Organization of Inland Biological Field Stations

Newsletter
No. 19
July 1974

OIBFS

Organization of Inland Biological Field Stations

NEWSLETTER #19

July - 1974

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Fall - 1974 Meeting
Late October - Early November

Where: Kellogg Biological Station, Hickory Corners, Michigan 49060

Who: Dr. George Lauff, Director, Kellogg Biological Station

What: Two or three days of meetings and a tour of the facilities at the Kellogg Complex (Biological Station, Farm, and Bird Sanctuary). Plenty of "Station Talk" and Good Food. Don't miss it.

Information on the dates and the final program will be mailed out shortly.

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REPORT ON FEBRUARY - 1974 MEETING

Message from the President: July 2, 1974

Although I consider all meetings involving directors of field stations to be enjoyable and often significant, our last meeting of February, 1974, possessed an equal portion of both ingredients. New directions and orientations were formulated for OIBFS, including active participation from a signigicant sector of our membership. This revival will undoubtedly strengthen the objectives of the Organization of Inland Biological Field Stations, and provide a vehicle for exposure of our activities and attributes to the scientific community. In many ways the setting of the Pacific Marine Station at Dillion Beach, California, added to the excitement of the new thrust, and the hospitality expressed to OIBFS from Ed Smith and staff of the University of Pacific, and others was directly responsible for our enjoyment. To these individuals the OIBFS expresses our appreciation.

Sincerely,

Dr. Loren G. Hill
President, OIBFS

MINUTES OF THE 1974 ANNUAL MEETING

The Eighth Annual Meeting of the Organization of Inland Biological Field Stations was convened at 9:00 a.m., on February 24, 1974, at the Pacific Marine Station of the University of the Pacific, at Dillion Beach, California.

Attendance:

Members:

James R. Barnes, Utah Lake Research Station, Brigham Young University Provo, Utah.
Robert C. Dalgleish, The E. N. Huyck Preserve, Inc., Rensselaerville, N. Y.

Robert Ediger, Eagle Lake Biological Station, Chico State College, Chico, California

Robert L. Fisher, Department of Biology, Juniata College, Huntingdon, Pa.

Richard T. Hartman, Pymatuning Laboratory of Ecology, University of Pittsburgh, Pittsburgh, Pa.

Charles E. Herdendorf, Stone Laboratory, Ohio State University, Columbus, Ohio.

Loren G. Hill, Biological Station, University of Oklahoma, Norman, Okla.

Gordon W. Hodgson, Environmental Sciences Centre, University of Calgary, Calgary, Alberta, CANADA

George H. Lauff, W. K. Kellogg Biologicial Station, Michigan State University Hickory Corners, Michigan

Oscar H. Paris, Jackson Hole Biological Research Station, University of Wyoming, Laramie, Wyoming.

David F. Parmelee, Field Biology Program, University of Minnesota, Minneapolis, Minnesota.

Edmund Smith, Pacific Marine Station, University of the Pacific, Dillon Beach, California.

Guests:

James Blake, Assistant Director, Pacific Marine Station, University of the Pacific, Dillon Beach, California.

Gordon Enk, Director, Environmental Studies, The Institute on Man and Science, Rensselaerville, N. Y.

Roger J. Lederer, Eagle Lake Biological Station, Chico State College Chico, California

guests cont.

Steven Obreski, Pacific Marine Station, University of the Pacific, Dillon Beach, California.

Felix J. Rimberg, The Institute of Ecology, Washington, D. C.

William Sievers, Division of Systematics and Ecology, National Science Foundation, Washington, D. C.

Agenda:

Saturday, February 23, 1974

Welcome address by Dr. Otis Shao, Dean of the Graduate School, University of the Pacific, Stockton, California.

THE PROPOSED SYSTEM OF NATURAL RESEARCH SITES
Discussants:
George H. Lauff, Kellogg Biological Station

Felix J. Rimberg, The Institute of Ecology

William Sievers, The National Science Foundation.

RESEARCH AND RESEARCH OPPORTUNITIES OF THE PACIFIC MARINE STATION

Edmund H. Smith, Director, Pacific Marine Station

James Blake, Assistant Director, Pacific Marine Station.

CRUISE AND SAMPLING OF TOMALES BAY, ABOARD THE RV CALIFIA

TOUR OF PACIFIC MARINE STATION

Sunday, February 24, 1974

Continuation of discussion on the proposed system of natural research sites.

BUSINESS MEETING OF THE ORGANIZATION OF INLAND BIOLOGICAL FIELD STATIONS.

President Loren Hill called the meeting to order at 8:30 a.m. The minutes of the 1973 Annual Meeting, published in Newsletter #18 were unanimously approved as read by the Secretary. In reviewing the activities of the past year, the president advised the membership that the booklet, PHILANTHROPY AND THE ENVIRONMENT, by William G. Wing, had been purchased from The Conservation Foundation, and was

distributed to all OIBFS members. It was the consensus of those present that this booklet was of general interest, and other literature found to be of relevance to the membership, should be either distributed or brought to the attention of all members. President Hill then reported on a meeting he attended, on December 6 and 7, 1973, in Washington, D. C., where the Presidents or President Elect of 44 biological societs met with the Executive Committee, Past Presidents, and Staff of the American Institute of Biologicals Sciences. One of the purposes of the meeting was to acquaint the society presidents with AIBS, its history and programs. (A complete report of the Society Presidents Meeting was published in the April issue of Bioscience.) The discussion focused on how AIBS can better serve its adherent societies, members and the biological sciences. The objectives and activities of the AIBS Public Responsibilities Committee were explained as including:

1. The appointment of a biologist as an AIBS Public Responsibilities representative in each of the 50 States. It is the duty of this individual to contact his State's Congressmen, his governor and State Legislators on any issue developing in Washington which impinges upon biology.
2. The concerns of scientists over the abolition of the Office of Science and Technology have been expressed to the President of the United States. Several alternatives have been proposed which would enable scientists' voices to be heard.
3. Strong objection has been made about the lack of representation of biologists on the National Science Board of the National Science Foundation. It is likely that this condition will be corrected in 1974-75.
4. A Council has been established by the Director of the National Science Foundation in response to a direct approach by AIBS to President Nixon which was actively pursued by Vice President Ford. This council is concerned with providing input into the generation of National Science Policy, and represents the major biological physical and chemical societies in the Nation.

To further these activities, the AIBS has established a Public Responsibilities Department and will employ a Public Responsibilities Officer. A Science Writer has been employed to report the activities of this and other AIBS departments to the members through Bioscience.

It was generally recognized by the society officers present that the financial strength of AIBS must be materially increased to implement the new thrust of the Institute in its efforts to speak and act for biology. This financial support must come by the addition of new members to the AIBS.

It was also the opinion of those present that there had to be improved communication between the adherent societies and the Institute. The AIBS Executive Committee reported that an amendment to the constitution would be coming before the Board of Governors at their spring meeting, in which Presidents or President-Elect of Adherent Societies would be elected as representatives on the AIBS Board of Governors.

Secretary Dalgleish, who is also the OIBFS representative on the AIBS Board of Governors, reported that he had pursued the matter of joint membership with Mr. Chuck Ossola, the AIBS business manger, and found that 1/2 of the OIBFS members are also AIBS members. Joint membership was but one of the options to AIBS for increasing its membership. Some OIBFS members had come out against such a joint membership, even though it could reduce the combined dues. It was then moved by Fisher and Hartman that the OIBFS members be polled on their opinion as to the desirability of joint membership. Paris offered a substitute motion calling for the President and Secretary to explore the other alternatives being considered by AIBS. The Paris motion was ruled out of order by the chair, Fisher and Hartman withdrew their motion and the Paris motion, seconded by Lauff was resubmitted and carried unanimously. The Treasurer's Report was then presented, and approved. (see apendix) President Hill delivered his report on his opinion as to the immediate needs and objectives of OIBFS. These were summarized as follows:

1. Increase membership in accordance with the amendment, passed at the 1973 meeting, in which membership is open to "include all individuals subscribing to the purposes of the organization, i.e., promote cooperation, well-being and objectives of field studies."
2. Up-dating the Directory of Inland Biological Field Stations, 1970.

3. Distributing relevant literature to the members, i.e., PHILANTHROPY AND THE ENVIRONMENT.

4. Establishment of standing committees to further the objectives of the OIBFS

5. Extend an invitation to the directors of Marine Stations to join OIBFS.

Following extended discussion it was moved by Paris, seconded by Hartman, to have the President, in consultation with the Executive Committee, establish the following committees and appoint members to them:

1. Membership 2. Newsletter 3. Directory

4. Program (President elect & future host) 5. Natural Research Sites

This motion carried unanimously.

Discussion then moved to the scheduling of the next OIBFS meeting. Dalgleish moved, seconded by Fisher, that OIBFS accept George Lauff's long standing invitation for the organization to meet at the Kellogg Biological Station, providing that a suitable date can be arranged. The motion carried unanimously upon Dr. Lauff renewing his invitation.

Dalgleish, called for instruction as to how he should convey the wishes of the members on the matter of Adherent Society representation on the AIBS Board of Governors, there being two proposed amendments before the AIBS Board of Governors 1) "Each Adherent Society shall be represented on the Governing Board by one Society member who shall be the Society's President-elect when beginning service on the Governing Board and who shall serve three years while Society President Elect, President and Past President. . . ." and 2) "Each Adherent Society shall be represented on the Governing Board by one Society Member chosen by whatever means the society may provide, but satisfying each of the following three criteria; 1. Shall be an officer elect, or officer, or shall have been an officer within 5 years from the beginning of service on the Governing Board. 2. . . . shall serve for a term of three years, and may be

chosen for an additional three-year term, and 3. . . . during service on the Governing Board, will serve also on the central governing body of the society, preferably, but not necessarily as a full voting member."

Dalgleish's motion in support of the second proposed amendment died for lack of a second. A show of hands called by the President tallied "0" for the first proposed amendment, "5" for the second proposed amendment.

Following a motion of appreciation to the host and his staff, the meeting was adjourned at 10:15 a.m.

TREASURER's REPORT

Bank: The Ohio State Bank, Wothington, Ohio

Balance in account: August 28, 1973		1,169.34
Receipts:		
37 Membership dues @ 10.00	370.00	
		1,539.34
Disbursements:		
Hill (AIBS-OIBFS meeting 12/6/73)	227.77	
Conservation Foundation (PHIL.& ENVIR)	40.00	
Huyck Preserve - postage & telephone	10.47	
AIBS - Adherent Society dues	100.00	
		378.24
BALANCE		1,161.10
DIRECTORY SALES		
1 OIBFS Directory	2.85	
postage	.15	
		1,164.10
Certificate of deposit @ 6% (12/3/73)	1,000.00	
		164.10
Balance in account as of February 24, 1974		164.10

Respectfully submitted

Robert C. Dalgleish,
Secretary-Treasurer

EDITORS' PAGE
and
ANNOUCEMENTS

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Although I haven't checked with the executive committee, I am going to take the liberty of instituting an Editors' Page and include some announcements. Hopefully this will be a regular feature.

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The newsletter: It is the intent of the executive committee that the newsletter be published more frequently and be shorter in length. This will be the longest newsletter that you will have to "wade through." I would like to devote one newsletter (Fall) to station activities of the past year. This will require that the directors provide me with information (funding, courses taught, enrollment, building programs, research, etc.) concerning their station. I will, in the near future, send you a form (Don't say it--I know it is another form to fill out--so tell yourself that this one will be fun and that your ideas might help another station) and from the forms the information for the newsletter will be compiled. This will be done before the next meeting.

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In back of the Editors' Page you find a paper by the late Dr. Arch Tryon on Ecosystem Experiment Stations--A Program for the Organization of Inland Biological Field Stations. This paper was mentioned several times during the last meeting while we were discussing "The Proposed System of Natural Research Sites" and the executive committee felt that all the membership of OIBFS should have the opportunity to read it. This paper was provided to us through the efforts of Dr. Richard Hartman, Pymatuning Laboratory of Ecology, University of Pittsburgh.

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As mentioned by the President (the gentleman from Oklahoma) on the front page of the newsletter, at the last meeting important "new directions and orientations were formulated for OIBFS." In my opinion, one of the most important directions taken was the formation of standing committees. These committees will take advantage of the leadership talent present in OIBFS. Be prepared to serve on one of these committees. The upcoming meeting at the Kellogg Biological Station, with at least two days of meetings, should provide ample opportunity for the standing committees to start their work. I have visited KBS twice and highly recommend that all Directors see this facility.

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Also, I hope you noticed in the 1973 amendment, passed at the 1973 meeting in which membership is open to all individuals subscribing to the purposes of the organization. How about bringing some Assistant Directors, Instructors, etc. to the meeting. We would welcome their input.

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One of the highlights of the upcoming meeting should be when Bob Fisher shows the slides he has packed to the last two meetings. I have promised Bob I would look at them. Anyone else willing to join me? Bob is the only director without a lab. I haven't checked the constitution to see if this is legal. In fact, some of us wonder if Bob is legal. If you plan to attend the meeting come early enough to witness the arrival of Director Tibbs. Maybe this year we can place bets on what small town in Michigan the bus lines will deposit him. Congratulations, John, on the new addition to your family. Puttie, remember ex-Directors and ex-Presidents of OIBFS are welcome.

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Please add the following new member to the membership list.

Dr. Neil A. Miller, Chairman
Meeman Biological Station
Memphis State University
Memphis, Tennessee 38152

Welcome to OIBFS.

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If you have any suggestions concerning the newsletter would you please forward them to me.

James R. Barnes
Department of Zoology
Brigham Young University
Provo, Utah 84602

Thanks.

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Ecosystem Experiment Stations—
A Program for the Organization of
Inland Biological Field Stations

C. A. Tryon*

Pymatuning Laboratory of Ecology

University of Pittsburgh

For a considerable time the general public has been aware of the crisis involving the utilization of the resources of the world, as well as the destruction and pollution of the world environment. More recently we are being warned that the living part of the world, including man, exists only as a part of a much larger total system and that human activities are affecting the relative rate of functioning of this system. This appears to be an even more serious matter since the basic composition and distribution of the world's atmosphere, lithosphere, hydrosphere and biosphere are to a great extent dependent on the rates at which the world system functions. Blair (1969) has emphasized that the ecosystem is the smallest unit that will provide solutions instead of deferments for management problems. Slobodkin (1968) has expressed the need for solving the problems of pure ecology before the engineering aspects of ecology will be fully effective.

The most critical problem mankind faces is the preservation of a functioning world ecosystem. Support of considerable magnitude is developing for basic research and training that will furnish greater understanding of the structure, functioning and activities of ecosystems. Such research is necessarily conducted under natural conditions and ultimately this will involve field stations, especially under the demands of modern instrumentation. Field stations have been an enduring feature of the biological sciences in America since Louis Aggassiz brought students to the Isle of Penekese in 1873. The stations may be divided conveniently into marine and inland stations, although their activities often overlap. A survey of the inland field stations was conducted by Dale Arvey for the National Science Foundation, and the results summarized in an article (1966). From the material presented in this article, it is apparent that the purposes, support, organization, and activities of field stations are diverse and resist classification. Most of them have an affiliation with an academic institution and give courses in field biology. A few give courses more commonly associated with the main campus of the institution. Courses are given only in the summer, almost without exception. Facilities for research, at least in name, are provided at most stations during the summer, and a few stations continue activities throughout the year.

As a result of the NSF survey a meeting of station directors was called at the Cedar Lake Station of the University of Minnesota

*Dr. Tyron passed away on February 1, 1973.

in 1966 to discuss the problems of the field station and the ways in which they were being met by individual stations. It was decided to form an organization that would provide a means of communication and a common voice for the needs and aspirations of the field stations. An executive committee was formed consisting of W. H. Marshall, R. Bovbjerg, L. S. Putnam, and C. A. Tryon.

At subsequent meetings in 1967 and 1968 the organization was formalized with the adoption of a constitution suitable for a non-profit organization. The name "Organization of Inland Biological Field Stations" was chosen. At present forty-one stations are members.

The magnitude of the field-station effort is indicated by a directory of inland biological field stations, now under preparation by Don Hunsaker and Robert Dalgleich of OIBFS, which lists 135 stations. The stations form a grid of the temperate continent and extend into the arctic and tropical regions to a more limited extent. Some three hundred biologists or more are involved in the activities of the stations. While the funds expended at many of them may seem small in comparison with those available to marine stations, it must be kept in mind that marine stations are doing a great deal of applied research that in continental areas is performed by agricultural stations, water quality stations, fisheries and wildlife stations and many others.

Unfortunately, education and research in the field situation appears to exist for many biologists only as a nostalgic reminder of nineteenth-century biology. It is, therefore, important to justify the expenditures for field stations in terms of national needs for education and research.

The usual justification for biological field stations is that it is vital to study living systems under natural conditions, and that to perform such studies adequately, it is necessary to bring students, scientist and facilities to the natural situation. The term "natural conditions" is not meant to imply primeval conditions; but rather, an experimental situation in which the various recognizable components interact without manipulation, at least in the sense of physical control. The phenomena studied are thus essentially those of ecology, and the justification of the stations must be found in the need of our society for basic and applied ecology.

Over the years, the use of the adjective "ecological" for any phenomena involving interaction with "environment" has diluted the original meaning of "ecology". Ecologists are without a "home" on most academic campuses and are found attached to a variety of departments. Some institutions have established institutes of ecology which cut across departmental lines, but various difficulties usually prevent effective programs. Departments of ecology do not seem probable in the near future although some institutions are moving in this direction.

The questions that arise from time to time about ecology as a field of science derive from the idea that the only approach to understanding natural phenomena is that embodied in the particulate concept of research. As Von Bertalanffy has said (1968), this idea stems from our attitude towards classical physical theory as the one to which all aspects of reality eventually will be reduced. There is nothing sacred, however, about the logical system of classical physics. Ecology has been working with the totality of systems for many years, and it seems evident that the future of ecology lies with systems theory.

For some time ecologists have used levels of biological organization as a means of separating their area of interest from the other biological sciences and have, for the most part, used the organism level as a point of departure. At present there seems to be a tendency for all biologists to rearrange themselves in clusters about levels of organization rather than taxons or the classical groupings relating to structure, functioning and activities of living systems.

The biological spectrum created by levels of organization extends from the molecular to the community. The emphasis that molecular biology was able to generate at one end of the spectrum is now being balanced by increased ecosystem biology at the other end. However, there does not seem to be sufficient recognition by either molecular or ecosystem biologists that they are studying different ends of the same continuum. All the levels of biological organizaiton in use are simply those points at which biologists find it convenient to observe component interactions for experimental or descriptive purposes. Shifting observation from one interaction point to another, as from the cellular to the population, does not change the complexity or extent of the total problem. In the experimental sense, it merely shifts components from one side of the interaction to the other side.

If systems theory is to provide the background for understanding and investigating the ecosystem, then it should provide suitable methods or constructs for ecosystem analysis. Paraphrasing Watts, (1967), ecological systems analysis is composed of the following major portions: (1) Recognition, measurement and determination of significance, of variables on both sides of the interaction in the indeterminate situation under consideration, (2) model making, (3) optimization, and (4) decision making. However, he follows engineering systems analysis by utilizing cause concept, i. e., cause is that point in a series of sequential events at which human manipulation can change the subsequent events. However, valuable cause concept may be in resource management, it is better to abandon it in basic systems research. Maximization and decision making are then sought as processes within the natural ecosystem. The question to be asked is not whether this event is the cause of that one, but rather is the interaction between the two events pertinent to the direction or rate of activity of the ecosystem. Functional understanding is provided by the twin concepts of energy flow and element cycling through trophic level compartments.

In a sense this has been the primary preoccupation of biologists at whatever level they might decide to investigate. What the ecosystem is maximizing (or minimizing) is controversial although productivity, stability, species diversity, environmental capacity, energy flux, material cycling, the ratio between structure and maintenance respiration, and others are possibilities. How the system makes a "decision" is also uncertain although natural selection is usually presented as the universal concept.

Up to the present time ecology has been mostly concerned with the first step in systems analysis--the measurement and determination of significant variables. This presents many problems even in the descriptive part; and, unfortunately, much of this has been done with a lack of standardization that prevents its use in the determination of significance other than on a very local basis.

Von Bertalanffy (1968) has defined a system as sets of elements standing in interaction. In the laboratory, the biologist is able to achieve logical control of interaction by using known intensities of the factors on one side of the interaction with different intensities of

factors on the other side. Under natural conditions where this cannot be done, the ecologist is faced with multiple correlation coefficients which resist decomposition, although this can be resolved by means of experimental designs that permit multivariate analysis. Such designs provide replications through either space or time, and responses are expressed in rate functions associated with the total system. This requires enormous amounts of data, and the ecologist is probably more in need of standardized data storage and retrieval than any other scientist. Although computers have made possible the extensive analyses associated with systems, they have not as yet solved the problem of collecting field data. While some of the physical factors of the environment are well on their way to automatic sampling and monitoring, the structure, functioning and activities of living organisms, populations, and communities existing under natural conditions are not. As yet, neither an individual nor a team of ecologists can hope to produce or to accumulate the amounts of data necessary to make inductive inferences on even the simplest of ecosystems, except in partial terms, and in a local sense. The need for training students in this area is obvious.

The foregoing indicates that understanding natural ecosystems has a national priority and requires a systems approach with its concomitant demand for enormous amounts of field data gathered on at least a continental scale. If inland stations are to have an effective role in this, then they must provide a program that furnishes not merely the physical facilities for research and education, but that also advances the field of science involved.

The following program is composed of personal ideas and is intended to provide a starting point for further consideration. While its scope may seem ambitious for an organization of field stations, it is only because no other organization has really undertaken these broad aspects as yet although the Ecological Society of America is moving in this direction. MacArthur (1969) in reply to Whittakers' (1969) plea for a National Institute of Ecology has suggested that some of its activities might be accomplished better by establishing a field station at each academic institution. However, it is not intended that OIBFS substitute for a National Institute of Ecology.

The collective uniqueness of field stations seems to lie in the following points: (1) proximity to natural situations, (2) a continental grid of facilities, (3) concentration on a single concept—the ecosystem, (4) a physical recognition point for support, and (5) isolation, both literal and figurative.

1. Proximity to natural conditions.

The ready availability of natural systems as a requirement for research and education on ecosystems needs no reiteration. The modern development of instrumentation and its demand for adequate facilities in proximity to the system under investigation emphasize the need. The field station is designed and located for these activities, par excellence. The future development of the physical plant must be planned carefully, however, so that it does not interfere with this purpose. Development of what amounts to a small campus at the field station will inevitably destroy its primary function. This will be a difficult line to draw if we follow the usual standards of progress for institutions--indefinite expansion of buildings and numbers of participants.

One expansion that should be pursued with diligence is the acquisition of land and water areas under control of the field station. The minute percentage of life science support that finds its way into the preservation of natural areas indicates a blindness in regard to the realities of the research on life systems. Even those areas which are preserved from commercial exploitation are primarily for hunting, fishing, scenic, or other recreational purposes. The stations should provide a comprehensive program for land acquisition necessary to research and training purposes and should integrate this program with national efforts for the preservation of natural areas.

2. Concentration on the ecosystem.

The concept of a functioning ecosystem permits organization and understanding of all the varied bits of information that have been gathered by field biologists over the years. As such this concept can provide for the motivation and organization of field station activities. It demands investigation of how the natural world system exists and how it works, including the activities of man, but not solely from the viewpoint of how the system can be managed by man. If the field station becomes involved with the latter, due to the exigencies of the present human situation, then it will not be able to fulfill its primary obligation. With such an encompassing objective the field station can provide a focal point for ecologists from all the scattered areas of the natural and social sciences. Such a "home" for ecology and ecologists, is important.

The actual development of the theoretical constructs necessary for effective investigation of ecosystems are clearly not a function of an organization of field stations. Yet, some attempt should be made to develop the broader aspects of experimental design suitable to field research. One type of design, perhaps the only one that we possess at present for ecosystem research, is the comparison of systems along latitudinal, longitudinal and altitudinal grids.

The presentation of courses is also an unsolved problem for ecology and is evidenced in the varied programs of field stations. Since taxonomy per se is taught better at the main campus where the necessary collections and library are available, courses taught about a particular taxon are necessarily confined to the classification, distribution and life history of the organisms involved. They become, in general, "how to know the _____" courses or studies of the adaptations of a particular group to whatever environment is available. The taxons utilized are chosen on the basis of staff interests or on the needs of a special mission to which the station feels a commitment. An alternative method is to study a system in its entirety, acquiring familiarity with names of organisms where necessary in order to present the concepts of energy flow, species diversity, trophic levels, etc. The OIBFS should attempt to develop course programs on the basis of what concepts are vital and at what academic levels--secondary, undergraduate, graduate or post-doctoral, the various courses should be presented. The eventual disposition of these attempts will be in terms of an analysis of the possibilities of ecology and a classification of its subject matter.

3. Continental Grid of Facilities.

The International Biological Program in its section of the Analysis of Ecosystems has emphasized the intensive phase of research on biomes but also recognizes the need for the diversification of research on a geographic basis. The geographic distribution of existing stations covers much of the continent and is being amplified with the rapid addition of new stations. These stations provide the opportunity for cooperative research on experiments that require latitudinal and longitudinal transects. Obviously, this provides the means for establishing ecological base lines on a continental plan. While most stations gather data constantly on ecosystem characteristics in the course of their training and research programs, these data need standardization in order to complete their usefulness. A cooperative plan should be developed by OIBFS to determine what kinds of data can be standardized, particularly those concerned with the living components of the ecosystem. Accompanying this should be a program for gathering such data into a common storage and retrieval program, which should then make the information available in a variety of forms to anyone requiring it.

4. Physical Recognition Point.

The obvious physical features of field stations provides a point of reference for recognition and support. If field stations become more fully identified with ecology, as an area of both research and study, then such identification may be beneficial to both in terms of basic support. Basic research in any field is difficult to support adequately. Mission oriented research aimed at technological fixes for environmental problems obtains support readily but cannot expect to find solutions. A real contribution could be made by OIBFS in making this need more visible to academic administrators, public agencies and foundations.

The need is not just for specific research projects but for support of a total area including staff, students, technicians, equipment, supplies and libraries; especially in terms of training more scientists for this field.

5. Isolation.

The isolation of field stations, in combination with the concentration on a single concept, together provide an unusual opportunity for the development of ecology, one not enjoyed by most other sciences. When combined with the ties field stations have with the facilities of academic institutions, an ideal situation is created. Slobodkin (1968) has suggested that "communication" meetings for people concerned with ecological problems, but with conflicting viewpoints, should be held in isolated places. Symposia on specialized areas of ecology are also best held in such settings. The field stations with their housing and dining facilities, often unused during most of the year, should be ideal for these purposes.

Conclusions.

If the inland field station is to depart from its role as a place to take field biology courses in the summer and to meet the challenge presented by the nation's need for ecosystem research and study, rather drastic changes in the format of its programs and its mode of operation must occur.

The following points have been presented for inclusion in the development of a program for the Organization of Inland Biological Field Stations.

1. Establish guidelines for the adequate development of physical facilities, students, and staff compatible with the purpose of field stations.

2. Prepare a plan for the land acquisition by stations and integrate this with the national programs for the preservation of natural areas by other agencies, both public and private.

3. Standardize the collection, storage and retrieval of ecological data gathered at field stations.

4. Promote cooperative projects between field stations so that ecosystems can be described and variations compared on a continental basis.

5. Encourage field stations to become a focal point or "home" for the diverse scientists involved in ecology.

6. Prepare guidelines for academic courses suitable to the potential and future development of field stations and ecology, including winter courses. This would involve a philosophy of ecology, i. e., an analysis of its possibilities as a field of knowledge and thus a classification of its area in operational terms subject matter.

7. Develop a program of support for ecology and field stations based on the recognition point provided by the physical existence of the stations.

8. Produce a support program for communication meetings of all sorts to be held at field stations.

Each one of these suggestions can be developed into a large program. All are important to the future of field stations, although not equally so. To detail the implementation of any one of them would produce too long a plan for inclusion here. However, the first step for all of these suggestions is one already taken by some field stations--transformation from a summer to a year-around operation. Too much of the available information about ecosystems has been gathered in summer. Also, it is no longer suitable to consider field station activities as a summer addition to campus programs, particularly in terms of staff and student time.

National needs for research on ecosystems, for the training of ecologists, and for the integration of the diverse sciences involved, require the multidisciplinary approach developed by agriculture in this country nearly a century ago. The program suggested is summarized in the similar name--"Ecosystem Experiment Stations."

References

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