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The Environmental Crisis

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THE ENVIRONMENTAL CRISIS
and the International Biological Program

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After something short of a million years of evolutionary history and after about 4,000 years of development of his present culture and technology, man has finally acquired the ability to destroy life catastrophically on this planet. He has also, through his increase in numbers and through his technology, acquired the potential for so degrading the quality of the earth's environments that human life worth living will no longer be possible on this planet. This is not a very pretty choice, and in some ways the catastrophic route is preferable to the slow but certain degradation of the quality of human existence.

The environmental crisis that we face today is not something that came about suddenly. It had its beginnings in man's first manipulation of the environment for his own purposes. These beginnings came with the shift of primitive tribes from a hunting culture, in which man was simply another predator on other species, governed in population size by negative feedback mechanisms that regulated the predator population with respect to abundance and availability of the prey species. With the shift to a herdsman and farming culture, man was able to stabilize his food source and hence his population levels and to escape to some extent from the effects of these feedback mechanisms. He was also to begin degrading the quality of the earth's environment in ways that have continued and accelerated to the present time.

As soon as he became a planter instead of a hunter, man broke the prairie sods and began to clear the forests in order to plant his crops. Rains washed the prime topsoil from his fields. Once clear rivers ran murky with this load of transported material. Increasingly astronomical tons of the continents' best soils were deposited in the oceans, silting up the bays and estuaries. Man's domesticated grazing animals were restricted by him in their movements unlike untamed grazers which are free to move about in search of the best forage, and which characteristically do so. This restriction also put pressures on the environment. Over-grazing resulted in the loss of cover plants and also promoted soil erosion. There is a succession of domestic grazers relative to degradation of the range. Over-grazing by cattle degrades the range to where it will no longer support cows but will support sheep which can utilize food not used by the cows by pulling the grass up by its roots. After some generations of this kind of treatment, the range will no longer support sheep but will support goats, which can subsist on woody vegetation. After some generations of goats, the result is a biological desert. Great areas around the Mediterranean, in northern South America, and right here on the Edwards' Plateau of Central Texas, attest to the inevitable end product of this process. The main economic reason for raising goats is the production of a fiber (mohair). This is a most inefficient and, in terms of environmental degradation, costly way to produce fiber in an age when our technological progress permits the production of a multitude of synthetic fibers. We might well argue that the time has come to prohibit the raising of goats except for a few in zoos to show future generations what one of man's closest competitors in lousing up the world's environments looks like. There are certainly more productive ways of using these "goated-out" areas of the world for man's benefit than by continuing to use them for goat culture. Finding such use will be a challenge for the ecologist-engineer of tomorrow. This kind of environmental engineering is an inevitable part of man's near future if he is not to lose the battle to keep the world worth inhabiting.

We have dwelt overly long, perhaps, on basic agricultural practices and their effects on the earth's surface. However, we cannot move to other subjects without reference to one agriculture-related contribution of our modern technology to the degradation of the world's environments. I am referring to the enormous diversity of pesticides, particularly those of a persistent variety, that are dumped into the world's ecosystems in millions of tons annually. The persistent ones stay around for years and by way of the ecological food web find themselves distributed around the world. They concentrate in different places in the food chains, particularly in the top carnivores. The whole world, even Anarctic penguins, has been dosed by these chemicals as they are passed along the food chains. My ecologist colleague, LaMont Cole of Cornell University, has said that we are luckier than we deserve in that our lavish use of a large family of pesticides has not yet resulted, insofar as we know, in an irreversible disaster. For example, where would we be if DDT had destroyed all of the tiny decomposer organisms in the world? Where would we be if this or some other pesticide should interfere with the photosynthetic process on which life on this planet is dependent? Lest we be complacent that neither of these disasters has occurred, it has been recently claimed that one of the pesticides does indeed have an adverse effect on photosynthesis. It has also been shown recently that DDT-resistant mosquito fish eaten by bass are lethal to the bass. Our reaction to this poisoning of the world's ecosystems must inevitably involve increased reliance on biological control and severe restriction on the use of the persistent varieties of chemicals. Some progressive states like Michigan and others in the Great Lakes watershed are already restricting the use of the persistent types like DDT and Dieldrin.

While the beginnings of man's degradation of the earth's environments can be traced back to his cultural beginnings, the very real environmental crisis in which we find ourselves today began to assume alarming substance with the development of our modern technological society. Modern medicine has lengthened man's life span and reduced death from many causes which formerly contributed to population control. The result has been a runaway growth of man's population – the so-called "population explosion."

People crowd into the large cities of the world, where just the presence of too many people in too small a space constitutes environmental degradation and promotes the crime and poverty with which our national leaders are attempting to cope. The problems are problems of human ecology – of an urban environmental crisis.

These great cities, and many not so great cities, must cope with problems of disposing of man's wastes – his garbage. Virtually any scheme for disposal of these wastes is going to result in some degree of environmental pollution. Even the

most thoroughly treated sewage effluent, discharged into a stream, will fertilize that stream to the extent that eutrophication or excess production of microorganisms will occur. Many of our streams and our estuaries have undergone this kind of pollution.

The factories and their products in this technological age in which we live provide a kind of a massive capstone to all of the other kinds of environmental degradation that man has achieved. We are impressed by the fact that industrial England in the past few centuries has so polluted the countryside with soot from soft coal that it has pressured the rapid evolution of a soot-colored bark-moth that is protectively colored on a soot-coated tree trunk.

The forms of industrial pollution are many-faceted. Until very recently, and then influenced only by legislative decree, industry generally has paid virtually no attention to what it was doing to environmental quality. Industrial wastes of incredible variety have been discharged into rivers and lakes under the apparent concept that it was the inherent right of industry to use such bodies of water for disposition of its waste products.

Furthermore, there has been air pollution from a variety of sources. Industry has been only one of several offenders that have contributed to the smog over such cities as Los Angeles, New York, Washington and many others. Automomiles make a major contribution. Jet aircraft discharge tons of particulate matter into the atmosphere each day. The city of Dallas is visible from an aircraft many miles away in part because of its smog from the exhausts of jet aircraft but in part also because of the smoke from a huge incinerator plant in which the city burns its trash. The same may be said of the nation's Capitol. It is hard to say whether the jet planes from National Airport or the smoke from the burning of the city's trash contributes most to the persistent smog. The accumulation of CO_2 and particulate matter in the atmosphere could result in a greenhouse effect that would lead to a warming of the earth's atmosphere. Some say that this is occurring. If so, we may be triggering another continental glaciation comparable to those of the Pleistocene.

If this happened, such great industrial centers as Chicago, Detroit, Buffalo and others would be ground under by the inexorable advance of a massive wave of ice. Perhaps we would have the technological ability to halt the continental glaciation by use of thermonuclear devices, but in so doing we would only pollute the planet with a fallout of radionuclides.

Another of our modern contributions to the pollution of the earth's environments is thermal pollution of major streams and estuaries by manufacturing plants and especially by atomic reactors, which are becoming increasingly important as sources of electrical power. As the world's store of fossil fuels becomes exhausted, problems created by such reactors will become increasingly numerous.

All in all, man has made a miserable mess of the world in which he lives. Time is running out on the opportunity to reverse the trend so that we may maintain what environmental quality there is left and so that, hopefully, we may regain some lost ground and restore some of the desirable features of the environment which we have destroyed or have altered to an intolerable extent.

What is the International Biological Program (IBP) and what hope does it offer for a solution to the environmental crisis?

The IBP is a multinational effort to understand the functioning of the world's ecosystems and to understand man's adaptation to his changing environment. This global effort is long overdue, but now 55 countries, representing most of the earth's land surface, are cooperating under coordination by SCIBP (Special Committee for the International Biological Program) in a combined effort toward such understanding. The parent body for this world-wide effort is ICSU (International Council of Scientific Unions). Each participant country has a national organization. In the U. S. this organization is sponsored by the National Academy of Sciences.

Efforts under the IBP have been coordinated in many international conferences, and a very sizeable number of binational or multinational projects have been organized. Nevertheless, the programs that have been generated vary rather conspicuously from country to country. This is true even though the central theme of the international effort is the same for all, namely "the biological basic of productivity and human welfare."

The differences in national participation reflect national differences and differing national interests. Some participant countries have simply identified ongoing research projects pertinent to the objectives of the IBP as their national programs. Countries with the greatest threat of food shortage have emphasized productivity. Some of the technologically advanced countries have joined efforts with less well-developed countries to work on problems of mutual interest, with the greatest benefits accruing to the technologically undeveloped partner. Adjacent countries have joined forces in a common effort. Prime examples are the Scandinavian countries in one consortium, a group of East African countries in another.

In the United States, the IBP has had a remarkably catalytic effect on the development of environmental biology, the like of which can be detected in no other national program. This development has been evolving over a period of more than 3 years, and it continues to evolve.

In developing a more sophisticated program than any other country, and one that has received the praise of the Chairman of the Australian National Committee for the IBP and of the British journal, "Nature," the U. S. has developed a program with two major components—Human Adaptability and Environment. In each component, there are several integrated programs, each with a program director and varying numbers of participating scientists.

In the human adaptability component, the integrated programs are directed mainly to man's adaptability to extremes, as the quickest answers can be obtained by examining the process of adaptation to extreme conditions. These involve studies of Eskimos, primitive South American Indians, populations living under the physiological stress of high altitudes, migrant populations that are moving from stressed, poverty-stricken situation of the South to the stressed conditions of ghetto life in large northern cities, and studies of nutritional stress under many environments.

In the environmental component, there is a series of integrated programs, but the one most pertinent to our subject is the program of Ecosystem Analyses. This is a program that has no equally sophisticated counterpart in any other national program. It also represents the birth of a new kind of environmental biology, truly ecosystem biology. It has been defined, not inaccurately, as the beginnings of "big biology." These studies represent multidisciplinary, coordinated, team efforts to understand the functioning of ecosystems. Data are shared. Modeling and systems analysis are used. These are going to be long-term studies that extend far beyond the official end of the IBP in 1972. They will ultimately supply the baselines necessary for rational use of the earth's resources so that some semblance of environmental quality is maintained at the same time that man's needs are being met.

Six of these ecosystem or biome studies are being developed under the U. S. program. The analysis of the "grass-

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What Level of Life?

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The Great Issues of the last half of the 20th century and of all the centuries that remain for man will be the Issues of the Environmental Crisis. It is characteristic of these issues that they are obscured by day to day emergencies and are treated usually only indirectly, and then by a succession of partial palliatives, while the fundamental problems accumulate. It is also characteristic that environmental problems expand in number and in magnitude with any expansion of the economy, requiring by traditional solutions that the regulatory functions of government be expanded in ways that are, if effective, unprecedented and increasingly unpopular with powerful segments of society. Thus the traditional role of government in mediating uses of resources becomes more and more complex, more and more difficult to interpret, and infinitely more difficult to implement as competition for resources increases. It is axiomatic that the needs for regulation far outstrip the abilities of governments to regulate by traditional means; the objectives of conservation must fail; and the level of life must be degraded. Technology holds no solution; neither does any traditional approach of government. A major innovation in philosophy is needed and it is this major innovation that is my topic.

The most fundamental issue in the environmental crisis is density of population. We have a good measure of the problem: it is doubling at the moment on a world-wide basis in about 37 years. And of course all of the problems to which growth of population or density of population contribute are being aggravated in some proportion to the increase. Unless this growth is checked through some most improbable miracle, we can look forward to sharing the earth in the year 2000 with about twice as many people as there are now. That such an increase in numbers will exert new and stronger pressures on resources is patent. And it takes little imagination to see further that such growth in human numbers can only aggravate domestic and international problems, including those that lead to wars, the current problems of the cities, the problems of food, of pollution, of education, and the general degradation of life we are watching the world over.

But we of the wealthy western world have an additional problem: our burgeoning technology, which is growing even more rapidly than the population. A measure of this technology is our consumption of fossil fuels, expected to double within the next 10-15 years. Technology is malignant in the sense that it develops its own resources, adding to its momentum, speeding its own unplanned growth. It's success is unquestioned; it has added what sometimes seems to be an infinitude of resources to western civilization, to the point where many ordinary optimists believe that it can make all resources infinite, thus solving the crisis of population. The fact is, however, that in many ways technology is itself a consumer in competition with man, growing on its own set of exponential curves, competing with each of us for its own monstrous share of the earth's oxygen, for its own rights to dispose of wastes in the common environment, for its own share of the earth's space. Technology progresses upward on its own exponentials, propelled by a series of individual decisions, many as trivial as the decision of the small boy to take his outboard for a spin on the lake. These, taken cumulatively, very quickly commit the earth to a significant pattern of changes in which the common interest is subordinated to the interests of the individuals exploiting the common resources, contributing to what Garrett Hardin has defined so eloquently as "The Tragedy of the Commons," the commons being what belongs to all.

There is, of course, no problem as long as resources are large in proportion to the demands made on them: as long as the lake is large and there are few boys with motors. But when the lake becomes crowded, regulation is necessary to protect the boys, to limit their numbers, and to assure that swimmers and other users will have a chance. Clearly then, the role of government becomes one of mediating between competing uses of resources that are in short supply, of defining niches or roles within the system, of limiting competition by establishing the rules. The tragedy arises when the regulations are not forthcoming or, existing, fail by abuse. The rules come hard because they clearly limit the freedom of individuals; they necessarily restrain private enterprise in favor of a common good that is much less specific than the profit motive. Just as the need for them clearly increases with each increment of population and technology, so does the difficulty of determining what the regulation should be: who is to be protected by regulation? Where does the common interest lie? And the aggravation applies as well to the problems of enactment and enforcement.

Clearly, with pressures on environment increasing exponentially and inexorably and with the problems of regulation becoming proportionally more difficult, there is real reason to question whether any government, including a United Nations, can sustain an impartial, wise, or indeed any regulatory function that is appropriate to the needs. If it did, government would have to become sufficiently aggressive to be widely unpopular, thus losing all its powers in a society that grants power to government through the "consent of the governed."

It is also too much, of course, to expect that government remain an impartial agent in the scramble for resources; government, quite properly taking on functions that private enterprise cannot, builds agencies with specific roles to exploit environment in the public good. These agencies, following some very simple evolutionary principles, soon become specialized, defining their niches in the bureaucracy and achieving an almost impregnable stability, supported by and supporting a large public clientele. We all know the story of the dam-builders and how they, having used almost all of the sites available for dams in natural rivers have, with imagination and characteristic vigor, turned now to building canals. Controlling the blessings conferred on the public by these agencies has become a major national problem as the competition for both a role in society and a share of the earth's resources has become more acute.

There are, of course, many examples of the diverse alliances developed between government and industry in the interests of regulation. The alliance between government and the agricultural community that has developed around pesticides is an especially rich illustration. It is the more complex in that the Department of Agriculture's role in promoting agriculture has been allowed to slip over into direct and indirect support for the pesticides industries, whose activities the Department of Agriculture also is expected to regulate under the

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Delivered at the ANSS Session "The System, Socio-Economic-Political, and Ecosystems," Dallas, Texas, December 28, 1968.

pesticides labelling act. It is extremely difficult, perhaps impossible, to challenge effectively even individual decisions, let alone the policies or the existence of such an alliance, once established. The standard response to a serious challenge of policy is appointment of a committee of distinguished experts, a majority from within the alliance, who reinforce the policy. This in itself is a sophisticated type of pest control (developed interestingly enough by Department of Agriculture scientists) involving filling the pest's niche with a sterile or harmless strain of the pest. Thus, conservationists can be controlled by diluting them with bureaucrats. And thus it is that, despite overwhelming evidence of world-wide secondary effects of a most serious sort from accumulation of persistent pesticides, it has not been possible to obtain any binding restriction on their use beyond the tolerances on human foods set by the FDA. And the arguments in support of the current policy sound compelling: the pesticides are necessary for food production in a world that is becoming increasingly hungry. But the persistent pesticides clearly threaten oceanic fisheries – and there is concern that they threaten much more. Where does the common interest lie? Are the manufacturers and users of pesticides alone capable of deciding this important issue? If not, who should decide it? The bird watchers? Those who eat fish? Or a bunch of nervous-Nellie ecologists who think that man is changing the biosphere in ways that threaten life as we know it? Certainly pesticides are necessary in agriculture; we might say, let's just use them wisely and eliminate the problem. But remember the current problems have resulted from what was considered "wise use" by the most knowledgeable experts. These problems seem already almost beyond control except by some extraordinary means, so thoroughly entrenched is the pattern of use and the alliance of business and government in support of it.

The agri-business alliance has even more in support of it than simply strong representation in government, a large clientele in the business community, and a large public constituency; it has its large and distinguished scientific community. The scale of this science is staggering: it reaches into every state through the agricultural colleges and experiment stations, through the Agricultural Extension Service, and through various other specialized agencies such as the Soil Conservation Service and the U.S. Forest Service. Clearly, in such a large scientific establishment there must be great diversity – and there is. But equally clearly, the context within which this science must operate is improved productivity for agriculture. And the criteria of production are the common market-place criteria of profit and loss within the limited sphere of agriculture. The profit from the use of pesticides is easily measured as fractional increase in yield; the costs of the use of pesticides are simply the dollar cost of the purchase; they do not include the costs borne by the public at large due to the leakage of pesticides out of agriculture into other ecosystems where they do great harm. These costs, of course, are extremely difficult to measure. The agricultural scientists, committed to research within agricultural ecosystems and to the traditional measure of success, have been blind to such possibilities, surprised when contronted with the reality, and understandably defensive of their wisdom. The defensiveness has led to utterances of such preposterous alternatives as "bugs or people" in defense of current use of pesticides. But worse than this, the "experts," the scientists of the alliance, have allowed their own limited studies to be presented in the context of the whole show; ignoring the larger questions of long-term stability of agriculture and of the possibility that their agricultural systems must be linked compatibly in the long run with the rest of the environment. In short, they have fallen, hook, line, and sinker, for the treadmill of what Alvin Weinberg calls the "Technological Fix," each cure generating the need for further cures. It is this attiture, supported by a large captive science, and all of the power of the agri-business alliance, that has produced the now world-wide problem with persistent pesticides and allows a headlong rush into an analogous series of problems with herbicides.

How can we control such problems? There are, of course, no simple solutions, but the context within which all solutions lie is very clear indeed and has been stated many times. The problems can be solved only within a context in which competition for resources is low; only when resources are large in proportion to the demands on them. Establishing and maintaining such a context must quickly become the policy of nations, for it is not only the central issue of conservation but also central to preservation of an effective government and to sustaining a vital, rich and rewarding civilization that offers a reasonable standard of living for all. No single bureaucrat, no national party, no manipulation of technology, no clever reorganization of government, no educational effort, no actions in court can solve the multiple crises of environment and society without public acceptance of this basic fact. Its principal element, of course, is control of population, but we must also develop restraints on technology and on government consistent with both the noblest aspirations of man and a stable biosphere.

The means for developing the details of such a policy and of implementing it are three: through education, legislation and possibly through a major extension of the common law.

Education

Education has been and must continue to be the principal reliance. We have been brilliantly successful in probing the details of atomic structure and the details of the gene and of the cell and have been equally successful in interpreting these details and introducing them to students very early in their careers. Somehow in this we have neglected to develop and teach a broad basic understanding of the life-supporting systems of the biosphere. The cries for "relevance" on the campus, whatever "relevance" may mean to the students using it, must be answered in large part by serious attempts at readdressing curricula to the great issues of environment. The issues themselves become clarified, once they are no longer ignored, and gradually become a part of public discussion and public policy. This process is slow even when functioning properly, and we must do all in our power to speed it through direct efforts in the academic community but equally importantly, through public education.

Legislation

The direct legislative approach is always at least superficially, more attractive than the indirect and slower educational process. It can be used, if cleverly designed and implemented, to lead social reform, but it can't lead by much without destructive controversy. It is sensitive in that it can be rapid, responding quickly to a need. Good legislation, however, is long in the building and the more complex the need the more difficult and time consuming it becomes to write good legislation and the greater the gap between the need and the cure. The speed with which the environmental crisis is developing and its magnitude has generated what is widely recognized as a legislative crisis. The Congress, recognizing this crisis, took unprecedented action last July in convening a joint House-Senate Colloquium on a National Policy for the Environment. Although no legislation has yet been implemented, the issues were very much clarified and a remarkable set of documents outlining various dimensions of the problem, including some I'm discussing here

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BRACKEN FERN -- SUSPECTED

(Pteridium aqualinum)

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In the winter 1967-68 issue of "Nature Study"[1] I published an article entitled, "Approaches to Nature Recreation and Interpretation." One of the approaches used in the article was the food-getting approach described on page one.

At the beginning of the second paragraph in this section I extolled the use of bracken fern in the young or fiddlehead stage as a desirable outdoor food. I had good written sources for accepting the young tender fronds in the fiddlehead stage as good food, either raw, or cooked as one would asparagus. For more than twenty years I have eaten bracken fern in the fiddlehead stage with enthusiasm and with no apparent deleterious effects. I have also introduced it on occasion to small groups of campers.

Imagine my surprise and concern when I received a letter from Dr. Richard Pough, President of the Natural Area Council, in which he raised the question as to whether it was wise to suggest eating the shoots of bracken fern, and called my attention to an item about it in the Science News Letter for December 25, 1965. I will quote some statements from this article, entitled *Bracken, Cancer Link Seen.*

"The prevalence of stomach cancer in Japan could be traced in part to the custom of eating a coarse fern called bracken.

"Two 'grasses' belonging to the large family of ferns called Polypodiaceae are believed to be indistinguishable and could be interchanged in food markets.

"Warabi *Pteridium aquilinum* is known to cause cancer in animals while Zen Mai *Osmunda japonica* is probably harmless. Used widely as a fresh or dried vegetable and seasoning throughout Japan, Zen Mai could easily be mixed with the cancer-causing bracken, it is feared."

One possible factor that appears to stand out in research relative to animals (rats, sheep and cattle) is that tumors seem only to develop in the older animals. Because rats have a much shorter life span than sheep or cows, experiments on rats with bracken diet give more and quicker opportunities to examine for rat tumors, since in a relatively short time rats have aged enough to show tumors on autopsy.

"A survey of sheep on the North Yorkshire Moors reported in Nature 208:913, 1965 has revealed that a number of older animals from areas infested with bracken have died of the same type of tumor produced in rats that ate a bracken diet."

"Drs. K. Antice Evans and J. Mason of the department of biochemistry and soil science, University College of North Wales, Bangor, Caernarvonshire, reported the study. These scientists pointed out that it is well known from previous research that *an effect like radiation damage has been found in cattle eating the bracken plant or extracts from it.* Intestinal tumors in rodents are rare, but the investigators found that 20 male rats and 14 female rats fed a bracken diet died, or showed poor condition when killed.

"Post mortem examination showed numerous multiple tumors protruding into the intestines . . . . Work is now going on to find the exact causative agent by trials with bracken extracts . . . Communications are being exchanged with Japanese scientists to determine how carefully fern material is being screened before being made available for public markets."

The author, who knew that his article was about to be reprinted in "Camping Magazine," immediately contacted the publishers and instructed them to leave out of the reprint the paragraph dealing with bracken fiddleheads as food, which they did.

The author has been in contact with Drs. Evans and Mason to follow their research. He is also studying some other sources relative to the bracken fern, and hopes members of the American Nature Study Society will share such information.

The best material found so far is contained in John M. Kingsbury's book, "Deadly Harvest."[2] He points out at least two very interesting and important findings relative to these "black sheep" of the fern family. The thiaminase enzyme, when present in simple stomached animals, destroys thiamine (Vitamin B_1). Currently only two plants – horsetail rush (Equisetum) and the bracken fern – contain the thiaminase enzyme. Eating either of these plants *raw* results eventually in deficiency of Vitamin B_1 and the death of the animal. Horses have been killed from this cause, since they have but one stomach, but cows and other cud-chewing ruminants escape this hazard.

Bracken fern, however, has killed cattle. Some chemical from the bracken not yet identified, slowly destroys living tissue in the hollow parts of the bone, decreasing white blood cells to the point where body resistance to disease in this area might cause severe infection from just a small cut or scratch. Also, clotting ability of the blood is interfered with so that bracken-poisoned cattle bleed internally and abnormally from intestines, eye-sockets, nostrils and other places. Normal healthy cattle commonly sustain various small scratches to the intestines in stride, whereas the cattle weakened by bracken poisoning, or destruction of cells in the bone marrow, cannot fight off infection, and may die from internal bleeding.

An interesting discovery is that bracken fern poisoning causes the same type of bone marrow cell destruction as that caused by overdoses of x-ray or atomic radiation. Also, the same treatment of this condition (use of butyl alcohol) tends to cure the bracken-poisoned cows or over-radiated individual if the condition has not been present too long, and there still remains enough healthy tissue in the cells of the bone marrow.

Another point mentioned by Kingsbury is that heat or cooking will destroy the thiaminase enzyme found in bracken fern and horsetail rush so that it will not kill Vitamin B_1 in single stomached animals.

More research needs to be done on bracken fern and its effects on animals. The author plans some research of this nature in cooperation with the Biology Department at the State University of New York in Cortland. At any rate, enough research has been done to prove that the bracken fern is such a bad actor with several different animals that it should not be used as food for human consumption.

Look For New Book

Dr. Helen Ross Russell, long-time ANSS member, expects her new book, *City Critters*, to be out this spring. It will be published by Meredith Company.

1 "Approaches to Nature Recreation and Interpretation," **Nature Study**, Vol. 21, No. 4, Winter Issue, 1967-68, page 1.

2 Kingsbury, John M. "Deadly Harvest," Holt, Rinehart and Winston, N. Y., 1965, pp. 82-84.

GOOD READING

The Wild Gardner in the Wild Landscape – The Art of Naturalistic Landscaping, by Warren G. Kenfield, Hafner Pub. Co. Inc., 31 East 10th St., New York, N. Y. 10003. 1966, $7.50.

Here is a book, written by a person willing to be himself. So I'll review it in the first person, even though Mr. Kenfield says unkind things (mostly true) about me and my colleagues in ecology, about my heroes in forestry and wildlife management, and about my gardeninging friends, the tame kind with premature bent backs but some of the nicest smiles. Mr. K. used too-sweeping statements with *joie de vivre*, bursts into capital initials when especially enthusiastic, occasionally uses simplified spelling and omits the verb when he thinks a "sentence" can survive without it. Notwithstanding, I accept Mr. K. for what he is and says – and applaud. This book is for the lunatic fringe of Urbania, people with a little or a lot more land than they can manicure while still having time to watch TV – or sit on a stump and meditate on the nature around them. But this book is not just for those who are tired of lawn, lawn, lawn and shrubs planted just the same way as the Jones'. It is for people with some art in them who want to learn to sculpture the living vegetation, to reveal therein what they personally want to reveal. It is for people who want to make the best of Nature by working with her rather than get the best of her by working against her. It is for members of the American Nature Study Society and their friends.

Using humor and perceptive philosophy, Mr. Kenfield presents naturalistic landscaping in an ecologically sound way, with special emphasis on knowing the growth habits of native plants and using planticides to kill or curb those which do not fit his creative image of what the landscape should be like. The last 100 pages systematically share his understanding (roots and all) of plants native of Northeastern United States, where the book will find the most direct application. But many of the species are found much more widely distributed; and his concept of "wild gardening" should range to many other regions and flourish there.

One reason why I applaud this book is that I myself have been dabbling in naturalistic landscaping for forty years (since I was ten). It has contributed to both my self-knowledge and my understanding of the world in which I live . . . I wish I had written this book; it can bring joy to so many people.

– John Brainerd

World of The Great White Heron. By Marjory Bartlett Sanger. Illustrated by John Henry Dick. Devin Adair. 147 pp., $10.00.

This book will be treasured for the illustrations by John Henry Dick rather than for the prose portion by the author. Her best writing is found in the sections of the book which deal with the rescue of the egrets, the hurricanes of history, Flagler's Folly, or the building of the railroad to Key West. The other chapters are tedious. There is too much contrived naming and listing which interfered with the reader's pleasure and acts as an irritant to this reviewer. However, one can leaf through this book many times enjoying Mr. Dick's illustrations and from them gain an appreciation of the world of the great white heron.

– E. Curry

The World of The Opossum by James Keefe. Illustrated by Don Wooldridge. Lippencott. 144 pp. $4.95

Another of the Living World Series, this book deals with the natural history of the opposum. If one can overlook a split infinitive here and there, careless use of taxonomic terms and some minor errors in fact, and if he wishes to know more about opposums, this is the book to read.

There are some contradictions in the book. The opening paragraphs on pages 51 and 93 do not agree. Opossums are not always found in a streamside habitat. In Florida they are found out in the pine and scrub oak flats a mile or more from water. In San Diego County in California they have been trapped in Mason Valley in the desert, miles from a stream. In describing the opossum he states that the guard hairs are white. This is true for many opossums, but in Florida and California black opossums with white faces and light colored feet and distal portions of the tail are not uncommon.

However, the book makes a valuable contribution to the amateur naturalist's library. Its value is enchanced by the excellent photography of Don Wooldridge. – E. Curry

The World Of The Frog And The Toad by George Porter. Lippencott. 153 pp. $4.95

This is one of the "Living World Books" published by Lippencott. These are all beautiful books, good bindings, fine paper, well illustrated with excellent photographs, well reproduced.

The author of this book has observed thousands of frogs and toads in habitats scattered across the continent of North America. In his studies he has not limited his observations to frogs and toads, but includes all the creatures and plants in the world of frogs and toads. He takes the reader through the seasons describing the activities of the toads and frogs and the sights and sounds of the places inhabited by these vocal critters. He deals with eight species of frogs and eight of toads, twelve of tree frogs, four chorus frogs, two cricket frogs, four spade food frogs, the barking frog, greenhouse frog introduced from Cuba, the tailed frog of the Cascades, sheep frog and Eastern narrow mouthed frog. He has a delightful literary style which enables one to share his experiences. He closes the seasonal cycle with winter. This one quotation will give an idea of the pleasure in store for the reader. "A cold wind causes us to turn up our collars, and we walk away, leaving only our tracks behind. Our thoughts are with those animals under our feet, throughout the land and water, snugly and peacefully sleeping out the winter. Almost subconsciously we count the weeks ahead. First will come the spotted salamanders – then the wood frogs – then the peepers – then the toads – How many more weeks?"

The last chapters deal with photographing frogs and toads, keeping frogs in captivity, species and subspecies treated in the book with the classification and range and a bibliography which those whom the book stimulates to more serious study of frogs and toads will find valuable.

George Porter is the controller and assistant treasurer of the National Audubon Society. His concern for conservation is evident in the chapter on the care of frogs in captivity and the advice given. – E. Curry

Bluebirds In New York by Wayne T. Bell, Jr. This 12 page pamphlet is available at ten cents a copy from the Mailing Room, Building No. 7, Cornell University Research Park, Ithaca, N. Y. 14850.

For those who need information on the status of bluebirds and on the construction of nesting boxes, this is likely the answer.

Continued on page 10

BLACK-TAILED PRAIRIE DOG

Cynomys ludovicianus

This is the prairie dog of the low country, the White-tailed Prairie Dog being found in the mountains of the West. The Black-tailed is found in the central short-grass prairies, from Canada to Texas. A little smaller than a cat, they may be found on their bare mounds, each a foot or two higher than the surrounding prairie, and spaced 25 to 75 feet apart. The raised earth around the burrow helps keep water from flash floods (common on the flat prairies) from filling the main burrow. These tunnels often drop vertically into the ground for 12 to 14 feet, then run horizontally with several side chambers, where food is stored and family activities take place. This female is still nursing young. Once quite common, prairie dogs are now restricted to relatively undisturbed land, and their "towns" are much smaller than before.

Photo by Vernon Hicks
U. S. Soil Conservation Service

Provided by the Audio-visual Committee
American Nature Study Society
No. 27

(May be removed for display)

U. S. Soil Conservation Service

Richard B. Fischer

EASTERN CHIPMUNK

Tamias striatus

Although "ground squirrels" of several species are common in the West, the Eastern Chipmunk is the only species in Eastern North America. Easily tamed to eat from the hand, chipmunks are common around picnic grounds and gardens. Since they hibernate in the North they are seen only in the warmer months. Food consists of seeds, insects, young birds, garden bulbs, and other plant and animal material. They store great quantities in the burrows, which are often under stone walls or fallen logs. Note the facial stripes. The short ears are typical of burrowing mammals. Runs with tail straight up. Seldom seen in trees. Length 5 - 6 inches, tail 3 - 4 inches.

Photo by Richard B. Fischer

Provided by the Audio-visual Committee
American Nature Study Society
No. 28

(May be removed for display)

NATURE STUDY TIPS

Seven Steps for Developing an Outdoor School Area for Teaching Science-Conservation

PHYLLIS S. BUSCH
Director, Project S.P.R.U.C.E. (Science Project Related to Upgrading Conservation Education)

INTRODUCTION

Why Use the Area Outside Schools?

Much that is wrong with our planet today stems from man's indifference or from his ignorance of the results of technology, the application of science.

People must learn how all living things interrelate with each other and with their environment, how altering any one affects all others. People must learn to assume responsibility for human actions, avoiding those which produce undesirable results.

Such understandings should be developed in science and social studies where we can begin including conservation as an important part of those subject matter areas. This training can affect attitudes and values if started with the young and continued from then on.

Science helps us to learn about the objects and events in the universe. Surely the objects and events are not limited to a book, or a film or the inside of a classroom. The environment outdoors where many changes are going on, naturally as well as artificially, is as important a place to study, to learn about and to explore as in the indoors. In fact, at times it may be more important to study outside than inside.

Outdoor areas where children go are suitable places for study. The purpose of this guide is to introduce the outdoor area of any school as a place for children to study ecological relationships, to use processes of science for investigation, to experiment, to learn, and to develop a sense of responsibility. Thus the immediate area outside of a school becomes the pupils' outdoor laboratory. It is as easy to use an outdoor area as it is to open the door. Eventually, there will be no indoor education versus outdoor. Good education will include the total environment.

The work presented or reported herein was performed pursuant to a Grant from the U.S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education and no official endorsement by the U.S. Office of Education should be inferred. 1968. A Title III: E.S.E.A. Project, Pine Plains, N. Y. 12567. No. 38 in the Series

How to Proceed in Developing the Usefulness of an Outdoor Area

The *Seven Steps* which follow present a useful and tested guide so designed that any school can plan to develop and use its outdoor environment. A step by step procedure is outlined here.

Samples of Discovery Guides as techniques for outdoor investigations are presented next, followed by a list of selected references useful to teachers in this "indoor-outdoor" approach to teaching science-conservation.

Step 1 — Call a planning meeting:

a. Call a meeting to explain the concepts and plans for using the outdoor area outside any school as a laboratory for studying science-conservation. Present at this meeting should be the principal, teaching faculty, representatives from the PTA and Board of Education, the custodian and any interested members of the community.
b. Organize a working committee. This consists of principal, custodian, teacher representatives from each grade, representative members from the Board of Education, PTA, etc.

Step 2 — Survey the area:

a. Explore the area. This is carried out by as many of the appointed committee as possible. Others may be invited. List all resources in the area which have usefulness for teaching.
b. Locate teaching stations at appropriate spots.
c. Plan a trail which will connect the teaching stations. Urban areas may not have a woodland trail but resources need to be designated all the same and a "trail" planned just as carefully.

Step 3 — Mark the area:

a. Place a marker at each teaching station at a convenient place but above children's reach. Markers may be made from round canning lids. They are painted with white enamel, allowed to dry, then painted with numbers in black. When the numbers are dry, the lids are dipped in outdoor varnish. When dry, these can be nailed on posts with aluminum nails.

Where discs are not practical, varnish luggage tags and tie them onto a stake.

At some stations, such as a rock or a post, the number might be painted directly on the surface.

b. In those places where a trail has to be cut, the trail can be indicated by ribbons tied to appropriate places or by laying a string along the length of the trail. The trail should be about three feet wide except at teaching stations where six feet is recommended.

Step 4 — Produce written materials:

a. Distribute to each teacher a sketch of a sample map of the area upon which the trail and teaching stations are designated.
b. Prepare a descriptive outline of each teaching station.
c. Committees of teachers of each grade level draw up a list of problems which can be investigated outdoors. The stations where the investigations can be carried on are indicated next to each problem.
d. State concepts in science and conservation which children can develop as a result of the recommended investigations.
e. Develop some techniques for children to use such as discovery guides. (See section "Discovery Guides.")

Step 5 — Introduce the use of the outdoor area:

a. Hold a teachers' workshop and distribute copies of each of the five kinds of written materials prepared in the previous step (4).
b. Go outdoors and explore the trail, examining the possibilities of each station for solving problems as suggested. Consider access, safety, content, techniques, grade level, etc.

Step 6 — Evaluating:

a. Each teacher tests the materials provided with his class for a period of four to six weeks. They are tested for content, grade placement, feasibility, etc.
b. Each teacher notes suggestions for additions or deletions and corrections. Followup meetings are held, perhaps grade level meetings, to continue improvement of the written materials.

Step 7 — Produce the finished product:

The committee should examine all

recommendations made by the teachers and develop a completed Teaching Guide consisting of:

a. cover
b. title page
c. contents
d. map of outdoor area with stations
e. for each grade level a list of problems with stations indicated for solving each problem, a list of concepts which children can develop as a result of their experiences, and some recommended discussion questions.
f. Discovery guide techniques and other techniques.
g. selected references for the teacher

OUTDOOR DISCOVERY GUIDES

What a Discovery Guide Is:

It is an aid to individualizing inquiry. This technique may be used indoors or outdoors. When children go outdoors in the immediate environment of their schools and they have a problem to solve, they are going to manipulate something or observe or compare or carry on some process necessary to solve their problem. A discovery guide directs them to collect the kind of data which is needed. It avoids confusion. It reduces talking by the teacher to a minimum, allowing for individual attention.

Objectives of Discovery Guides:

1. To *foster* the natural curiosity which children have about the world around them.
2. To *guide* children to learn about their environment both indoors and outdoors by getting them involved in the process of finding out for themselves.
3. To *give* children a chance to appreciate science as a method of discovery through solving problems.
4. To *emphasize* the ecological approach by including studies in the physical and biological aspects of the environment.
5. To *help foster* the kinds of attitudes and appreciations which lead to understanding how a scientist works: to explore things in depth rather than superficially, to be accurate and unbiased, to collect sufficient evidence, not to jump to conclusions.
6. To *stimulate* interests and to develop skills which enable children to investigate for themselves.
7. To *develop* an understanding of the out-of-doors as well as of the indoors and possibly lead to interesting hobbies of various kinds.
8. To *create* an awareness that our resources are not restricted to soil, forests, fish and wildlife; but that they also include peace, quiet, clean air, clean water, space and beauty.
9. To *lead* children to the enjoyment of the esthetic beauties in the outdoors and to *explain* the privileges and duties each one has to make it possible for others to obtain the same enjoyment.
10. To *appreciate* conservation as it develops from an understanding of the ecological interrelationships in our environment and to recognize that man is part of this "web of life."

EXAMPLES OF FOUR DISCOVERY GUIDES

Description of the examples:

Four examples of discovery guides are presented as samples of the kinds of aids which teachers can develop to direct children to use methods of inquiry in problem-solving situations, in urban as well as in rural areas.

The first one is for use with a very young group, K or Grades one or two. It concerns investigating the variety of colors to be found among the flowers growing on the school lawn, in a weed patch, on a tree, in a window box, or at a florist's. The aim is to sharpen powers of observation. The teacher will probably explain the directions orally. The investigation may take two fifteen-minute outdoor sessions followed by the suggested discussions which are held indoors afterwards.

The second example of a discovery guide is designed for grades three or four and is especially suitable for urban areas although it is applicable to any paved area so that all rural schools can make use of this approach too. It deals with uses of artificial and manmade rock materials, all stemming from the earth's resources.

The third example is an outdoor discovery guide useful for a fourth or fifth grade planning an investigation of outdoor habitats which exist near their school. The guide is printed so that when the sheet is folded along the dotted lines a small handy booklet is made. This is convenient for carrying and using in the field. Since instruments (thermometer, compass, magnifier) are used which are time-consuming, two sessions might be provided for the habitat investigations outdoors. Two indoor sessions for the suggested discussions might follow.

The fourth discovery guide, recommended for a fifth or sixth grade is for the indoors and outdoors. The "seed packages" should be collected outdoors. The number of sycamore balls and milkweed pods should be counted at the same time that the collections are made. Sycamores are commonly planted in urban areas. The number of these per plant might be counted outdoors. The careful counting of seeds is then carried on indoors, followed by interpreting the data in a series of discussions.

Books

Ashbaugh and Beuschlein. **Things to Do in Science and Conservation.** Interstate Printers and Publishers, Inc., Danville, Ill. 1960.

Brown, Vinson. **How to Explore the Secret Worlds of Nature.** Little, Brown and Co., Boston. 1962.

Busch, Phyllis S. **Lions in the Grass, The Story of the Dandelion, a Green Plant.** World Publishing Co., New York. 1968.

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Carvajal, Joan, and Munzer, Martha E. **Conservation Education, A Selected Bibliography.** Interstate Printers and Publishers, Danville, Illinois. 1968.

Conservation Foundation Audio-Visual Center. **A Critical Index of Films and Filmstrips in Conservation.** Conservation Foundation, 1250 Connecticut Ave., N.W., Washington, D.C. 20036.

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Stapp, William B. **Integrating Conservation and Outdoor Education into the Curriculum (K-12).** Burgess Publishing Co., Minneapolis, Minnesota 55415. 1965.

Youngpeter, J. M. **Winter Science Activities.** Holiday House, New York. 1966.

Bulletins, Periodicals and Visual Aids

Audubon Bulletin, National Audubon Society, 1130 Fifth Avenue, New York, New York 10028.

CF Letter. Report on Environmental Issues from the Conservation Foundation, 1250 Connecticut Avenue, N.W., Washington, D. C.

Conservation Education Bulletin from Conservation Foundation, 1250 Connecticut Avenue, N.W., Washington, D. C.

Conservation in the City (underfoot, eye-level and overhead). Filmstrips on conservation for primary grades by Phyllis S. Busch with teaching guide. Encyclopaedia Britannica Educational Corporation, 452 No. Mich. Ave., Chicago, Ill. 60611.

The Conservationist. State of New York Conservation Department, Room 339, State Campus, Albany, New York 12226. Subscription $1.00 per office year if mailed to elementary school.

Cornell Science Leaflets. Stone Hall, Cornell University, Ithaca, New York 14850. $1.00 per year or 25¢ per issue.

Curious Naturalist, Massachusetts Audubon Society, Lincoln, Massachusetts 01773. 10 issues $2.00, bulk rate $1.25.

Nature and Science, Natural History Press, Garden City, New York 11531. $3.50 per year, bulk rate $1.95 per school year.

Nature Study (including Nature Study TIPS and PHOTOS), American Nature Study Society, R. D. 1, Homer, N. Y. 13077. $5.00 per year. (Includes Cornell Science Leaflet)

Ranger Rick's Nature Magazine, 381 West Center Street, Marion, Ohio 43302. $6.00 per year (published by the National Wildlife Federation, 1412 16th St., N.W., Washington, D. C. 20036).

Science and Children, The National Science Teachers Association, 1201 Sixteenth St., N.W., Washington, D. C. 20036. $4.00 per year.

An Approach to School Site Development (19 min., sound, color, 16mm). International Film Bureau Inc., 332 South Michigan Ave., Chicago, Illinois.

EXAMPLES OF FOUR DISCOVERY GUIDES

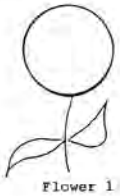
EXAMPLE 1 -- (For Kindergarten, Grade One, and Grade Two)

NAME _____

INVESTIGATION: What colors are the flowers outside?

1. Find a flower which is in bloom. Do not pick it. Which of your crayons makes a color that looks like the flower? Color this circle with that crayon.

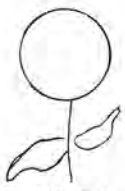
2. Now color the leaves with the crayon which looks most like the leaves of this plant.



Flower 1

3. Find four (4) more flowers, each of a different color. For each of these four (4) flowers pick out matching crayons and color a circle and the leaves.

Flower 2



Flower 3

Flower 4

Flower 5

DISCUSSION:

1. Which parts of these five (5) flowers are the same color?
2. Which parts are different colors?
3. How can we use flowers to make our school look more attractive?

EXAMPLE 2 -- (For Grades Three and Four)

NAME: _____ Grade: _____

TEACHER: _____ Date: _____

Problem: What kinds of hard areas are there around the school?

Materials: Pencil, Clip-board for guidesheet, a small plastic bottle of warmed vinegar with medicine dropper or weak hydrochloric acid.

1. Walk around the school. Examine buildings as well as what is under your feet. Place a check next to every hard surface which you discover. Write in any that you find but which have been omitted from the list.

A concrete pavement or sidewalk	___
A stone sidewalk or pavement	___
A brick pavement or sidewalk	___
A gravelled path or pavement	___
An asphalt path or pavement	___
A path paved with wooden planks or blocks	___
A pavement of hard-packed earth	___
Any other kind(s)	_____

2. Which of the materials are natural? (in the same form as they occur in the earth)

_____

3. Which are artificial? (not in the same form as they occur in the earth)

_____

4. Which have limestone products in them?

_____

Discussion Questions:

1. How are manmade rocks different from natural rocks? What materials which are natural, are used in artificial rocks?
2. Why are artificial rock materials used?
3. From where will more natural rock materials come after all that there is in the earth is used up?
4. Which materials from the earth are used to ornament buildings?
5. Why is glass being used more and more in constructing large buildings? How is glass made?
6. Could you design a more attractive use for both the natural and artificial rocks which you have observed?

EXAMPLE 4 -- (For Grades Five and Six)

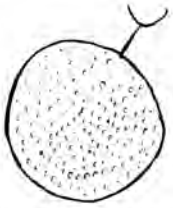
Name: _____ Teacher: _____

Date: _____ Grade: _____

I.

Problem: How many seeds does one sycamore tree produce?

1. Locate a sycamore tree. Count the number of balls.



Sycamore balls

A. ☐ Number of Sycamore balls on one tree.

2. Find one ball on the ground. Indoors, count the seeds. Make a check for every 20 seeds which you count.

☐

Checks for sycamore seeds (Each ✓ = 20 seeds)

3. Multiply the number of seeds by the number of balls on the tree. About how many seeds does one tree produce?

B. ☐ Number of sycamore seeds on one tree.

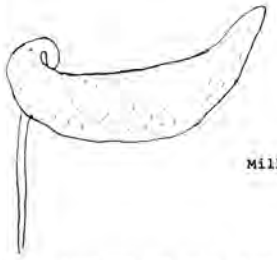
Name: _____ Teacher: _____

Date: _____ Grade: _____

II.

Problem: How many seeds does one milkweed plant produce?

1. Locate a milkweed plant. Count the number of pods.



Milkweed Pod

A. ☐ Number of milkweed pods on one plant.

2. Find one pod on a plant. Indoors, count the seeds. Make a check for every 20 seeds which you count.

☐

Check for Milkweed seeds. (Each ✓ = 20 seeds)

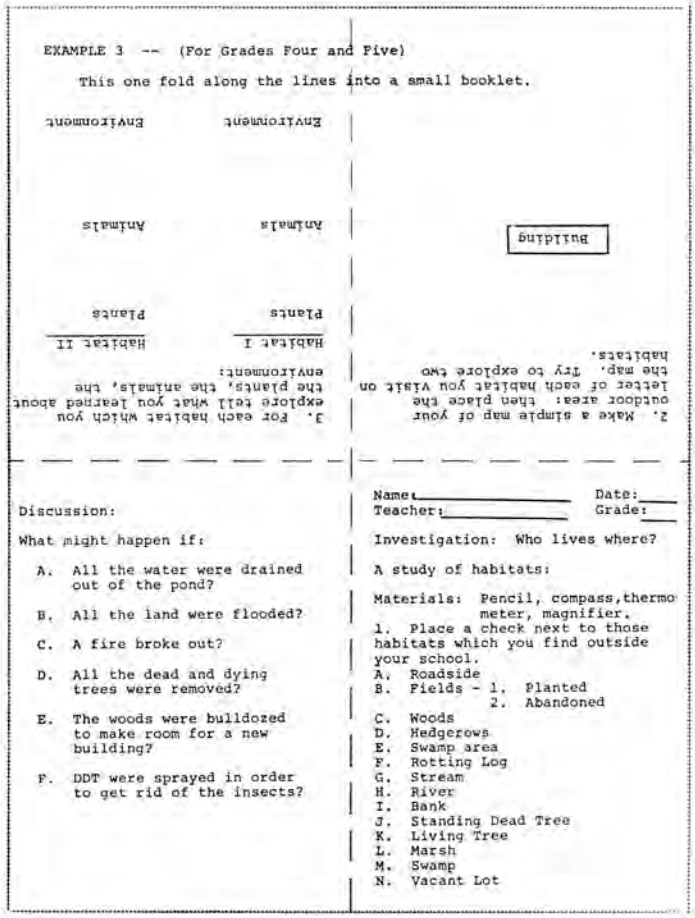
3. Multiply the number of seeds by the number of pods on the plant. About how many seeds does one plant produce?

B. ☐ Number of milkweed seeds on one plant.

Discussion:

1. Why isn't the world full of sycamore trees or of milkweed plants?
2. How does the habitat of one compare with the other?
3. How near to one sycamore is the next?
4. How near to noe milkweed is the next one?
5. Which plant requires more room?
6. How does the sycmore effect other life around it? How is it affected, in turn?
7. How does the milkweed affect the landscape? Other life around it? How is milkweed affected?

Example 3 on next page



EXAMPLE 3 -- (For Grades Four and Five)

This one fold along the lines into a small booklet.

Environment | Environment

Animals | Animals

Building

Plants | Plants

Habitat I | Habitat II

2. Make a simple map of your outdoor area: then place the letter of each habitat you visit on the map. Try to explore two habitats.

3. For each habitat which you explore tell what you learned about the plants, the animals, the environment:

Name:_____ Date:____
Teacher:_____ Grade:____

Investigation: Who lives where?

A study of habitats:

Materials: Pencil, compass, thermometer, magnifier.

1. Place a check next to those habitats which you find outside your school.
   A. Roadside
   B. Fields - 1. Planted
      2. Abandoned
   C. Woods
   D. Hedgerows
   E. Swamp area
   F. Rotting Log
   G. Stream
   H. River
   I. Bank
   J. Standing Dead Tree
   K. Living Tree
   L. Marsh
   M. Swamp
   N. Vacant Lot

Discussion:

What might happen if:

A. All the water were drained out of the pond?

B. All the land were flooded?

C. A fire broke out?

D. All the dead and dying trees were removed?

E. The woods were bulldozed to make room for a new building?

F. DDT were sprayed in order to get rid of the insects?

PRESIDENTIAL ADDRESS

(Continued from back cover)

hundreds of nature centers can promote short courses and training locally. Materials, comparable to those produced by the National Audubon Society for its junior programs, can be devised and produced cooperatively, involving the talents and resources of not only ANSS and N.A.S., but the federal Office of Education, The National Education Association, The National Wildlife Federation, the great natural history museums, the Nature Centers, the National Park Service, The Bureau of Outdoor Recreation, the Association of Interpretive Naturalists, 4-H (now moving into "Youth Services"), the Ecological Society of America, the Conservation Foundation, the Nature Conservancy, the several outdoor education organizations, The Association of Soil Conservation Districts, the National Council of State Garden Clubs, Inc. and those professional organizations involved with resources and resource management, including planning and landscape architecture.

I see the desirability of a national meeting of the organizations I have enumerated for the purpose of exploring cooperative efforts to step up teacher training. The Natural Resources Council (composed of some forty organizations, including more recently CEA and AIN) does have an Education Committee. This Council has power in national circles and might consider a well-couched proposal emanating from ANSS for an exploratory workshop.

Fifth, and last, I plead that Nature Study be *enjoyable*. That is, taught in a way that children are attracted to it and can engage in it with the spirit of freedom of discovery. In its ultimate, I see Nature Study as another quest for the meaning of Beauty.

GOOD READING

Continued from page 6

The Appalachian Trail, by Ann and Myron Sutton. Lippencott. 188 pp. $4.95

Here is a book for all hikers, ex-hikers, hikers-to-be and lovers of the out of doors. The book is the result of the personal experience of the authors who are veteran hikers. Mr. Sutton is Assistant Chief, Division of International Affairs, National Park Service. Ann Sutton, his wife is a geologist.

The book is more than a description of the trail, its geology, plants and animals, history, and advice to those who would hike it. What makes it of lasting value is the philosophy of the authors. This is what will make one read and reread the book. Here is a sample, "There are bright days when the sun pours its energy into the leaves, and the hikers, watching this, grows as the leaf grows, expanding time and space and comprehension. He walks among the trees; he becomes part of the natural world, for he walks in epic strides himself, and his troubles fall a step or two behind him. It is then that he is in tune with wilderness."

This is another beautiful Lippencott book. The texture and quality of the paper, print and fine reproductions of the author's photographs enchance the fine writing. — E.Curry

Hill Country Harvest by Hal Borland. Lippencott.

If this were the only book Hal Borland had written he would be worth considering for an award for nature writing. It is, however, his 24th. Added to this book are numerous magazine articles. The quality and quantity of his writing, in the opinion of this reviewer, makes him a fitting candidate. "Hill Country Harvest" is based on a series of weekly columns written over the past ten years for the Berkshire Eagle in Pittsfield, Mass. He has arranged the articles in a seasonal sequence so that one follows the pattern of his observations through the year in the Berkshire Hills. In Borland's words the book "is a running account, salted with opinions and flavored with convictions, of life here in a somewhat remote corner of New England. And, since it reflects life as I know it, there are trifles here too, nonsense and tomfoolery and japery. Life would be intolerably dull and depressing without them." The result is a book to cherish, to dip into, to open at any page, to read for a few minutes or hours, to enjoy over and over again. Each essay is a jewel, perfect in itself. Hill Country Harvest will take its place with other great works in the literature of nature.

— E. Curry

Imperial Collection of Audubon Animals. Edited by Victor H. Cahalane. Hammond, Inc., Maplewood, N. J. 07040. 307 pp. $25.00

While many associate the name of Audubon with birds, yet the great painter likewise gave attention to other groups including the mammals. After completing the "Birds of America" he gave increased attention to the preparation of "The Viviparous Quadrupeds of North America." This new addition with a text by Victor H. Calahane, formerly chief Naturalist of the National Park Service promises to become a collector's item.

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The Wonders of Nature by Coe, Ferguson and Jensen, Grosset and Dunlap, New York.

This is an elementary book divided primarily into three parts: mushrooms, ferns and mosses by Elizabeth Jensen; Wild Flowers by Grace F. Ferguson, and Trees by Geoffry Coe. There are sections of activities such as collecting mushrooms and making spore prints; collecting ferns and other activities; collecting and studying mosses; and making a terrarium. There are numerous illustrations.

NEWS and NOTES

The Florida Audubon Society is saving cancelled commemorative stamps which they sell to dealers and use the money for Bald Eagle research. Here are directions: Save only cancelled commemorative stamps, or any of the common issues over 40¢. Do not save Christmas stamps. Also do not save any of the commonly used stamps of such nations as Germany, England, France, or Australia. Leave a wide margin around the stamp when cutting them from the envelope. Dealers will not buy stamps with torn perforations or those that have been folded or thinned. Send them to: Florida Audubon Society, P. O. Drawer 7, Maitland, Florida 32751.

"02", Noted Owl, Dies

The captive Great Horned owl, used by Dr. Paul Fluck of Washington Crossing State Park in Pennsylvania, died in Lakeland, Florida, in early December. The bird, brought to Dr. Fluck after having been shot early in its twelve years of life, was unable to fly. It had been seen and petted by an estimated 135,000 persons in the ten years of its captivity at Washington Crossing Park. Dr. Fluck, an active ANSS member, has maintained a unique conservation education program at Washington Crossing Park for many years.

Mrs. M. A. Snyder Gets Action

Mrs. Michael Snyder of Brownsville, Pennsylvania, has succeeded in getting the State Legislature in Pennsylvania to set aside the first day of spring as Bird Day each year. Mrs. Snyder is an active member of ANSS, and gave valuable assistance to President-Elect Ruth Scott in her work of preparing the recent program at Dallas. Members in other states might encourage their governments to establish a similar day of recognition for the value and importance of birds in our lives. In a congratulatory letter to Mrs. Snyder, Congressman John D. Dignell wrote: "This nation badly needs people concerned with the future, wise use of our resources and preservation of our fish and wildlife resources. We in Congress who are interested in this great endeavor, cannot effectively carry forward our responsibility in this particular without the invaluable assistance of diligent leadership and effective support from the people of this Nation. This is why your labors and those of many others like you are indispensable."

New Section Recognized

A new section of ANSS has been formed in Utah. The Utah Section was recognized by the Board of Directors at the meetings in Dallas in December. There are approximatey twenty ANSS members in Utah. The Utah Section will be actively affiliated with the Western Division of ANSS.

Groups of ANSS members in other states or regions are encouraged to form regional or state sections, to better carry out the purposes of the Society.

Cornell Science Leaflet Packets Available

Dr. Verne Rockcastle, editor of the *Cornell Science Leaflet*, has announced the availability of five packets containing forty-one leaflets at reduced prices while they last. Order your packets directly from the *Cornell Science Leaflet*, Mailing Room, Building Seven, Research Park, Cornell University, Ithaca, New York 14850. The packets are as follows:

Packet A (Plants and Animals) – 10 leaflets – $2.00

Packet B (Physical Sciences) – 10 leaflets – $2.00

Packet C (Environmental Studies) – 11 leaflets – $2.00

Packet D (Inquiry Studies) – 5 leaflets – $1.00

Packet E (Supervisor's Special) – 5 leaflets – $1.00

WHAT LEVEL OF LIFE?

Continued from page 4

today, were made available to the Congress and the public, serving both the educational and ultimately, the legislative role. It is a most encouraging fact that the Congress is as sensitive as it is to this set of problems and it is our job to see that this sensitivity is reinforced with real understanding at all levels of government.

Common Law

The third realm, one that we seem to have exploited only in small degree, and one that appears to offer to connect science to human affairs much more sensitively than heretofore, is the realm of the common law. This, of course, is the law that is developed by the courts. Extensive use of the courts to develop laws defining human rights in environment might require an amendment to the Constitution, but such an amendment requiring as it does approval by 2/3 of the Congress and ratification by ¾ of the States would stimulate unprecedented interest and discussion and, if passed, constitute a mandate for progress. It would provide for the growth of the common laws regulating environment in some proportion as population and technology grow, a possibility that exists at present only in very limited degree. What better forum is there to discuss and determine the relationships of science and human affairs than the courtroom, operating as it does under a rigorous protocol and offering the test of cross examination? A limited attempt has been made in this direction by the Environmental Defense Fund during the past year with results that are, if not totally successful, certainly salutary in their broadest aspects, including their effect on public education. These attempts require much greater attention and much more financial support than they have received to date.

No degree of cleverness, no further proliferation of government, no educational, legislative, and no technological or agricultural program can long mitigate the environmental crisis without a deliberate and effective program for establishing an equilibrium between population and resources, thus breaking the exponential curves that have described the rate of development of this crisis so far. The challenge is a major one, perhaps the ultimate one, for conservation, for education, for legislation, for the courts, for government, for business, and for each one of us.

Dick Fischer Honored

Richard Fischer, well known in ANSS circles, was recently named the Conservation Educator of the Year in New York State. The New York State Conservation Council, the National Wildlife Federation, and the Sears Roebuck Foundation made the awards at a ceremony in Rochester. Dr. Fischer has conducted a teachers workshop in conservation education at the Arnot Forest near Ithaca for fifteen years. He has also been the featured nature educator in the extension training program of the Rose Tree-Media Schools of suburban Philadelphia, Pennsylvania. He is also the science editor of the McGraw-Hill Book Company's "Living World of Nature Series," and is a contributing editor to "Ranger Rick's Nature Magazine" for children. At Cornell, where he is professor of nature education, he teaches a course in nature literature and writing, and has encouraged a number of his students to write and publish in NATURE STUDY.

New Conservation Education Guides Available

"People and Their Environment" is a series of eight graded curriculum guides designed to help teachers develop a program of conservation education as an integral part of a school's existing curriculum.

Written by teachers for teachers, these guides were developed as the *South Carolina Conservation Curriculum Improvement Project*. They have been used experimentally in classrooms throughout the United States and reviewed by departments of education in all 50 states, and by curriculum committees in several foreign countries.

They offer a unique program of action – a series of curriculum experiences relating to all areas of conservation: natural resources, human resources, sociological resources, and economic resources. They apply to various subject areas and cover all levels of education from grade one through twelve.

To obtain these guides, write to: J. G. Ferguson Publishing Company, Six North Michigan Avenue, Chicago, Illinois 60602.

Susquehanna Conservation Council Gets Action

ANSS member Nancy Ayers reports significant conservation progress in Broome County, New York, during 1968. Under her leadership, the Susquehanna Conservation Council succeeded in getting a County Conservation Commission established. The Commission is authorized to recommend and give advice to the county government regarding conservation matters. Recently the Commission sent a letter to the Chairman of the County Board of Supervisors, recommending the establishment of a study committee to establish conservation education programs and nature study sites throughout the county. The Commission said it visualized an informal facility directed primarily at grade-school children. The Council also urged that the Board of Cooperative Educational Services inaugurate a program of conservation education in grades K through twelve, and employ a science coordinator with special training in conservation education.

New Student Rate

At the recent Board meetings in Dallas, the rate for student membership in ANSS was raised to $3 per year. Also, students will be asked to give their permanent home address, rather than their school address. It is costly and difficult to keep school addresses up to date.

Welcome New Members

Alan M. Anderson, Shelbyville, Ill.
The Baker Brothers, Christchurch, New Zealand
Mr. and Mrs. T. Blasko, Brookside, N. J.
Don Cole, Oak Park, Ill.
Miss Marrienne Cole, Edgewood, Md.
Gordon W. Dalton, Salt Lake City, Utah
Dominican College Library, Houston, Texas
Everglades Natural History Assoc., Homestead, Fla.
Janet Harkenrider, Ithaca, N. Y.
Daniel Hart, West Cornwall, Conn.
Miss Marion Kurath, Waukegan, Ill.
Dr. K. Kuruvilla, Kerala State, India
Joseph Lipson, Nova University, Fla.
Miss Victoria Lundquist, Stillwater, Minnesota
Ralph H. Lutts, Boston, Mass.
Terry Pearl, Camillus, N. Y.
Richard C. Rosche, Bernardsville, N. J.
Mrs. Adelaide Rozelle, Bellefonte, Pa.
William N. Saha, Fritch, Texas
Tim Sares, Deerfield, Ill.
Prof. Albert Schatz, St. Louis, Missouri
Paul Smith, Grosse Point Farms, Mich.
Steve Tan, Whitewater, Wisconsin
Mrs. Dolla C. Weaver, Topeka, Kansas
Miss Katherine W. Zahl, Corvallis, Ore.

Zim To Go To India

Dr. Herbert Zim, well known author of the Golden Nature Guides, will represent ANSS at the IUCN meetings in India this spring. ANSS has given active support to the IUCN for many years, and has been represented at each of the triennial meetings of the organization.

Help Save Allerton Park

Conservationists in the Midwest are hard at work to prevent the construction of the proposed Oakley Dam on the Sangamon River just upstream from Decatur, Illinois. The construction of this dam would flood an extensive area in Allerton Park, a recreation area made from one of the most beautiful estates in the middle West. Over 600 of the park's 1500 acres would be flooded to an average depth of five feet of water. Fifty-two percent of the forest area in the park would be destroyed including all the lowland areas. These lowland areas now form a natural habitat for many species of trees, wildflowers and wild life.

Senator William Proxmire of Wisconsin has strongly opposed the Oakley Dam project. His amendment to delete an appropriation of two million dollars for land acquisition on the site was defeated when Senator Dirkson of Illinois approved the project.

Senator Proxmire carefully noted the benefits and deficiencies of this project, and called it "a pork barrel" boondoggle of the most blatant kind."

Mrs. M. H. Cole of Deerfield, Illinois, an active ANSS member, urges interested persons to write to Senators Dirkson and Percy of Illinois at the Senate Office Building, Washington, D. C. 20510. She will be glad to provide additional information – write to her at 1224 Norman Lane, Deerfield, Illinois 60015.

ENVIRONMENTAL CRISIS

(Continued from page 2)

lands biome" has been given top priority, and this will serve as a prototype for the development of the 5 others which are presently in a planning stage. These are: deciduous forest, desert, coniferous forest, tundra and tropical forest. The last will probably involve cooperation with biologists of several Latin American countries in a coordinated effort with U. S. scientists.

The IBP, as such, is planned for only 5 years, ending in 1972. However, there are few associated with the exciting new biology represented by the ecosystem analysis studies who doubt that we are seeing the development of programs that will extend far beyond that date. Many far-sighted people in our Congress, like George Miller of California, Chairman of the House Committee on Science and Astronautics; Emilio Daddario of Connecticut, Chairman of the Subcommittee on Science, Research and Development, and their counterparts in the Senate have called attention to the problems of environmental degradation and are seeking solutions before it is too late. The IBP studies promise to provide baselines for use in arriving at such solutions. The important researches contributory to this effort developed under the IBP may well be continued under a National Institute of Ecology, modeled after the National Center for Atmospheric Research. Ecologists have been laying plans for such a center for the last few years. Congressman Daddario has taken interest in the possibility of such a center, funded in part by Federal funds but independent of the strictures of governmental bureaucracy.

The IBP thus promises to provide the umbrella under which we develop the technological capacity for environmental management in a way that will not promote its continued degradation. Since the problems of environmental quality are global ones, it behooves us to continue and expand the cooperative efforts originated under the IBP, to develop global systems for environmental monitoring and to aid the less developed countries to improve their capabilities in this respect. We are starting very, very late. Hopefully, we are not too late.

Presidential Address:

Nature Moves with the Times

DOUGLAS E. WADE
Northern Illinois University

Today, where is there a place on Planet Earth, from the tallest mountain top to the deepest canyon of the oceans, that has not been modified to a lesser or greater degree by activities of human beings?

Consider, for example, atomic fallout and derivatives of certain pesticides. Is it not known that these have attached themselves to tiniest and largest flows of water and dust particles and penetrated every major ecosystem of the world? This distribution has occurred over the past twenty-three years.

In large dosages, fallout and certain pesticides can be considered effective "killing factors." When fanned out in an ecosystem, they act as "influences," insidiously affecting many plants, animals and human beings in ways still not precisely defined, but nevertheless suspect. Thus nature has surely changed (moved) with the times.

On another front, the cities, we are slowly and painfully responding to vast and dramatic happenings in natural ecosystems induced by input-output activities of large populations of human beings. In some megalopolis developments, nature has not only moved with the times but has been reduced to a cesspool. Caught up in this ecological travesty are millions of citizens. To the politico-socio-economic struggles of cities, we surely must add ecologic dysfunctions.

The late William Vogt, in his brilliant book, *Road to Survival* (Sloane, 1948), gave emphasis to the relationships between human populations and natural resources. He urged that we realize that we live on the earth in an ecological as well as a political way. His candid remarks on birth control raised a howl heard worldwide.

Again, on a worldwide basis, you get a sense of the impact on environments that comes from the ever-increasing mobility of man and his traveling companions – plants, animals and viruses. Charles Elton describes this well in his intriguing book, *The Ecology of Invasions* (Wiley & Sons, 1958).

Elton devotes two chapters in his book to conservation and qualifies conservation actions as leading to "modified man in a modified environment." He cautions that we are now in a position in much of the world of having to be aware of *what* we wish to modify (change or eliminate) and *when* and *where* and *how*.

In North America and elsewhere in the world, many so-called "conservation battles" are being fought on these lines of *what, when, where* and *how*. These are universal battles and apply to every human enterprise.

There are other man-induced factors and influences exerting pressures and changes in environment. In the various sessions of this AAAS meeting and other recent meetings, you have heard one recital after another of changes invoked by activities of human beings. I need not repeat these reports; by now you are aware of most of them. However, I urge you to review the literature of "earth as modified by human action." I recommend two recent publications: *Future Environments of North America* (Natural History Press, 1966) edited by F. Fraser Darling and John P. Milton and *From Sea to Shining Sea. A Report on the American Environment – Our Natural Heritage* (Gov't Printing Office, 1968) by the President's Council on Recreation and Natural Beauty.

But here, at this 60th year meeting of the American Nature Study Society, you are probably asking (and so am I): "What has Nature Study to do with all this talk of modification?"

My reaction to this question is probably too simple, but I shall try to give an answer.

First, I feel that Nature Study has the distinct advantage of enabling children to relate directly to environment.

Second, I still see the validity of Nature Study in public school systems, especially in pre-school and grades K through 6. (If nature study carries over into adulthood and sustains certain qualities of life – awareness, discovery, perception, curiosity, courage, and the seeking of Beauty, so much the better.) I believe it was at a AAAS meeting two of three years ago that a leading zoologist from the University of California made a statement that unless a child got some exposure to nature study before grade six, his chance of getting it in future years of education, on through intermediate and senior grades and college, was probably nil. This scientist, was in effect, saying, "Before we run, we must learn to walk, before we walk, we must learn to crawl." He was also supportive of teaching Nature Study in the elementary grades.

Third, I recommend an in-depth examination of the role of Nature Study in the context of current educational programs and projections. Then we need to follow up with the development of imaginative teaching-learning sequences geared at first to home localities.

Searches for innovative improvements should extend world-wide, involving the strengths of such organizations as the International Union for Conservation of Nature and the professionalism of curriculum specialists. There is much to learn from nations and cultures, from the history of mankind, from cultural turmoils, and from the probes of communication and science that seem to characterize life today.

Fourth, if Nature Study is to be effective in the formal school systems of the Nation, there must be trained teachers. At this moment, I doubt if any one of us here knows the extent of what training is being offered and where. My guess would be very little. This lack imposes a tremendous challenge and Nature Study may be forced to ride on the coattails of more favored conservation, outdoor and environmental education. But, to date, all three of these lack an innately substantive body of knowledge and, in general, are not fully geared up to teacher training needs. Nature Study does, fortunately, possess a considerable body of knowledge which in part, historically, has branched off into a large number of sophisticated sciences.

If America can spend over a billion dollars on one flight to the moon, then I can see the need for allowing the children of America their chance to do a little "flying" but in a less erudite way through Nature Study.

All is not lost, however. There are indications that the National Audubon Society intends to step up its educational programs and perhaps start new ones. A modest number of teachers may be able to obtain some training and background through improved accreditation cooperation with Audubon Camps. The larger teacher training institutions can fortify or re-institute modernized Nature Study courses (including extension courses) aimed at elementary education majors. The

(Continued on page 10)

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THE RIPPLES WIDEN

At the December meetings in 1967, ANSS co-sponsored a symposium (with other science teaching societies) at which Prof. LaMont Cole of Cornell spoke on the environmental crisis facing the world. **The New York Times** printed the speech in its March 31, 1968 Sunday magazine section (entitled "Can The World Be Saved?"), and it also appeared in **Bioscience** in July, 1968. The ripples (or should they be called waves?) of the speech continue to be felt, as more and more people take up the alarm. The well-attended environmental pollution sessions at the 1968 AAAS meetings attest to the growing concern. In December a detailed report on the effects of a proposed nuclear/thermal power plant on Cayuga Lake gave credit to Cole's article for stimulating public interest in the project. Dr. Cole is the newly elected president of the American Institute of Biological Sciences. Although ANSS has traditionally worked for environmental education through the schools, the present urgent need is for broad public education of adults — and we welcome every opportunity to make use of the papers delivered at our annual meetings to this end. Note that **Nature Study** may be quoted or reprinted freely. The only provision is that credit be given.

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