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A Mobile Desert Laboratory

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Many physical, chemical, and biological problems can be solved in our standard laboratories where materials and experimental methods can be brought together. A number of other problems, however, require for their solution observations in nature or require materials which are available only in special locations. This is particularly true for ecological problems where plants and animals have to be studied in their natural habitat in relation to the environmental factors which exist in particular localities. This is also true when studies have to be made on old plant specimens which could not be produced of sufficient age in the laboratory. Perhaps most unique are the requirements for studying desert ecology. A considerable number of the most extreme desert plants have very extensive root systems which could not be reproduced in any laboratory of reasonable dimensions.

During the last fifteen years I had been studying problems concerning desert plants. I found that their germination occurred only under very special conditions which did not prevail every year and very often did not occur in the same locality more than once every five to ten years. The first stage of this investigation could be carried out through simple observation and counting in the field and was accomplished on frequent weekend desert trips. Inevitably a stage was reached in which more precise measurements and experiments were required for which more elaborate equipment was necessary. Therefore, this desert research had outgrown the family car and the improvised camping site. An ordinary, stationary, laboratory could not accomplish desired ends since only infrequently conditions proper for the investigations would occur in the immediate neighborhood of such a stationary laboratory. Probably this has been one of the main difficulties in connection with the Desert Laboratory of the Carnegie Institution of Washington in Tucson, which was abandoned 20 years ago.

To overcome the problems of a fixed location, a mobile desert laboratory was designed, partly on the basis of the car park of the Land Research and Regional Surveys Division of the Commonwealth Scientific and Industrial Research Organization in Australia and partly on the truck-based ecological laboratories which had been surveying the Sahara desert. Through the generosity of Mrs. Pearl McManus of Palm Springs these plans could be realized and in the autumn of 1956 the first trial runs were made. In the intervening 2 years the laboratory has proven its effectiveness and now a short description of its facilities can be given.

For precise physiological measurements laboratory space is provided in a 24-ft. trailer. The utilities for this trailer laboratory are provided in a 5 ton truck. In its body are mounted:

1) a 2000 liter water tank which can be pressurized as high as 12 atmospheres.
2) a 6 kilowatt motor generator with good frequency and voltage control. This generator uses approximately 1 gallon of gasoline per hour and therefore with its 5 gallon tank capacity has to be refilled every 5 hours.
3) a 70 gallon gasoline tank which can be brought under pressure.
4) an air compressor providing pressure for both the water and gasoline tanks, and for inflating tires.
5) storage cases for tools, plant presses, and other necessary bulky equipment.

This truck is covered with a tarpaulin and it has a specially reinforced rear housing which can take it over fairly rough roads. It would be desirable to have a four-wheel drive truck to give it better traction in sandy places where occasionally measurements have to be made.

The trailer was originally a house trailer which has been rebuilt to provide the necessary laboratory facilities. The rear end has a low bench across the back which is of proper height for microscopic work. Both a binocular and a regular microscope are available, plus a set of reagents, slides and tools to make microscopic sections. A folding table leaves enough space for two investigators to work in this rear end. A small library of floras and faunistic literature is available for convenient reference. In the rear end are also mounted a desert cooler which can keep the trailer very comfortable even in the hottest weather, and a less effective air-conditioner.

The front end, equipped for physical and chemical work, is separated from the rear by a short corridor, on one side of which there is a wash room and shower, plus storage space for microscopes, balances and further

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equipment, and on the other side, cupboards and an electrical refrigerator. A four burner gas stove with oven and a gas heater are both operated with butane gas. The same gas can be used for bunsen burners. A double sink can be used both for washing and for laboratory needs and is provided with a direct connection to the water tank in the truck and thus provides plenty of running water. A 6 gallon electric water heater provides a limited amount of hot running water. Cooking utensils, food and dishes are stored above and below the sink, stove and refrigerator in cupboards. Along one side and in the front of the forward compartment are high benches with drawers underneath in which laboratory glassware, corks, tubing, etc., is stored. Along the other side a couch occupies the forward compartment.

The main problem at present under investigation in the Mobile Desert Laboratory is a study of transpiration, photosynthesis, and respiration of desert plants. A few annuals have been investigated but the main effort is concentrated on the study of more specialized desert shrubs which are able to grow under extreme drought conditions. To this end a Liston-Becker CO_2 analyzer has been installed which operates on the power supply from the motor generator in the truck. The power supply for this CO_2 analyzer goes through an extra voltage regulator but unfortunately any considerable change in load on the generator changes the frequency sufficiently that the readings of the analyzer change. Therefore, a separate power source should be installed for the CO_2 analyzer. At present all intermittent power consumers such as the air compressor, water heater and refrigerator have to be disconnected as long as CO_2 measurements are being carried out. Continuously operating equipment such as lamps and the desert cooler can be left on without influencing CO_2 readings. A Leeds & Northrop Type H Speedomax records the readings of the CO_2 analyzer.

Photosynthesis is measured by enclosing a branch in a plexiglass container which has a fan mounted inside for internal circulation of the air. Also a set of four Aminco humidity sensing elements is mounted inside which makes it possible to measure the rate of transpiration of the branch with the Ashby-Grieve method. By measuring the rate of increase in relative humidity inside the plastic chamber after the air renewal of the container is shut off the rate of transpiration can be calculated quite easily.

It is very difficult to make these plastic containers with the enclosed branch and fan shaft completely air-tight but by measuring accurately the amount of air which is pulled from the chamber the air renewal rate can be measured. In this case outside air is used to make up the air withdrawn from the container by suction. If air of a known CO_2 content has to be introduced into the container the presence of leaks is again inconsequential if air samples are withdrawn from the container at a rate smaller than what is being introduced. Manifolds have been installed to connect containers enclosing different plants in succession with the CO_2 analyzer. An automatic valve and switch system provides a means to switch automatically from one container to the other and to record behavior of five different plants.

In a more recent modification of the apparatus by Mr. G. Durdle the measurement of the transpiration has also been made automatically recording. To this end a fast stream of dry air is introduced by opening a magnetic valve into the plant container. This air dries out the container to a pre-set point, e.g., 30% r.h. Then the magnetic valve is closed, and the humidity in the container increases through transpiration of the branch. When the humidity has reached 40%, the magnetic valve opens again, the air in the plant container is dried to 30%, etc. These changes in humidity are recorded, and from the record the rate of humidification, indicating transpiration, is read.

The equipment just described has already allowed the establishment of the existence of exceedingly high DPD in one of the most extreme xerophytes of the California deserts, *Peucephyllum schottii*. It also has become established that under drought conditions both transpiration and photosynthesis may occur for a short time in the morning and late afternoon stopping during the middle of the day. The same branch after sufficient rain will continue both transpiration and photosynthesis throughout the day.

Although it is not too easy to pull the laboratory off the roads there are sufficient small roads in the desert to reach almost any plant or plant community which should be measured. Setting up of the trailer, making all water and electrical connections, and making the laboratory ready to operate takes two people 30-60 minutes.

A canvas canopy can be installed along one side of the Laboratory, providing shade and living space for the personnel. Several tables and chairs are carried at all times. Upon arrival at the desired locality, a rather level spot is selected, not too sandy, and in close proximity to the plants to be measured. After unhitching the trailer from the truck, and securing the wheels of the trailer with stones, the truck is pulled up 100 feet, and electrical and water connections are made. Then 4 hydraulic jacks are put under the 4 corners of the trailer, and they are adjusted until the levels attached to the trailer indicate the proper position. Then the motor generator is started, and the laboratory is ready to operate, after microscopes, balances and further equipment have been set up.

It is believed that the same mobile equipment would be valuable not only for a study of the ecology of other types of vegetation, but also for study of cultivated plants and forest trees under normal field conditions. The degree of water stress of any plant could be determined by its transpiration behavior, and the degree to which cultural methods, such as irrigation or fertilization, change dry-matter production could be determined instantly by CO_2 exchange rather than by the slow final-yield-method. The mobility of the laboratory could be increased, if only transpiration and photosynthesis measurements are needed, by decreasing truck and trailer size.

This Mobile Desert Laboratory is managed for the California Institute of Technology by Lloyd Tevis, P. O. Box 308, Rancho Mirage, California. It is available to qualified investigators when they need its facilities for their research. In addition to investigators of the California Institute of Technology, the Laboratory has been used by scientists from the University of California and Duke University. Inquiries as to its availability can be sent either to Lloyd Tevis or to me, Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

JOHN SIMON GUGGENHEIM MEMORIAL FELLOWS—1958

Dr. Henry Nathaniel Andrews, Jr., Professor of Botany, Washington University, St. Louis: A critical study of certain groups of early land plants.

Dr. Orlin N. Biddulph, Professor of Botany, State College of Washington, Pullman: Studies of the movement of salts and organic substances in plants.

Dr. Emanuel Epstein, Plant Physiologist, U. S. Department of Agriculture, Beltsville, Maryland: Studies on the movement of inorganic ions in the roots of higher plants.

Dr. Robert Norman Goodman, Associate Professor of Horticulture, University of Missouri: Studies of the antibiotically active compounds produced by higher plants.

Dr. Harold Franklin Heady, Associate Professor of Forestry, University of California, Berkeley: Studies of grassland characteristics under the influence of large, wild herbivores.

Dr. Harvey Alfred Miller, Assistant Professor of Botany, Miami University, Oxford, Ohio: Studies of the phytogeography and ecology of the Hawaiian Hepaticae.

Dr. Jack Edgar Myers, Professor of Zoology and Botany, University of Texas: Studies on the photosynthetic metabolism of algae.

Dr. Robert Baxter Platt, Professor of Biology, Emory University: Ecological studies of organisms and communities with reference to their micro-environment.

Dr. Paul Bigelow Sears, Professor of Conservation, Yale University: A study of Pleistocene vegetation and climate in North America.

Dr. Paul Claude Silva, Associate Professor of Botany, University of Illinois: Studies of the marine algae of California.

Dr. Helen Adele Stafford, Assistant Professor of Biology, Reed College, Portland, Oregon: Biochemical studies of the formation of lignin in plant tissues.

Dr. Stanley George Stephens, Professor of Genetics, North Carolina State College, Raleigh: Comparative taxonomic and genetic studies of the Caribbean cottons.

Dr. James Herbert Taylor, Associate Professor of Botany, Columbia University: A study of the mechanism by which living material reproduces at the molecular level.

Dr. Thomas Wallace Whitaker, Geneticist, Crops Research Division, U. S. Department of Agriculture, La Jolla, California: Studies of the cultivated Cucurbitaceae.

Dr. Stephen Wilhelm, Associate Professor of Plant Pathology, University of California, Berkeley: Studies of vascular parasitism of the fungus *Verticillium albo-atrum* in plants.

Dr. Frederick Paul Zscheile, Jr., Professor of Agronomy and Biochemist in the Experiment Station, University of California, Davis: A study of the role of environmental factors, especially light, in the expression of genes for bunt resistance in wheat.

SUMMERTIME INSTITUTE FOR COLLEGE BOTANY TEACHERS

The National Science Foundation is supporting an Institute for college teachers of Botany sponsored by the Botanical Society at Indiana University this coming summer from June 23 to July 31. Announcements will be distributed in December. While the arrangements for the staff are not yet completed, it is known that it will include Drs. Wetmore, Steward, Galston, Banks, Rollins, Swanson, Tippo, H. Lewis, K. Raper, Srb, and Creighton.

EDITOR OF THE JOURNAL

All manuscripts being submitted for publication in the *American Journal of Botany* should be sent to the Editor, Dr. Harold C. Bold, Department of Botany, University of Texas, Austin 12, Texas.

ROYALTIES WANTED

Have you bought your personal copy of the Society's Golden Jubilee Volume, "Fifty Years of Botany," W. C. Steere, Editor, McGraw-Hill Book Company, New York, Toronto, London, 1958? Have you ordered several copies for your department library? You should have a bound copy of the articles most of which, but not all, appeared in Volumes 43 and 44 (1956 and 1957) of the *American Journal of Botany*. Your students will appreciate having bound copies in the library and so will you when you are trying to take out the number in which a particular article appeared. It is the very book to send undergraduates and graduate students to for readable articles on everything from "Microbes—Man's Mighty Midgets," through "An Anatomist's View of Virus Diseases," "The Odor of Botany" to "Fifty Years of Plant Physiology in the U.S.A.," to mention only a few of the 40 that cover a wide variety of botanical subjects. Many a microbiologist or a zoologist will appreciate the reviews that are included. Furthermore, the book will stand as a record, necessarily not complete, but still significant, of where plant science stands in mid-twentieth century. All the copies sold beyond a specified number will yield royalties to the Botanical Society. Buy one. Get your graduate students to buy one. Get your library to buy several. Act now before the supply is exhausted.

Plants are Different from Animals

BETTY F. THOMPSON, Connecticut College

Are We Teaching Our Biology Students the Interesting Things About Plants?

When people hear the word "biology," how many of them think of plants, or when plants are mentioned, how many people think of biology? In recent years biology courses, to judge by the changing contents of the textbooks being published, have come a long way in their consideration of plants. But very few students today become seriously interested in botany by way of their experience in a beginning biology course. Botanists know how interesting plants are. Otherwise why should we be in the business ourselves? Then why do so few of our beginning students find our interest contagious and go on to more advanced work?

I would like to suggest that most biology students never hear of the most uniquely interesting things about plants and their way of life. Can it be that we are still subtly influenced by the ancient and insidiously stubborn view that plants are somehow imitations of animals, and so we assume that the things a beginner should learn about plants concern the ways plants solve the problems that are important *to animals*? The assumption, if not the basis for it, is most strikingly evident in biology courses; but one can see indications of the point of view in many general botany courses, too. For example, how many botany courses, let alone those in biology, make any but a fleeting mention of seed and bud dormancy, of the photoperiodic control of phenomena other than flowering, if indeed that, or of the propagation of plants? How much of an issue is made of the fact that plants have permanently embryonic regions, and the manifold consequences of this? These are a few of the most interesting and fundamental things about the lives of plants; but they do not relate in the same way to animals, so they are left entirely out of biology subject matter and are largely omitted even from botany.

Biology courses seem to fall into one of two general patterns. Either they consist of a semester of botany and an independent semester of zoology, or they attempt an integration of ideas about all living things, more or less lumped together.

First as to the separate semester approach. To my knowledge, such courses ordinarily do the botany in the first semester, which then serves as a basis or point of departure for the second semester study of animals. It is certainly true that if one kind of organism is any more basic than the other, it is the plant, with its monopoly of organic-from-inorganic syntheses. But how relevant is this in organizing the subject for teaching purposes, and what else is there to be said for the usual sequence? It means that much of the botany semester must be devoted to what is esentially cellular biology, leaving only a fraction of the time to be devoted to the plants themselves. By the time students have acquired enough information to be able to deal with more advanced ideas, the semester is over, and the period when they can follow a more sophisticated approach is spent entirely on animals. I pose the question, Why not begin with the much more familiar animal? The general acquaintance with life as an animal that students bring to college offers a ready-made, if somewhat general and often vague, foundation to work with. Into this existing framework the details of cellular biology can be incorporated immediately, in the very first weeks of the course. Then the various aspects of the life of an animal can be considered at a fairly advanced level. Later, with a fuller understanding of his own kind of organism as background, a student can see far more meaning in both the similarities and the differences of the much less familiar plant, with its own special way of getting along in the world.

As for the "integrated" course, I submit that this approach must in the very nature of things do violence to the way of life of either the plant or the animal; and considering how things are currently done, it is the plant that suffers the inevitable distortion. To be sure, all cellular organisms share many of the same cellular phenomena; but there is a limit to the amount of this that is meaningful until a student knows something about specific whole organisms. And with a few equivocal exceptions, whole organisms are *either* plants *or* animals. Even in one-celled organisms, the whole body organization and way of life and the major logistic concerns stem from the esentially autotrophic life of the plant or the heterotrophic existence of an animal. The central topics that give meaning and form to the study of plants are quite different from those that are significant for animals. Consider the topics that come to mind when you think about a first study of animals: digestion, nutrition, respiration, circulation, coordination (nervous system and endocrines), perhaps embryology. How many of these are major considerations in a parallel way in the study of plants? Then think of the big topcis for a beginner learning about plants: overall organization, growth patterns, organic syntheses (and not just of carbohydrates), water relations, interaction with soil, and the great influence of environmental conditions such as light and temperature.

In order to close with a concrete proposal, the following scheme is suggested as a more valid sequence for a truly integrated biology course:

1. *Cellular biology*, pretty much as it is commonly done now.
2. *The animal way of life.* Food-getting the most immediate daily problem, and why. Digestion, nutri-

tion, circulation, respiration (at various levels of meaning), excretion; sensing and responding to the environment and meeting crises, such as eat or be eaten.

3. *The plant way of life.* Food synthesized from air, water and soil minerals. What is food? Indefinite growth pattern and its consequences (no vital or- [illegible] Role

Society of America.

The Business Manager of Biological Abstracts, Mr. H. I. Anderson, has informed us that the chief source of revenue for Biological Abstracts comes from subscriptions. They believe that this is the most important income for them, since it is much more dependable than grants and because they feel that this is actually *earned* income.

Biological Abstracts is publishing sectional editions so that individual biologists may have a coverage of their special literature at prices they can afford to pay. However, they need many more subscriptions to justify continuing their sectional editions; less than 5% of all biologists subscribe to these sectional editions personally. Since it is most convenient to have abstracting files handy right at your fingertips while writing or researching, I urge any botanist who is able to do so to subscribe to the botanical section of Biological Abstracts.

Biological Abstracts expects to be able to increase its coverage next year by nearly 50%; this means many more abstracters. Any botanist who has some time to give to this important undertaking is urged to contact Biological Abstracts to offer his services as an abstracter. Forms are available from Biological Abstracts.

F. W. WENT

SPECIAL SUMMER PROGRAM FOR HIGH SCHOOL SOPHOMORES AND JUNIORS

At the A. and M. College of Texas, the Biology Department conducted a 5 week science enrichment program for sophomore and junior High School students who had been selected for high scholastic ability. Lectures, discussions, field and museum trips were provided. One aim was to find out what could be done for gifted students, early enough to encourage those interested to continue their work in the sciences.

35TH ANNUAL PLANT SCIENCE SEMINAR HELD

The 35th Annual Plant Science Seminar sponsored by the Ferris Institute was held this past summer with a variety of scientific papers presented and tours and field trips made to botanically interesting spots in Central Michigan. Key, new officers for 1958-59 are Edson F. Woodward, President, and Frank L. Mercer, Secretary-Treasurer.

Personal Subscriptions to Biological Abstracts

In view of the financial situation of the Botanical Society of America, the Council, at its August meeting in Bloomington, voted to discontinue the yearly contribution of $1,000 to Biological Abstracts. We were thoroughly convinced of the importance of financial support for Biological Abstracts but we felt that this was not [illegible]

of environmental factors. Brief consideration questions as the following: Why should a pla around? What use would a plant have for a system? an excretory system? Does a sp sedentary organism need lungs, heart, blood can a plant ~~profitably perceive~~ about its envirc Why can plants just as well grow to ind large size? What crises does a plant meet in life? ~~Such comparisons can throw light c~~ plant and animal ways of doing things.

4. *Reproduction,* animals first. General ideas on ian reproduction are already familiar to studer viding a basis for fuller, college-level study the less familiar plants, showing some of t problems met in a parallel way, however our mental "set" toward the two kinds of org
5. *Genetics and evolution.*
6. *Ecology* in some form, in order to end wit organisms living their lives in a more or less environment.

NORTHEASTERN SECTION OF ASP

The New England Section of the American of Plant Physiologists became the Northeastern when a constitutional amendment was passed 21st annual meeting held at Brookhaven in 1957 bers of the parent Society who reside in New Y New Jersey are now eligible for membership. T meetings were held at Yale University in Ma larger geographical area is undoubtedly preferabl alternative of establishing a new section for Ne and New Jersey plant physiologists.

SUMMER SCHOOL COLLEGE BOTANY C FOR HIGH SCHOOL STUDENTS

The Botany Department of the University nessee offered the standard, first quarter college course carrying 4 hours of credit to a group of high school students this past summer. Fred H. who was in charge reported, according to the Ne Times, that there were seven A's, eight B's, one D, and no failures. Probably he would be glad more details to anyone who might like to exp with this way of encouraging good high school s to find out the possibilities of botany as a colleg and as a field for possible selection for a career.

Botany in the National Science Foundation Institutes for High School Teachers

VICTOR A. GREULACH, University of North Carolina
AND
MARIE C. TAYLOR, Howard University

Among the most extensive of the current programs designed to improve education in the sciences and mathematics are the National Science Foundation Institutes. Through a few of these, such as The Cornell Institutes of 1957 and 1958 and the Indiana University Institute of 1959 sponsored by the Botanical Society, have been designed for teachers in the smaller colleges, the vast majority are for secondary school teachers. The institutes are of three main types: summer, academic year, and in-service, the latter consisting of night or Saturday classes during the school year. The NSF Institute program began in 1953 with two summer institutes, and subsequent growth has been steady and rapid with 4, 11, 25, 95, 126, and 350 in successive summers, including 1959. The academic year institute program began in 1956 with two institutes, increasing to 16 in 1957-58, 19 in 1958-59 and 30 in 1959-60. In 1957-58 21 in-service institutes were established for the first time. This year there are 86 and next year there will be 200. The institute program will probably be stabilized at essentially the 1959 level. By 1960 about 42,000 participants will have attended NSF Institutes, representing about 30% of the 140,000 junior and senior high school science and mathematics teachers in the country. Of course, some individuals have attended more than one institute, so the total number of individuals reached is somewhat less.

This report has been prepared primarily for the benefit of those botanists who are not well acquainted with the institute program and who are interested in its goals and characteristics and in the extent to which Institutes are contributing to the improved botanical education of secondary school science teachers.

The institutes were established to improve the subject matter competence of secondary school science and mathematics teachers, in view of the fact that many teachers, though well fortified with courses and degrees in education, have had inadequate preparation in the subjects they are teaching. Even those teachers who have a reasonable number of courses in the sciences in their transcripts are frequently very poorly informed in the sciences they teach, particularly as regards developments subsequent to their undergraduate days. Though many teachers have attended summer sessions and extension courses since their graduation from college, almost uniformly they have taken only courses in education, since suitable graduate courses in the sciences were rarely available to them. One aspect of the institute program has been the rather widespread development of graduate courses in the sciences and mathematics particularly adapted to the needs of secondary school teachers and applicable toward masters degrees in education or science teaching. The provision of stipends along with allowences for dependents and travel enables many teachers to attend institutes. Without such financial support few, if any, teachers would be able to take time out for study during an academic year, and the majority would not be able to devote even a part of a summer to subject matter courses.

The reaction of teachers who have participated in institutes is almost uniformly enthusiastic, and the scientists who have taught institute courses are almost all convinced of the value of the program. Though some educators and scientists have raised objections to the institutes, the majority opinion is very favorable.

Of the 120 institutes held during the summer of 1958, 74 offered courses in biology. Only 7 of these offered regular biology electives, the other 61 having organized special courses, usually carrying graduate credit, designed particularly with the needs of high school biology and general science teachers in mind. Of these special courses 44 can be described as advanced general biology, 4 as field biology, 12 as radiation biology, and one as marine biology. Six summer institutes offered special graduate courses in botany and zoology. Of the 19 academic year institutes in 1958-59 17 offered biology courses, and 13 of these organized special graduate courses for the high school teachers, though they also usually permitted qualified teachers to take the regular graduate courses if they preferred. Of the 13 institutes offering special graduate courses for teachers, 9 gave advanced general biology and 4 advanced general botany and zoology.

Obviously the most common type of institute offering in biology is an advanced general biology course, for which graduate credit is usually given and which generally requires at least a year of college biology as a prerequisite. Though most of the courses are taught principally by one instructor (commonly a senior member of the staff), eight of the courses during the summer of 1957 and seven during the summer of 1958 used visiting lecturers exclusively for periods of a few days to one or two weeks to lecture on their specialties. Some of these courses were apparently more on the order of seminars or lecture series than regular classes, and made no effort to provide any general comprehensive coverage of the biological sciences.

TABLE I

Mean Per Cent of Time Devoted to Various Topics in Ten General Biology Courses for High School Teachers Offered in NSF Institutes.

Fields	Organisms			Total
	Animals	Plants	Micro-organisms	
Physiology & biochemistry	10.5	9.6	3.5	23.6
Genetics & cytogenetics	7.3	4.3	1.0	12.6
Morphology & anatomy	6.3	3.5	1.4	11.2
Growth, development & reproduction	5.5	3.9	0.6	10.0
Systematics: surveys of taxa	5.3	1.6	1.2	8.1
Evolution & paleontology	4.3	2.1	0.1	6.5
Conservation & economic biology	3.0	2.8	0.4	6.2
Ecology & biogeography	3.0	2.9	0.1	6.0
Pathology & parasitology	3.0	1.6	0.7	5.3
Systematics: identification	1.3	1.5	0.3	3.1
History of biology	1.0	0.8	0.6	2.4
Other	2.5	2.1	0.4	5.0
Totals	53.0	36.7	10.3	100.0

Table I gives the time distribution in ten of the general biology courses offered during the summer of 1958 or the 1957-58 Academic Year, the data being secured from a quentionnaire filled in by the instructors. Though less than 20% of the biology courses are represented in the data, due to low questionnaire returns, the data are presented for what they are worth. As might be anticipated, the dynamic and rapidly developing biological disciplines such as physiology and genetics receive major emphasis. Ecology receives less attention than might be desired. The percent of time devoted to botany is a little higher than might be anticipated, especially if a major part of the time listed for microorganisms was devoted to bacteria and fungi, though not as great as botanists might wish.

In general, we may conclude that botany receives a reasonably fair amount of attention in the NSF Institutes, though since most high school biology teachers are not as well prepared in botany as zoology a greater emphasis on botany would certainly seem desirable.

A few facts about the training, teaching assignments and characteristics of teachers who applied for work in biology in the 1957-58 Academic Year Institute and the 1958 Summer Institute at the University of North Carolina may help characterize the type of teacher desiring institute training. This information was secured from the NSF Institute application forms. The complete report, including detailed tabular data, is available without cost from the Institute of Natural Sciences, Venable Hall, University of North Carolina, Chapel Hill, N. C.

The number of applicants for biology training was 141 in the Academic Year and 183 in the Summer, and 17 and 25, respectively, were granted stipends. The summer applicants consisted of 117 biology teachers and 66 general science teachers, 30 of the biology teachers being assigned to biology only. The Academic Year applicants included 24 general science teachers and 117 biology teachers, 19 of them teaching biology only. The Summer applicants had a mean age of 39.8 years and a mean of 11.5 years teaching experience, while the comparable figures for the Year applicants were 33.9 and 5.3, respectively. While 44% of the Summer applicants had a masters degree, only 12% of the Academic Year applicants had secured this degree. Only 26% of the masters degrees held by Summer applicants were in biological fields, the remainder of the degrees being largely in education, the comparable figure for winter applicants being 29%.

The biology teachers applying for the 1958 Summer Institute at Chapel Hill had taken an average of 7.1 biology courses, graduate and undergraduate, 2.2 chemistry courses, and 1.2 physics courses. Of the biology courses, 1.8 were botany, 3.5 zoology, and 1.8 of a general biological nature such as general biology and genetics. Compared with this total average of 10.5 courses in the basic sciences, the applicants averaged 10.0 courses in Education. The biology teachers applying for the 1957-58 Academic Year Institute averaged 7.7 courses in biology—3.5 in zoology, 2.0 in botany, and 2.2 in general biology. General science teachers applying for summer work in biology averaged only 4.7 biology courses, while those applying for the academic year institute averaged 7.8 courses. The general science summer applicants had taken an average of 7.5 courses in all the sciences in contrast to 11.4 Education courses.

Only 2% of the biology teachers applying for the Academic Year Institute and none of those applying for the Summer Institute completely lacked college courses in biology. About 21% of the Academic Year applicants and 14% of the Summer applicants had taken over 10 biology courses. Some 10% of the Summer applicants and 20% of the Year applicants who were teaching biology had taken no botany courses, the figures for general science teachers being 30% and 24%, respectively.

Of the biology teachers applying for the Summer Institute, 43% had an undergraduate major in biology, 2% each in botany or zoology, 32% in other sciences or science in general, and 21% in other fields than science (including 6% in education).

The Summer applicants belonged to an average of 2.0 education societies and 1.2 scientific or science education societies, and read an average of 1.3 educational periodicals and 2.3 scientific periodicals, but the year applicants read an average of only 1.3 scientific periodicals as compared with 1.9 education periodicals. However, among the Summer applicants 53% had no scientific or science education society memberships, and 30% read no scientific periodicals, the membership and reading percentages being brought up by relatively high figures for a rather small number of the applicants.

Some 15 per cent of the academic year applicants indicated they read the *Scientific American*, and the per cent reading the *Science Teacher* was the same, while 13 per cent read the *Science News Letter*. Readership of the other scientific or science teaching publications was considerably lower: *Nature Magazine, American Biology Teacher, and School Science* and *Mathematics*—7% each, *Science Digest*—5%, *Journal of the American Medical Association*—3%, *Science*—2%, and miscellaneous biological research journals—2%. All other publications were read by less than 2% of the group. It is evident that no single journal reached a substantial per cent of the applicants and that few read any of the scientific research journals. There was no indication as to the extent to which any periodical was read and digested.

In selecting participants from among the applicants the University of North Carolina Institutes followed what is perhaps the most common institute practice throughout the country; i.e., an effort being made to select teachers who seemed capable of doing good quality work but who were deficient in knowledge of the subjects they were teaching. Preference was generally given to those who had been teaching at least three years but who still had a substantial portion of their career ahead of them. Despite the difficulty of judging capability from data available, and though most participants proved to have even less biological knowledge, especially as regards botany, than would be presumed from their course backgrounds, the great majority have been eager and hard working students and their rate of progress has been exceptional. There seems to be little doubt but that the NSF Institute Program is contributing greatly to the subject matter competence of secondary school science and mathematics teachers. This is true of botany as well as of other sciences, even though as botanists we might hope for some increased emphasis on botany in future Institutes for high school teachers.

ADDED OR CHANGED DUTIES

At the Missouri Botanical Garden George B. Van Schaack has been made Librarian and Curator of Grasses. Robert E. Woodson, Jr. is the new Curator of the Herbarium.

Wayne C. Hall has been made the head of the Department of Plant Physiology and Pathology at Texas A. and M. replacing G. M. Watkins who became Dean of the School of Agriculture.

Sydney S. Greenfield, Rutgers—The State University, Newark, N. J. is a participant in the Basic Curriculum Study of the Council for Basic Education, Washington, D.C. He will represent the field of biology. Dr. Greenfield is also serving as a member of the Committee of Examiners for the Biology Test of the College Entrance Examination Board for 1958-59.

Carroll E. Wood, Jr. has been promoted to the position of Associate Curator of the Arnold Arboretum. He will continue as Editor of the "Journal of the Arnold Arboretum."

John J. Sperry, Professor of Botany at the A. and M. College of Texas has been appointed supervisor of the Bureau of Sport Fisheries and Wildlife project entitled, "Vegetative Type Mapping of the Marshes of Southeastern Louisiana". This project is administered by the A. and M. Research Foundation and the Department of Biology.

Leon R. Kneebone Associate Professor of Botany and Plant Pathology at Penn State replaced H. W. Popp, on his retirement, as Chairman of the Committee on Biological Science in the Graduate School of the University. The Committee is concerned with the candidates for the M.Ed. and D.Ed. degrees who have majors in the biological sciences.

George W. Burns, Chairman of the Department of Botany at Ohio Wesleyan, has been made Acting President of the university on the resignation of the former president, Dr. Fleming, when he accepted the position of Secretary of the Department of Health, Education, and Welfare. Elwood B. Shirling is taking over the Chairmanship of the department for the year.

ANOTHER KEY

A new manual, "Woody Plants in Winter" by Earl L. Core and Nelle Ammons of West Virginia University has been published by the Boxwood Press in Pittsburgh. About 300 species are included with keys and brief descriptions of the winter characteristics and illustrations of the bud and twig appearances.

SOUTHERN CALIFORNIA BOTANISTS

The Southern California Botanists have held their fall meeting at Los Angeles State College. The professional botanists, horticulturists and amateurs plan a winter meeting, January 24 at Descanso Gardens, and a spring meeting, March 21, at San Dimas Experimental Forest.

POESY DEPARTMENT

The growth of the mold Phycomyces,
Is a succession of stages, or crises,
It's a wonderful sight
When it turns from the light,
Seeing wavelengths that no human eye sees.

An anonymous post card from Milan brought this to the Editor saying that Curry and Green's recent finding that the sporangiophores of Phycomyces, in stage IV, show negative phototropism in the ultraviolet brought to the writer's mind this item from a "collection of mediaeval Italian folksongs."