teacher ask only to be impressed.

**They Can Be Used At Any Grade Level** It is never too early or late to introduce students to the art of keeping a journal. It has been interesting in my own experience that I have found elementary students generally better authors of journals than college students. Younger students tend to be less inhibited



when trying new things and expressing themselves. I have also found that the journals of older students have to be checked with great regularity or they will too frequently let their entries get behind, often with an attempt to fabricate the entire text the day before it is due.

With very young students you may want to create much of the structure. You can develop a format that permits students to be creative yet still learn concepts concerned with dates, topics, observing, etc.

**Art, Style, and Neatness** I always tell students that good journals will reflect themselves as personalities and authors. Some students become quite elaborate with their art work. Others put a lot of themselves into prose or even poetry. A good journal will reflect growth in style. It is always good to see corrective notations in a student's own hand as to such matters as spelling, grammar, or updated and corrected information.

**Long Time Effects** One of the most pleasant rewards of having had students do journals over many years is meeting these students after a period of time and having them thank me. Some get into the habit and continue to keep journals through the years. Others retain journals done years ago and express their pride over what they had accomplished. Some say they enjoy the fun of going back to thoughts of long ago. There is also the hope that all one's students have learned better skills of expression and observation through their journal work.

**Good Science** Perhaps the most important attribute of journals as a teaching tool is that they inculcate good scientific technique and methodology. Students learn that accuracy in observations, recording and interpretation are the building blocks of good science.

**Evaluation** Careful use of journals by teachers can provide them with an evaluative device of almost unlimited potential. They can be used in both objective and subjective modes although they lend themselves much better to the latter. One particular use I have made of journals is in the evaluation of residential environmental education experiences for elementary school children. The

journals required were structured so that the students commented on specific areas such as subjects taught, social interaction, food, free time, etc. When these journals are studied individually they provide good perspective to a student's benefit from the experience. Looked at *en masse*, they do a much better job than questionnaires in providing qualitative information as to various aspects of the experience. Occasionally unexpected revelations will be uncovered and the teacher must be prepared for an occasional bite to be found in comments.

Teachers must be aware that the assignment of journals requires considerable preparation. Sometimes it takes quite a selling job. Student cannot be handed journals and simply told to write in them. Fears and inhibitions must be allayed. The students must understand the long and great tradition of journal keeping and that you are requiring something more than simply another project or exercise. It is best they realize that though you will be inspecting their journals, criticism will be constructive and when possible, a mutual effort. Most important, they should know that a journal is personal and will be eventually their own unrestricted property to keep and do with as they like. Hopefully they will cherish their journals and keep them for life.

Always keeping in mind that one of the primary reasons for keeping a journal is to practice good science, it is recommended that students be given prior instruction in some of the techniques of good field science. These techniques should include the following:

**Observing**  
**Collecting**  
**Notation**  
**Field Data Organization**  
**Field Sketching**  
**Field Shorthand**  
**Classification Methods**  
**Use of Field Guides**  
**Keying Methods**  
**Deductive Processes**  
**Field Measuring Methods**  
**Careful Date and Time Recording**  
**Prompt Noting of Ideas and Thoughts**

Sometimes I am asked what material should be used for a journal.

This varies immensely according to what the teacher requires or has in mind. The best journals are those bound blank books made for the purpose. On occasion I have left the matter to individual students where they select what they want to use. Loose-leaf notebooks can suffice but there is something less permanent about them. Looseleaves perform particularly well as field journals with the option of transposing notes, data, and sketches to a more permanent volume. With elementary children I have frequently used mimeographed sheets with a simple cover page which can be creatively expanded. The other pages, stapled into booklet form, are left blank except for topic titles.

Let's hope teachers and nature instructors rediscover journals. In an age where student spend so much time filling in blanks and checking off choices for answers, journals provide an excellent alternative. They give students a wonderful feeling that they are an important part of the process while their teachers have at hand a multidimensional instructional tool. Best of all, we may eventually find that more and more students come to appreciate nature while they develop an unrestrained affinity for science.

*Dr. Pierson is Executive Director of the Flora and Fauna Preservation Society*

**On the next page  
are some entries  
from primary grades**



Trumansburg, New York.  
 We C.A.R.E. project  
 Baiba Woodall,  
 Coach Teacher  
 Central NY Science Impact  
 Project

Anna Botsford Comstock was the first woman professor of Nature Study at Cornell University. She was a pioneer in environmental education and has influenced many generations of educators and students throughout New York state, our country, and even the world. Her classic book, **Handbook of Nature Study**, first published in 1911 has undergone 25 editions and has been translated into 16 languages. It is a basic resource in the classrooms of Trumansburg Elementary school.

In the preface to the book Anna Comstock says the following about children's writing in journals:

"The field notebook is a friendly gate which admits the teacher (and the parent) to a knowledge of what the child sees and cares for..."

In our classroom we enjoy using journals every day! Frequently the entries include things which the children have observed for either science or nature study. I know you will enjoy taking a peek into what our students see and care for!

Feb 7, 1989  
 when she is in  
 the front,  
 the shadow  
 is in the  
 back!

Jan. 24, 1989  
 I like nature. it is fun! you  
 can learn and when you  
 learn you know!  
 Kyle S. H.



Jan. 2, 1989  
 to todayll have a  
 lot of snow  
 Truck

"Today we have a lot  
 of snow!"



Feb. 6 1989  
 We saw buds and holes in the  
 tree and a nest. the holes had  
 insect eggs and a web. Melani.

"We saw buds and holes in the tree  
 and a nest. The holes had insect eggs  
 and a web."

Mealworms  
 in corn  
 meal.



Jan 11



Jan. 13, 1989  
 some mealworms  
 have turned into  
 they are pupas  
 Lobby

mealworms  
 Feb 7, 1989 Joe



Our Mealworm  
 Observations we got them for  
 17, 1989. They have let  
 their skins off! They have  
 segments. They look like  
 my tomato worm!  
 Brian, Nathan, Joe



# Dandelion Fun

Easy and Simple Dandelion Activities for Your Class

Edith Sisson

Let's hear it for dandelions! A weed, after all, is only a plant that grows where we don't want it, and it may have its own special features. Look closely at a dandelion flower. Isn't it a radiant yellow color? And a near-perfect circular shape? Can you see the smaller flowerets? Did you know that dandelions have followed people around for a long time? Did you ever think you could interest a class of youngsters in such a banal plant?

You can! In fact, you can overwhelm them with a multitude of dandelion activities. Here are a few suggestions for different age groups.

**Dandelion Growth** Who can find the first dandelion flower of the spring in the school yard? Where was it found? In a warm corner? What about the second flower of the season? Keep a record on the classroom wall of flowers and finders and observation skills will sharpen as more children join the activity.

Keep growth charts. Have each student "adopt" a dandelion plant and measure and record its growth. At first the basal rosette leaves may not spread out far, but what happens as spring progresses? Have the children watch for the first buds, and keep track of the growth of the bud stems and record the date of the first bloom. How many more blooms follow? How long does it take for the seed

heads to develop?

**How Many Flowers?** We tend to think of the whole yellow bundle as

the flower of the plant, but along with daisies and others, dandelions are members of the composite family, which means that each so-called flower is in fact composed of many small flowers or florets. Have your children look for the florets with a magnifying glass and they may be

able to see the flower parts (anthers, stigma, style) that make a complete flower. Ask how many florets the students think are on their blossoms. Then have the students count and remove the florets from one quarter of the entire bloom. Next, multiply by four, and each will learn how many florets are on their bloom. Whose guesses came the closest?

## Dandelion Leaves

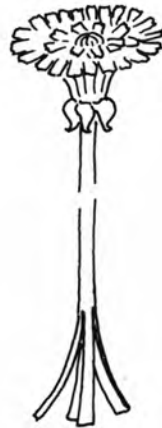
Tender, young dandelion leaves are tasty as an early spring green, but, since eating any wild edible plant can be risky, consult an authoritative wild food book before trying to introduce this new taste to your students. They can, however, pick the leaves to find the shortest, the longest or the most jagged. Even young children are intrigued to learn that the sharp-edged leaves gave the plant its name because the jagged points look like lion's teeth. The French name for the plant is "dent de lion" (tooth of the lion) and it's easy to see how that name became corrupted to "dandelion."

## Dandelion Chains

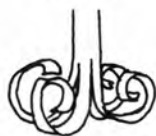
Unless you covet your dandelions more than most people, you will be glad to use them in various ways. To make a chain, pick a dandelion flower with its stem. Remove the flower, and stick the small end of the stem where the flower was into the hollow bottom

## Try these Dandelion Activities

### DANDELIONS



curls



chains



Braid a crown



or make it this way-

MSS

From "Nature With Children of All Ages" drawn by Mary S. Shakespeare.



of the stem. You will have a circle. Next, repeat the process but make the new circle go through the first one, and you have started your chain. Its length depends on children's patience, how adept they are with the activity and the number of flowers available. A good stopping point is when the chain is long enough for the child to wear as a necklace.

**Dandelion Crowns** Gather dandelion flower stems. Cut or tear the bottom into four strips several inches long. Plunge the split stem into a container of cold water, and watch the magical way the strips curl up. Almost pretty enough to put on a wrapped package!

**Dandelion Soap Bubbles** Gather dandelion flower stems. Mix some detergent and water in containers, or use commercial bubble solution, and let the children use the hollow stems as soap bubble pipes. What fun the children have making single bubbles and watching them drift away! It is almost more fun to blow into the container of bubble solution and cause cascades of bubbles to rise up and fall over the edge. You can do this in your classroom, but outdoors on a warm spring day you can enjoy

it more and have less concern about the pick-up afterwards.

**The Tallest Dandelion** As the season goes on, have your students go out with rulers to see who can find the tallest dandelion bloom. The length of the stems of the bloom vary according to conditions, which is one reason for the success of dandelions. In the school yard the rosettes and the blooms will be low, a fine adaptation to defy lawn mower blades and to block growth of competitive neighboring plants. In a field, however, the blooms can become quite tall to equal the length of the grasses around. Let the students observe the differences. Do the rosettes of leaves grow in the same manner in different habitats?

**Adaptations** Along with the rosette, another adaptation for dandelion success is its long tap root, which stores an abundant food supply for the plant during the winter and makes it a challenge to try to pull the plant up. Have the students write dandelion success stories, such as "How I Succeeded Despite the Custodian's Lawn Mower," "Tips on Survival in a Field of Aggressive Grasses," or "Just Try to Pull Me Up."

**Dandelion Seeds** If the children have examined the dandelion florets, they will better understand why there are so many individual seeds on each gone-by blossom. Multiply the number of seeds on one blossom by the number of blossoms on a plant and you have a title for another adaptation story, "How Thousands of Seeds Help Me Survive."

Attached to each seed is its own "parachute," which aids in dispersing the seed to another area. Take three breaths and try to blow off all the seeds. The ones that remain have fortunes to tell, depending on the folklore of your region. I remember that the number of seeds remaining supposedly told me the time my mother wanted me home! Admiring the "parachutes" floating away with their seeds becomes an experience

with seed dispersal.

**Dandelion Fritters** Without a doubt the best way to conclude a study of dandelions is to feast on dandelion fritters. First, the children should pick flower heads from safe, unpolluted areas. Then have them beat up some eggs and crushed cracker crumbs. Next, dip the blossoms into the egg mixture and then into the crumbs. Melt butter in a frying pan, and cook the coated flowers until they are golden brown. Let them cool a little, then enjoy. I have never yet known a child who did not enjoy dandelion fritters.

Nor have I known a child who has done some of these dandelion activities and has failed to have a greater appreciation and understanding of these beautiful sunshine yellow flowers that we tend to call weeds.

**Edith A. Sisson, science teacher at Wayland (MA.) Academy, educator-naturalist with Massachusetts Audubon Society and author of Nature with Children of All Ages**





# Working Together to Prepare Supplementary Materials For Mainstreaming

Susan H. Hayward

As an elementary teacher for a number of years and more recently a teacher of students with Moderate Special Needs, I have had the opportunity of working with students in widely varying settings, with widely disparate skills, in grades K-12. This experience has caused me to develop flexibility in my planning and execution of lessons and to look for creative approaches in preparing materials. I can honestly say that the most difficult situations I encountered in my teaching experience are the ones which prompted me to take new initiatives.

I do not view myself as a curriculum writer but rather as a practitioner who has been forced by circumstances to make "curriculum adjustments" to provide for the extremes on the learning spectrum. In my role as a special educator, I do a lot of assessment of individual students and analyze the testing results against current classroom performance. The test results as well as observing the student during the testing situation give me many clues as to how to adjust lessons and materials to allow for greater student success.

As the result of the Presidential Commission report titled, A Nation At Risk, studies were undertaken and committees appointed nationwide to come up with solutions to the many problems posed in the report and in general to attempt to improve the quality of education. In Massachusetts, the Dukakis Administration's answer was the Chapter 188 School Improvement Act which was passed in 1985 and which provided via Horace Mann Grants, money to individuals in the teaching profession who were interested in developing ideas and programs

which would contribute toward improving education. These grants were not intended to provide compensation to teachers but rather as a gesture of appreciation for commitment and professionalism. Every one of the three hundred and fifty-one cities and towns in the Commonwealth were eligible to participate.

At the time the Horace Mann Grants became available, our middle school was struggling with the issue of wanting philosophically to mainstream more special needs students for science and social studies and yet not wanting to do so precipitously without knowing that the proper modifications were in place. The seventh grade had selected a new social studies text just the previous year and we knew that a significantly large group of special needs youngsters from sixth grade could be mainstreamed if we could develop materials to supplement those already in use. Thus it was that I was prompted one day at a staff meeting to suggest as a Horace Mann Project that the entire program be modified which could then serve as a model for others to use when attempting the task. When the proposal received a favorable response from administration, I suggested that we submit a group proposal (Special Needs Teachers) which might also serve as a catalyst for our group to integrate our ideas with those of the regular classroom, and the total dynamics of the school. Due to time constraints on the part of individuals in our group, another colleague and I volunteered to develop the prototype to help us develop similar components for each chapter, giving the project cohesiveness and yet still allowing for our own individuality so

the project also had variety.

Prior to developing the prototype we spoke with the two teachers who had been instrumental in selecting the test and who would be primarily responsible for implementing our project. We stated our intentions and asked them to share briefly their experience of one year with using the test. We asked them to be candid about any problems or weaknesses they saw in the program and also asked them if they wished to work with us on the project. They had already submitted a grant proposal of their own and did not wish to overextend themselves. They gave us the teacher's edition and all the components which accompanied the text so we would not duplicate anything. The components we developed for each chapter were an audio tape of each chapter of the text with various instructions to the student interspersed throughout the reading. The questions at the end of each chapter are also taped and their answers provided following the questions to allow for self-checking by the students. Each chapter is accompanied by an outline so that as outlining skills are taught, the student can model the procedure and also use the outline later for study purposes prior to tests. Mind maps are done for each chapter so that youngsters who find a sequential approach difficult, can organize concepts visually and relate them to the main theme of the chapter. Transparencies are made of the mind maps and any other visual aids such as charts and graphs. Frequent use was made throughout the project of such techniques as mnemonics, cueing, and association. This entire project was designed to assist any student

**Continued to page 33**



# Historical Sketch of American Nature Study Society

Ralph W. Dexter

In the late 19th century and early 20th century, the need for more and better nature education became apparent. Among the early publications were books by Wilbur S. Jackman (1891; 1896; 1904) - especially his volume on "Nature Study for the Common Schools"; C. F. Hodge (1902) - "Nature Study and Life"; Liberty Hyde Bailey (1903) - "The Nature-Study Idea"; and (1905) "The Outlook To Nature". In 1905, Maurice A. Bigelow of Columbia University established The Nature-Study Review. Response to this periodical prompted Bigelow to propose forming a nature study society in 1907. Immediately following the annual meeting for the American Association for the Advancement of Science held in Chicago in December, 1907, an organizing committee met on 2 January 1908. L. H. Bailey had been chosen as chairman, but was unable to attend, Otis Caldwell served as vice-chairman, and M. A. Bigelow as secretary. A constitution was adopted and officers were elected: L. H. Bailey, president, M. A. Bigelow, secretary-treasurer, five vice-presidents and ten directors. Thus was established the American Nature Study Society, which was eventually incorporated at Washington, D.C. in 1938.

This is now the oldest organization for nature and environmental education in the United States. It has consistently followed the Agassiz philosophy of "Study nature, not books," and the precepts set forth by Liberty Hyde Bailey in his pioneering work on "The Nature-Study Idea." The original objectives of appreciation and study of nature remain the central theme. In recent years, the scope has broadened to include environmental education in its broadest sense.

The revised constitution of April 1986 states that this society is a "a professional society for nature leaders and teachers, and to promote nature and conservation education programs." From the very beginning, the method has been learning by first-hand observations to understand the natural world -- the study of objects in nature and natural processes rather than generalized principles of science. In due time conservation of natural resources came into focus and was promoted by such guidance as given by E. L. Palmer (1947a) for public school education. Brief historical accounts of the American Nature Study Society and its accomplishments have been published in the Nature Study journal by Shaw (1930), Anon. (1947), Palmer (1947b; 1957), Trussell

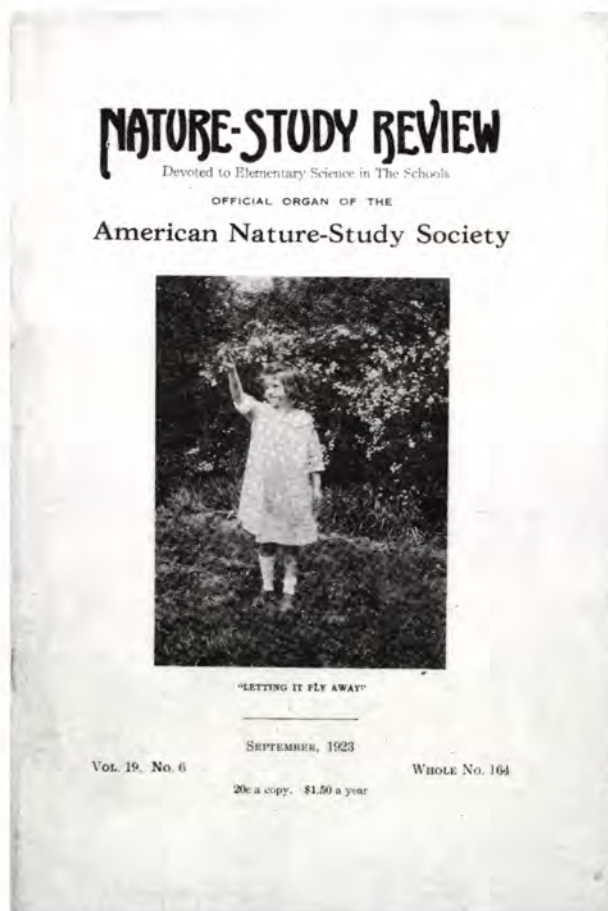
(1954), Gordon (1958), Howard Weaver (1967), Russell (1976; 1983), Dexter (1982), and Chase (1985).

From the beginning, the society has been affiliated with the American Association for the Advancement of Science, and for some time met annually with that group. In 1926, L. H. Bailey served as president of the A.A.A.S. Also, for a period of time, a Western Section of the society met with the Pacific Division of the A.A.A.S. We have also been associated with the National Association of Biology Teachers, holding joint meetings on occasion, the National Science Teachers Association, the National Association for Environmental Education, and the Alliance for Environmental Education, to which we are an active affiliate. Our treasurer and former

president, John Gustafson, once served as president of the Alliance, and in recent years we have co-sponsored projects and events with that group. In 1983 we co-sponsored the First National Congress for Environmental Education Futures held at Burlington, Vermont, with the Conservation Education Association and coordinated by the Alliance for Environmental Education.

We have also been affiliated with international groups concerned with nature education and conservation. For several years we were affiliated with the International Union for Conservation of Nature and Natural Resources (IUCN). We have been an affiliate of the Canadian Nature Federation since 1986, and have held meetings in Canada over nearly a quarter of a century.

The Society has had several different "official publications," and in recent years, in addition to the ANSS Newsletter, the journal Nature Study has been





its principal activity. The Nature-Study Review served as the official organ between 1908-23. M. A. Bigelow, the founder, remained as editor for the first five volumes, and in 1910 the journal was transferred to the American Nature Study Society. Four years later, the Comstock Publishing Co. of Ithaca, N.Y., produced the journal, with Anna Botsford Comstock as editor. In 1924, The Nature-Study Review merged with Nature Magazine, published by the American Nature Association, which had been founded in 1923. Richard W. Westwood served as both president of the Association and editor of its magazine. Official notices and special inserts for our Society were included in issues of that publication. In 1960, Nature Magazine in turn merged with Natural History and our affiliation ceased.

Between 1943-47, Richard L. Weaver, as our secretary, founded and produced a mimeographed newsletter. In 1947, this was expanded and entitled The American Nature Study Society Newsletter, with Weaver continuing as editor. In 1954, the title was modified to American Nature Study Society News, with Stanley Mulaik as editor. In 1964, a quarterly journal, Nature Study Society News (Journal of the American Nature Study Society) began, edited by Stanley Mulaik and assisted by John Gustafson. In 1974, John Gustafson became senior editor, and the next year the name of the journal was changed to Nature Study. The American Nature Study Society Newsletter is now a quarterly and is sent to members in addition to the journal.

At certain periods of time, The Cornell Rural School Leaflets, Canadian Nature Magazine, and the Kansas School Naturalist were also regarded as "official publications" for the American Nature Study Society, and these publications were sent to members in addition to the regular journal.

Special publications were the

"First Yearbook of American Nature Study Society" (1924); "Nature Education in Elementary Schools" (1925); "Nature Study for Conservation" by John Brainerd (1971); and "City Critters" by Helen Ross Russell (1976).

The Cornell Rural School Leaflet was founded in 1907 and edited by E. Laurence Palmer between 1919-1952. A special Teacher's Number, edited by Palmer and Eva L. Gordon, was issued in September 1950 entitled "Nature Writings." It contained articles or reprints by Louis Agassiz, David Starr Jordan, Wilbur S. Jackman, Liberty Hyde Bailey, Anna Botsford Comstock, E. Laurence Palmer, James G. Needham, and Eva Gordon. It also included a list of all of the leaflets published between 1920-51. Following Palmer's retirement, Eva Gordon and later Verne Rockcastle edited the CRSL until it ceased publication in 1969.

Special projects of our Society have included cooperation with the

American Nature Association and the National Association of Biology Teachers to form a conservation committee to produce the "Conservation Handbook" under the direction of Richard L. Weaver (1958), and the "Eyes on Nature" kit for presenting slide showings, organized by John Brainerd in 1966. Also, special projects of national importance have included the Eva L. Gordon Award for Children's Science Literature since 1964. In the spring of 1988 a workshop entitled "The Write Stuff: Children and Nature" was held to commemorate the 25th anniversary of the creation of the award in 1963. Also, in early 1988, a new honor, the Liberty Hyde Bailey Award, rewarding excellence in teaching, writing, or interpretation of nature was given to former A.N.S.S. President, Ruth W. Melvin at a "Gathering of the Elders" cosponsored by our society and the Holden Arboretum in Mentor, Ohio.

Nationally-known presidents of our Society over its first fifty years include the following selected individuals with the term of their service (see Nature Study Vol 37 Numbers 1 and 2 for a complete list of past presidents):

**Liberty Hyde Bailey** of Cornell University -- first president (1908, and again 1915-17). Biographies of Bailey have been published by Rodgers (1949), Dorp (1956), Fazio (1975), and Russell (1982).

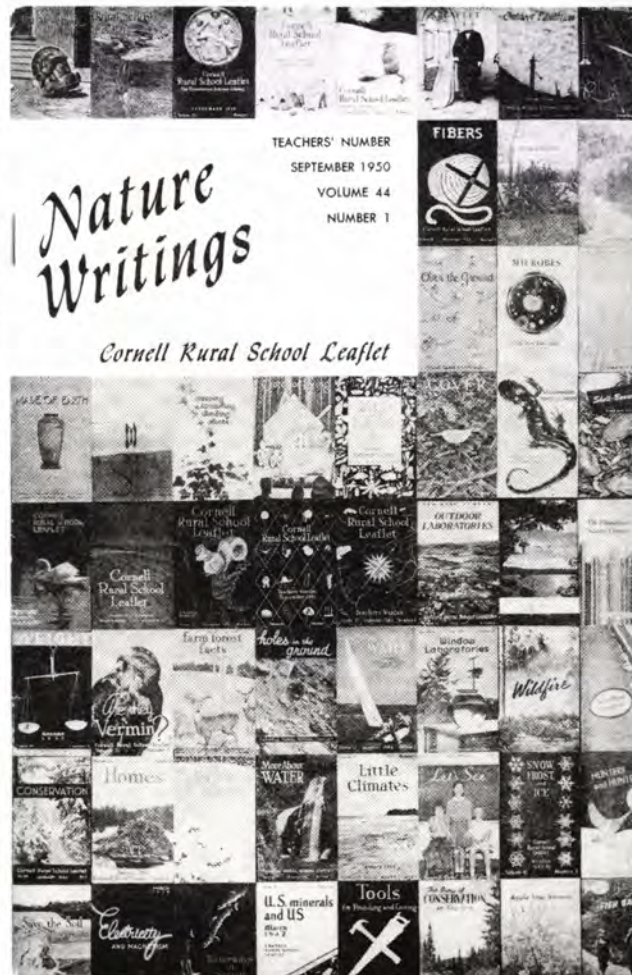
**Clifton F. Hodge** of Clark University -- author of "Nature Study and Life" (1902): (1909).

**Otis W. Caldwell** of University of Chicago -- authority on teacher education: (1910).

**Anna Botsford Comstock** of Cornell University -- author of "Handbook of Nature Study" (1911) and editor of The Nature Study Review, (1917-23): (1913-14).

**William G. Vinal** -- authority on camping and author of "Nature Guiding" (1926) and "Nature Recreation" (1940): (1922-23).

**E. Laurence Palmer** of Cornell University -- read his first paper to the Society in 1919, which was published in The Nature





Study Review for February 1920. He edited The Cornell Rural School Leaflets between 1919-52 and authored the "Fieldbook of Natural History" (1949). He was known generally as "Mr. Nature Education": (1935-36).

**Edith M. Patch** -- established the Department of Entomology at the Maine experiment station and was the first state entomologist for Maine. She was also an author of children's literature: (1937-38).

**Charles E. Mohr** -- an Audubon Society lecturer and authority on cave biology who coauthored "The Life of the Cave," published in 1966: (1944-46).

**Edwin Way Teale** -- author of such popular works as "Grassroot Jungles" (1937), "North with the Spring" (1951), "Autumn Across America"

**Richard W. Westwood** -- president of American Nature Association and editor of Nature Magazine: (1949-50).

**Roger Tory Peterson** -- world's number-one bird watcher, originator, author, artist, and editor for the Peterson Field Guide Series, beginning with his classic "Field Guide to the Birds" (1934): (1952-53).

**Richard L. Weaver** -- director of Audubon Camp, Greenwich, Connecticut; state director for resource-use education programs in North Carolina; director of the University of Michigan Conservation Program; and editor for "Conservation Handbook" (1958): (1957-58).

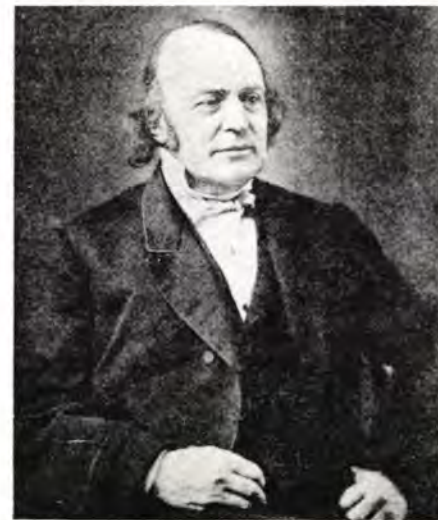
**Stanley B. Mulaik** of the University of Utah -- editor of American Nature Study Society publications for twenty years (assisted by his wife Dorothea); organized the Utah Nature Study Society in 1954: (1959).

In 1975, Cornell University offered to house the archives of the American Nature Study Society in the J. M. Olin Research Library. All officers and past officers are encourage to contribute their Society documents to these archives to make them available for future historical research on the American Nature Study Society.

**Professor Ralph Dexter was appointed historian of ANSS in 1965. He has written many articles on the nature study movement.**

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Louis Agassiz

Photo from the "A History of Nature-Study" article in the September 1923 issue of "Nature-Study Review".



# The Strange Case of 007 and the Eskimo Curlew

Margret Nathanson

Recently I was made aware of a book by a fellow member of our local book club, The Sebastian Brandt Society, titled How 007 Got His Name by M. W. Bond, published by Collins, London 1966. It was a revelation to me, and when I learned that hardly any of my fellow naturalist or "birding" friends knew anything about the association between Ian Fleming and the ornithologist James Bond, I decided to share it by writing this piece. Should one be fortunate in finding a copy of this book, I recommend it unreservedly; it's a fascinating true story. The following has been abstracted from, and where indicated quoted directly from, Mrs. Bond's book.

Ian Fleming began as a newspaper journalist, editor, foreign manager of the London Sunday Times, undercover agent for the British foreign office, stock broker and banker. But we know him best as the creator of countless spy thrillers whose central protagonist is 007.

In 1950 Fleming built a home for himself in Jamaica, the one in the West Indies, not Long Island. Ten years later, and now in his forties and on the brink of his first marriage, Fleming determined to take his mind off this terrifying prospect by writing a thriller. He also decided that this would be one secret agent with a bland, anonymous personality totally unlike such literary relatives as Hercule Poirot, Sam Spade or Sherlock Holmes.

During his years in Jamaica Fleming had become part-time birdwatcher and a long-time user of that classic field guide, Birds of the West Indies by James Bond. This name struck Fleming as just right, and so it was that James Bond the second was born.

The effect upon the original James Bond, an eminent and dedicated ornithologist and curator of ornithology at the Academy of Natural Sciences in Philadelphia was, however, not immediate. The first

shock wave was felt when a strangely facetious review of Birds of the West Indies appeared in the generally sedate London Sunday Times under the heading "Wrong Man". An incensed reporter writes:

"'Image' is the new nauseating word. I can barely bring myself to write that James Bond, like practically everyone else mentioned in the newspapers these days, is trying to establish a new image of himself.

To show maybe that his life is not all sado-masochism, Smith & Wessons, and ecrevisse-tails in white wine and brandy, Bond has revealed himself as a bird-watcher: and I shouldn't be a bit surprised if his Birds of the West Indies which comes from Collins tomorrow, doesn't place him, ornithologically speaking, well above Mr. Wolf Mankowitz, but somewhat below W. H. Hudson... and the people who feed the pigeons in Trafalgar Square. As the subject of West Indian



The only Ian Fleming meets James Bond, Goldeneye, Jamaica.

birds is not without its sensational aspects, one must hope that Mr. Bond has seen fit to preserve a decent discretion, particularly in his treatment of the nuptial plumage of the copper-rumped humming-bird (Amazilia tobaci) and the private life of the scaly-breasted thrasher.

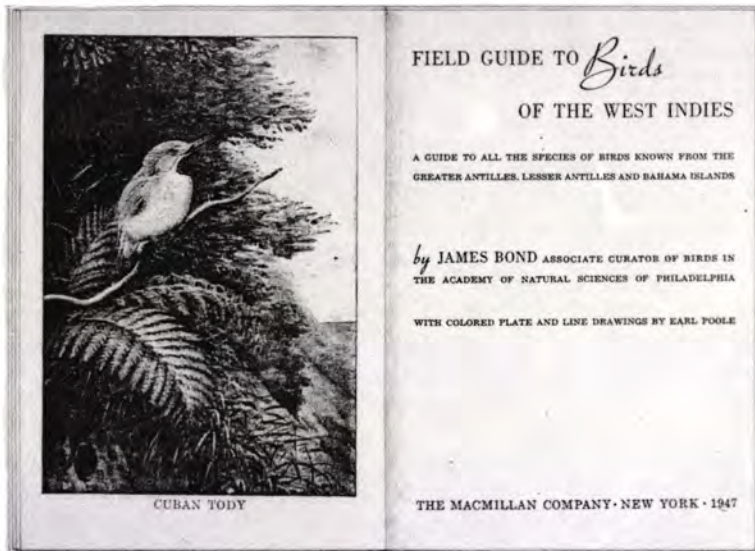
P.S. Terrible mistake! I now find that the author of Birds of the West Indies is a different James Bond, Curator at the Academy of Natural Sciences, Philadelphia, and a top banana in ornithology. You may have complete confidence in this Mr. Bond, who knows all about species, habitat, nidification and the reversible outer toe of the osprey or fish hawk."

Mr. James Bond and his wife Mary reacted with understandable perplexion. Shortly, however, their publisher's agent explained the entire situation...how an English author by the name of Ian Fleming had chosen the name James Bond for his main character in a series of spy thrillers. Referring to his code name, 007 romped through incredible escapades in Casino Royale, From Russia with Love, Dr. No and with the help of movies and TV he soon became a household word both in England and all over the world.

The only meeting between the ornithologist James Bond and Ian Fleming, the man who "stole" his name, occurred at Goldeneye, Fleming's home in Jamaica a few months before the latter's death. Fleming presented Bond with a copy of his latest book, You Only Live Twice with the following inscription: "To the real James Bond, from the Thief of his Identity, Ian Fleming. Feb. 5, 1964 - a great day!"

The double identity produced all sorts of incidents. The strangest took place in 1965 when James Bond obtained a rare specimen of the almost extinct Eskimo Curlew which





had been shot by a native hunter in Barbados. Like the Ivory-billed Woodpecker and California Condor, the Eskimo Curlew is an extremely rare bird. The last one to be seen was 33 years ago in 1932. Photos were taken at the Academy of Natural Sciences in Philadelphia of its curator of ornithology holding the new specimen in one hand and an aged stuffed Eskimo Curlew in the other. Reporters from all over the country had a field day with headlines blaring:

"James Bond hot on trail of a bird of a case."

"James Bond - bird detective in Fleming tradition."

"Original James Bond deals in birds, not spies."

"James Bond in case of vanishing Curlew."

"James Bond finds clue to Curlew killer."

An imaginative journalist wrote the following in *Sports Illustrated* on May 24, 1965 as quoted in Mrs. Bond's book:

"After a long stalking of his quarry James Bond killed quickly, silently and painlessly. Then, in a variation not yet screened in any neighborhood theatre, Bond skinned his victim and sent him back to headquarters to be stuffed. 'A hundred years from now, this may be the last specimen of the Eskimo Curlew', crowed Bond, Curator of Birds at the Academy of Natural Sciences,

Philadelphia. He hadn't been so excited since author Ian Fleming borrowed his name to christen Secret Agent 007."

This prompted a righteous young biology student from Yale to send a letter to James Bond accusing that renowned ornithologist of reverting to 19th century biology when it was common practice to slaughter animals for museum collections. Upon receiving a short note of explanation from James Bond, the zealous student offered apologies for having jumped to false conclusions.

*Margret Nathanson is a naturalist with Nassau BOCES, Caumsett State Park, Lloyd Harbor, NY and Volunteer Naturalist at Muttontown Preserve, Muttontown, NY*

## **Working Together to Prepare Supplementary Materials For Mainstreaming**

Continued from page 28

who might encounter difficulty assimilating information presented in the text in its usual format. We allowed for much practice and repetition, using vocabulary words in definitions, in close exercises using the term but omitting another key word in the definition. We used a computer program called Crossword Magic to develop crossword puzzles using vocabulary, and in some cases we scrambled the letters to see if students could identify the terms from each chapter.

Wherever possible throughout the project we provided students with hands-on assignments to help them gain proficiency. Examples of concepts which lent themselves to this approach were latitude and longitude and how to locate places on maps; glaciers and how they move and what a powerful force they can be; how erosion shapes the land; what is acid rain?; the hydrologic cycle. In some cases we created original materials and in other instances we used supplemental materials which we had used

successfully in teaching substantially separate social studies and science classes in the resource rooms; materials we knew firsthand to be successful with special needs students.

The school in which I currently teach has developed its faculty into teams at each grade level with team leaders and provided for summer workshops during which teachers are paid to develop materials and interdisciplinary units. Administration supports enthusiastically participation at conferences and workshops, thus allowing us to exchange ideas and information with other professionals in the state. It also supports committee work and inservice workshops which encourage comradeship within the building. This type of support has encouraged me to develop materials and scheduling, knowing the ideas developed would be received with enthusiasm and implemented in a nurturing climate.

**Susan Hayward is a junior high level special needs teacher in Mansfield, MA.**



# HOW CONGRESS VOTES

Thomas Tanner

For some years I have heard the view expressed, both from within and outside the nature study community, that more nature educators should be more aware of political-economic-social issues relevant to their field, and should even incorporate more information about these issues into their teaching. This short article assumes that there may be some validity to this position, and it describes the use of instructional materials which may be obtained free of charge.

In recent years I have taught workshop sessions, university and high school classes about congressional voting records on bills dealing with environmental quality and sustainable energy. The principal source of my information has been the biennial report from the League of Conservation Voters, 2000 L Street NW, Suite 804, Washington, DC 20036. LCV is a respected nonpartisan group whose board of directors is drawn from a variety of mainline conservation organizations such as National Audubon Society, Natural Resources Defense Council, Environmental Action, and Wilderness Society. Every two years the directors select the most important environmental and sustainable energy bills brought to a floor vote in the last Congress. The LCV staff tallies every congressperson's vote on these and computes a score for each. Scores range from 0, for a congressperson who always voted "against" the environment and sustainability, to 100 for one who always voted "for."

I use the data from the latest several reports to construct tables for groups of congresspersons interesting to the learners with whom I'm working. The tables are distributed one at a time, and the participants generate observations and draw conclusions in a highly learner-centered format. For instance, in 1987 I constructed such a table for those presidential hopefuls who were current or recent members of Con-

gress -- Biden, Dole, Gephardt, Gore, Hart, Kemp, Schroeder, Simon. Participants immediately see that there are sharp distinctions among individuals and, very quickly, that there seems to be a party difference as the means from the other party ranged from 68 to 91. We then go to other tables, showing the record for the senators and representatives from the state where the session is being held, and summaries for Congress as a whole. Party differences continue to be revealed, but participants also discover that these are moderated by region, and that individuals may vary considerably from the mean for their party and region.

I also use tables constructed from other sources, on specific issues. For instance, a recent House committee vote on whether to allow oil drilling in the Arctic National Wildlife Refuge, and a list of cosponsors for a Utah wilderness bill, reveal the same party and regional differences.

Students consistently generate reasonable explanations for their

findings, such as the markedly high scores in the East and low scores in the Mountain West. I supplement their hypotheses with additional information, e.g. the way in which large federal landholdings in the latter region contribute to attitudes there.

These sessions always elicit a high level of apparently enthusiastic participation, and observation confirmed by anonymous evaluations. For instance, 257 of 428 high school students gave the lesson an A, and 150 a B, when it was taken to central Iowa schools in 1988.

A current set of tables, with all necessary instructions and background information, can be obtained from me at 143 Bessey Hall, ISU, Ames, IA 50011.

**THOMAS TANNER is Professor of Environmental Studies at Iowa State University and editor of the 1987 book Aldo Leopold: The Man and His Legacy.**

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# Former ANSS President Honored

Joe White

Springdale, PA -- Ruth Scott, well known environmentalist and educator, was honored here Sunday December 3, 1989 by the Rachel Carson Homestead Association with a scholarship in her name.

Mrs. Scott served for many years as an environmental educator at Carnegie Museum's Powdermill Nature Reserve in Westmoreland County. While there she designed and supervised the re-construction of two existing buildings into environmental education facilities. She also developed and carried out nature and environmental education programs for adults and children under Museum Director Dr. M. Graham Netting.

A personal friend of Rachel Carson, the late writer/biologist now world famous for her book Silent Spring, Mrs. Scott served on the board of directors of the Rachel Carson Trust which was formed to carry out Miss Carson's efforts to establish a strong public awareness of the hazards of lethal pesticides.

Mrs. Scott also served as President of the American Nature Study Society and is a former board member of Defenders of Wildlife. In addition, Mrs. Scott has served on several local, regional, state and national boards of organizations concerned with the wise use and management of natural resources.

The scholarship which bears her name will be used to provide environmental education programs for young persons attending the Rachel Carson Homestead summer programs.

The Homestead, site of Miss Carson's early years in the Pittsburgh area including her years at Pennsylvania College for Women (now Chatham) has been established as a combination museum and educational center. Mrs. Scott figured prominently in the acquisition, development and restoration of the Homestead as a tribute to Miss Carson.

Ruth Scott has worked for many years with various projects of Western Pennsylvania Conservancy, especially in its early development as a membership organization. She has directed or participated in numerous projects and programs on local, state

and national levels through garden clubs, conservation districts and similar organizations.

Although much of her work has been accomplished working "behind the scenes," Mrs. Scott's efforts have been far-reaching and have been recognized by such leaders as Ornithologist/Artist Roger Tory Peterson, Lady Bird Johnson and former Interior Secretary Stewart Udall.

Mrs. Scott was educated at Carnegie Institute of Technology and the University of Pittsburgh. She now resides in O'Hara Township where she has taken an active part in park and natural area planning.

*Joe White is a nature columnist in Pittsburgh.*



*Rachel Carson, author of "Silent Spring," was born in Springdale, PA on May 27, 1907. Her birthplace is maintained by the Homestead Assoc. and used as a center for environmental education.*



## Good Reading

**ZOO** by Gail Gibbons, Thomas Y. Crowell, New York 1987 16 pages, \$12.95 This brightly colored book tells the story behind the scenes of the zoo: the diets, the feeding, the care of animals, the veterinary activities, the Children's zoo and its activities and the conservation role. Written for 4-8 year olds, it would be good before-and-after-reading for a zoo trip. *H.R.R.*

**AT THE FROG POND** by Tilde Michels with pictures by Reinhard Michl. Translated from the German by Nina Ignatowicz. J.B. Lippincott, New York, 1987, upaged.

Next to experiencing spring with all of its beauty, here it is again. It describes what you wonder about: "how tadpoles become frogs, where all of the sounds come from, how herons hunt". It brings back the memories of your first spring thunder storm with its fright, its beauty and wonder.

This is a wonderful book in every sense. It raises many questions and answers some. It is full of wonder and awe. It can be read over and over, each time inspiring something new. It intends to inspire the wonder of calm spring days, then describes the approach of a thunderstorm and the reaction of animals and plants as the storm comes and goes.

Altogether it intends to inspire discovery. "Look and listen. What is it? What do you discover when you look and listen? Are you an observer without discovering? Are you a listener without hearing?"

The illustrations by the Artist Reinhard Michl are superb. In color, they can be read with or without the text. They show the finest detail of what's happening. To quote: "On clear nights the moon glimmers on the pond. Sounds of life are all around. There are squeals and gurgles, chirps and burbles, and rustling in the reeds." Look at the full page picture that accompanies this text and you'll discover what's making the sounds, and where they come from. The sounds are lively and calm, quiet and loud. That's the kind of book this is. Add beautiful.

Glenn O. Blough, Professor Emeritus  
University of Maryland

## New Books by Eva L. Gordon Award Winners

Sandra Flynn Burns

\* **ONE DAY IN THE PRAIRIE.** Jean Craighead George. Thomas Y. Crowell. New York, 1986. 42 pages. \$11.96.

Jean Craighead George beautifully explains the interactions on the grassland prairie as well as the daily life of its individual inhabitants. She carefully describes the plant and animal life of the prairie as she interweaves the story of an impending storm and the photographic adventures of a young boy. The prairie is brought to life by the meticulously rendered pencil drawings of Bob Marstall. A bibliography and an index permit you to refer easily to items of interest. The book is suggested for ages 9-12.

\* **THE IMAGINE LIVING HERE** series. Vicki Cobb. Illustrated by Barbara LaVallee.

Vicki Cobb, author of over forty award-winning science books for children and Barbara LaVallee, noted illustrator, have combined talents to produce the Imagine Living Here series. Together they describe some of the wettest, coldest and driest spots on Earth. Each of the books relates interesting facts about the environment and of the people who inhabit these regions. Vibrant and animated watercolor illustrations fill each page.

\* **THIS PLACE IS COLD.** Vicki Cobb. Walker and Company. New York, 1989. 30 pages. \$12.95

This book describes life in Alaska. It explains why it is so cold and how such extreme cold affects the environment, both physical and biological. The author explains the adaptations that humans, animals, and plants have made to exist in this region.

**THIS PLACE IS DRY.** see above.

This book describes what it is like to live in the Sonoran Desert in Arizona. It asks you to imagine living in a place where it is so hot that if you went a single day without water you would die. Or where some of the largest spiders and most poisonous snakes live. It relates the steps taken by the people of the region to obtain a reliable water supply.

**THIS PLACE IS WET.** see above.

The interactions in the tropical rainforest of Manaus, Brazil are the focus of this book. We learn what it is like to live in a place so wet that houses are built on stilts or where plants grow on the sides of trees with their dangling roots gathering water from the air. We learn about manatees, jaguars, anacondas and seven inch beetles. Human impact on the rainforest is explored and the effect that burning the rainforest has on pollution and Earth's atmosphere is discussed.

\* **WHALES.** Seymour Simon. Thomas Y. Crowell. New York, 1989. 38 pages. \$14.95.

Seymour Simon explains in a clear and simple narrative the anatomy and behavior of the whale. He also describes the different types of whales and their struggle to survive in the oceans of the world. The text is accompanied by over twenty breathtaking photographs. Although this book is suggested for ages 5 through 8, even adults will enjoy and learn from it.

**Sandra Flynn Burns is professor of Earth Science and Science Education at Central Connecticut State University.**



# Naturalist's Notebook

## A Luna Moth Emerges



Pupa twists and turns in cocoon. Fluid secreted, weakening silk fibers at head end of cocoon.



FRONT



BACK

2:20 A.M. - Emerging moth shrugs "shoulders" (wings) against pupal case, which cracks open down and across back.



wings sulfur yellow

2:33

Moth quickly scrambles out of pupal case and pushes through the weakened silk escape hatch of cocoon. Squirts brown liquid from rear end. Moth crawls up a fern. Finds suitable resting place. Starts to pump blood into wing veins.



moth is a male

♂

2:42



wings now showing green

2:45



green

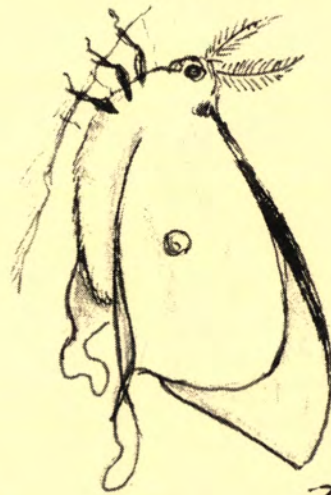
2:48

developing trailers still yellow

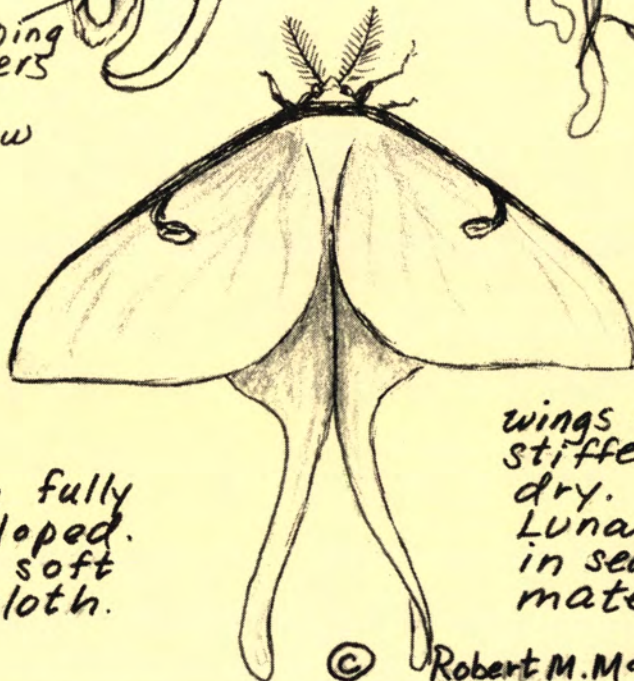


3:25

wings fully developed. Still soft as cloth.



3:16



wings gradually stiffen and dry. Tonight, Luna will fly in search of a mate.



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