

PLANT SCIENCE BULLETIN

A Publication of the Botanical Society of America, Inc.

VOLUME 4

JANUARY, 1958

NUMBER 1

Suggested Outline for Teaching Systematic Botany

Panel on Systematic Botany Courses of the Committee on Educational Policies, Division of Biology and Agriculture, National Academy of Sciences—National Research Council*

[Introductory Note: One unending task confronting biologists concerned with teaching is to find effective ways of helping to keep instruction in pace with scientific advances and changing educational needs. Although various familiar methods for accomplishing this are in use, there seems to be a need for greater effort. Like other groups and individuals, the Committee on Educational Policies has therefore looked for other approaches to the problem and has suggested several. One proposal is to organize ad hoc panels to examine the evolving content of a given field and to offer ideas about course organization, presenting them to stimulate teachers to reconsider their present practices.

A carefully chosen panel of competent working scientists could bring a larger fund of knowledge and ideas to bear upon the problem than any single individual may possess, and the interplay of their knowledge and ideas could lead to suggestions for courses that could give new emphasis to basic principles, could place the field in a fresh light, could build upon accumulated knowledge and experience without letting tradition dominate teaching unduly. (See Behnke, J. A., 1957. *Toward improvement of advanced undergraduate biology courses*. *Plant Science Bulletin* 3(2): 8, April.)

Aided by a grant from the National Science Foundation, the Committee, to test the idea, sponsored two such panels during the past year. The panel approach has merit, the Committee suggests, if a panel's report encourages continuing reevaluation and experimentation in teaching by individual faculty members, authors of textbooks and manuals, and college departments. If the approach demonstrates its value, similar ad hoc panels could be organized on a formal or informal basis by any group interested in a specific biological area.

The report of one experimental panel is presented here. The Committee takes great pleasure in expressing appreciation to the Panel on Systematic Botany Courses for their thoughtful and imaginative effort. We also want to emphasize what their report illustrates: that the key objective of this tactic is not to prescribe anything to anybody, but to help biologists focus upon teaching the kind of constructively critical thinking they focus upon biological investigations, both as individuals and in symposia and conferences. — Howard M. Phillips, Chairman, Committee on Educational Policies.]

We have given prime consideration, in attempting to construct an outline for a course in Systematic Botany, to the statement in our instructions that "the objective is not to replace one orthodoxy by another but rather to stimulate continuing reevaluation and experimentation in teaching practice." We have also taken seriously the advice that our charge was to "throw the subject out the window" and start over."

When we pooled outlines of courses now being given, we concluded that our common agreements represented little more than pious platitudes. The teaching of

Systematic or Taxonomic Botany differs widely from institution to institution. It is usually taught as a course in local flora, or as the classification of vascular or flowering plants. It may be distributed in one or several courses through fall, winter, spring, or summer, on the basis of quarters, semesters, or a whole year. Instruction may be by lecture, laboratory, or field work, or by any combination of these. In short, the particular instructional vehicle for Plant Taxonomy depends greatly upon local conditions and facilities, the particular curricular environment, and the interest and training of the instructor. Although we imagine that the scope of many such courses could be broadened with profit, we do not think any model would be appropriate for all situations.

We have tried, therefore, to divorce the subject of Plant Taxonomy from the detailed survey and classification of any particular group of plants (or other organisms) as an end in itself. Instead, we have endeavored to abstract those principles that should, in our opinion, be common to all teaching in Plant Taxonomy, the better to emphasize to both taxonomists and other biologists the fundamental nature of the subject.

None of us has attempted to give a course like that outlined below. As we have worked on it, we have come to think it might be possible and desirable to develop one. However, whether or not such a course is ever actually taught, we hope our essay will stimulate discussion, some re-thinking, and the ultimate improvement of the stereotyped taxonomy courses that now are all too prevalent. If such a stimulatory influence is realized, we shall feel that our efforts are well repaid.

Principles of Systematic Botany (Plant Taxonomy)

We believe that the basis of Plant Taxonomy may be expressed in the form of the following three principles, the first two being biological, the third operational:

- I. The diversity of phenotypes present is one of the obvious features of the plant world, and is an expression of the fundamental and underlying genetic diversity.
 - a. By phenotype we mean the whole range and variety of qualitative and quantitative aspects of structure and function of the individual plant, e.g., morphology, mode of reproduc-

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Plant Science Bulletin

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tion, chromosomal behavior, habitat specificity, parasite-host relationships, developmental processes, etc. Thus, we understand the phenotype to be the full embodiment of interaction of genotype with environment.

- b. Diversity is most evident in the presence of gross discontinuities when one examines the whole plant kingdom, but one must recognize also the less obvious diversification that exists among the individuals of a natural population of a given species. Thus, the diversity one finds is a matter of degree, extending all the way from genetic identity (as in clonal individuals) to the extreme diversification that might be exemplified by a unicellular alga, on the one hand, and a complex seed plant, on the other.
- c. The similarities of plants existing at any one time-level make them appear to form aggregations separated by gaps of varying magnitude.

II. The patterns resulting from this diversity are the product of evolution and hence deserve a phylogenetic interpretation.

- a. Evolution, or descent with change, is the sum of processes that result from interaction between genetically diversified plants and the multiplicity of available environments.
- b. All living individuals and groups have had their origin in preexisting individuals and groups, to which they are tied by direct descent.
- c. One of the characteristic features of evolutionary lineages is that they have been diverging continuously through time.
- d. Phylogeny involves the study of ancestry and divergence, and is hence the history of genetic relationships.
- e. Phenotypic similarity, in the absence of known genealogies, is our best guide to relationship.

III. The present patterns of similarities and differences may be classified in such a way that the arrangement reflects evolutionary sequence.

- a. A classification should synthesize and systematize for general use all pertinent biological data of a comparative nature.
- b. It is possible by comparative procedures to determine degrees of relationship that permit delimitation of natural groups of organisms.
- c. Any classification is tentative and, like any other hypothesis in science, subject to continuous reevaluation in the light of new evidence. Thus, any grouping which is subsequently demonstrated to contain discordant elements demands revision.
- d. Groupings of organisms are made on the basis of similarities; differences between them—that is, discontinuities in the total applicable pattern of variation—permit their separation.
- e. Genetic discontinuities may be inferred or measured by the study of genetical or cytogenetical behavior and geographical distribution, as well as by other modes of comparison.
- f. An internationally accepted hierarchical system of categories has been developed to express formally the observed patterns of biological variation. Categories of any given rank must be recognized as being arbitrary units of expression, and are not necessarily equivalent as applied to different groups of organisms. Once the biological aggregations have been assigned to categories, the resulting taxa may be arranged to express phylogeny on the basis of evolutionary specializations or modifications.
- g. The universal acceptance of a uniform code of nomenclature is necessary for precision and ease of intercommunication.

Objectives of a Course in Systematic Botany (Plant Taxonomy)

From the course outlined below, we hope the student would derive the following:

1. An understanding and appreciation of the three principles outlined above, upon which taxonomy is based.
2. A broad and thorough acquaintance (in field, garden, and laboratory) with examples from the plant world that serve to illustrate these principles, on the basis of careful selection rather than encyclopaedic coverage. Instructors should select illustrative materials from those groups about which they possess special knowledge or in which they have special interest.
3. An interest in and appreciation of living plants as they occur in nature or in cultivation.
4. A knowledge of the methodology of identifica-

tion and procedural techniques, and of the organized and available sources of information and documentation.

5. An appreciation of synoptic thinking in science, that is, the evaluation and integration of a multiplicity of data in order to produce sound generalizations.

6. An understanding of the relationship of taxonomy to other branches of biology and to human affairs.

Course Outline

The following outline should be recognized as only a very rough framework, upon which each instructor is expected to build from his own experience and interests. At various points, we have inserted examples that have occurred to us; doubtless many better ones will occur to the reader.

1. *Introduction to diversity*, emphasizing the existence of large discontinuities and groupings on the basis of similarities and evolutionary trends. (Any appropriate plants conveniently at hand may be used as examples, preferably to be studied out-of-doors. Such methodology as the construction and use of keys might profitably be introduced at this point.)

2. *Detailed study of diversity* as shown by evolutionary trends in different structures and processes, such as elaboration series, reduction series, etc. (Possible examples: (a) Organization and specialization of gametophyte or sporophyte; development and specialization of vascular tissue; development of reproductive organs; comparative morphology of photosynthetic structures; elaboration of the leaf, flower, or fruit; specialization of sori in ferns; body-type tendencies in algae. (b) Other graded trends in phenotypic expression that are not wholly or primarily morphological, such as parasitism; ecological specializations in aquatic or desert plants; dispersal and pollination mechanisms, as in Asclepiadaceae and Orchidaceae; genome series.) Thus, no major plant group would be studied in all its details, but suitable illustrative evolutionary specializations would be selected from appropriate plant groups.

3. *Organization of diversity.*

a. Hierarchy of categories.

b. Application of categories:

(1) to a major group, stressing the kinds of differences that occur between taxa;

(2) to a particular group in which differences may be studied at the specific and infraspecific levels. There should be free selection of materials, such as mosses, ferns, gymno sperms, or a particular genus from any plant group.

c. Introduction to the use of nomenclature—a topic which should be kept strictly within bounds!

d. Introduction to the literature of Systematic Botany (systematic anatomy, morphology,

cytology; important bibliographies; illustrations; manuals, floras, monographs).

4. *Biological basis of diversity and taxonomy*, the mechanisms underlying evolution.

a. Mutation and recombination—genes and chromosomal changes.

b. Variation in populations (introducing graphic means of expressing the differences, e.g., scatter diagrams, etc.).

c. Restrictions to free gene-interchange and the developing of isolating mechanisms (spatial and ecological; genetic).

d. Natural selection.

e. Speciation, through divergence.

f. Hybridization and reticulate evolution (introgression, polyploidy).

g. *Breeding systems and variation patterns* (outcrossing systems, inbreeding systems, apomixis and vegetable reproduction).

5. *Phylogeny of a particular group of plants and the methods of determining it.*

a. Study of individual trends.

b. Correlation of characters (use of correlating methods, phylogenetic charts).

c. Identification of conservative members and conditions.

d. Experimental approaches (e.g., artificial synthesis, transplantation, breeding programs, etc.).

e. Prediction of discoverable taxa.

f. Phytogeographical considerations.

(Possible examples of well-documented studies of some aspects of the phylogeny of a particular group of plants might include: algal groups, ferns, cycads, Magnoliales.)

6. *Taxonomy in relation to other biological fields.*

a. Naming and initial organization, to make possible accurate identification and reference.

b. Expressing the genetic relationship of plants through assigning them to categories.

c. Documenting research in taxonomy and in other fields by identification and preservation of materials (voucher specimens, herbaria, type specimens).

d. Synthesizing all botanical knowledge around the central theme of evolution (phylogeny).

7. *Taxonomy in relation to human affairs.* An appreciation of the plant world and its importance in the human environment. (In addition to a possible short series of lectures and demonstrations on this topic, we suggest that attention be given throughout the course to the selection of examples of agricultural plants, drug plants, history and development of economic plants, forestry and conservation, etc.).

8. *Historical development of taxonomic thought*, as a phase of history of science and intellectual history.

Summary of Minutes of Botanical Society Council Meetings

Stanford University, August 1957

Meeting called to order by Pres. Avery, 1 p.m., Aug. 25. . . . Sec. Bold presented results of balloting for officers. Council instructed him to present names of nominees and their votes at business meeting for action by the membership. Sec. Bold presented his report, mentioning the new edition of the Yearbook (Misc. Publ. 140), the increasing number of inquiries about vocational and professional opportunities in plant sciences, the removal of his records to U. of Texas. Report accepted. Treas. Fuller presented an interim financial report, which indicated a cash balance of \$5,363.53 on Aug. 20, 1957; he estimated a balance of \$3,163.00 at end of fiscal year (Nov. 30, 1957). Report accepted. Treas. presented also a proposed budget for 1958, with estimated expenditures totalling \$15,452.00 Budget accepted. Treas. gave a report on membership: total membership as of Aug. 20, 1957—2,004 (1665 regular members, 271 grad. student members, 24 family memberships, 31 corresponding members; 13 life members). Retired members—42, delinquent members—102. . . . Bus. Mgr. Canright of Amer. Jour. Bot. presented his report, which was accepted by the Council. . . . Retiring editor Steere of AJB presented his annual report on the operations of AJB, stated that the McGraw-Hill Book Co. will publish in the winter of 1957-58 a volume containing the 40 invitation papers published in the Golden Jubilee volume (vol. 43) and in some numbers of vol. 44 of AJB. He reported favorable reaction of numerous members to the occasional publication of general papers of similar type in future volumes of AJB. He reported also that H. J. Fuller would become editor of AJB on Sept. 1, 1957. . . . Editor Fuller of Pl. Sci. Bull. reported on 1957 activities of that organ. He suggested that wider geographical distribution of news coverage would improve PSB, suggested that regional correspondents be appointed. Council approved publication of PSB on bimonthly basis during 1958, in view of many requests for more frequent publication. . . . Sec. Bold presented report of Director Harlan Banks and his staff for their excellent organization and administration of the 1957 institute. Sec. was instructed to explore possible sites for an NSF Summer Institute in Botany for 1959 and to act for the Society in this matter. . . . Sydney Greenfield presented brief report of Committee on Education for Chairman Victor Greulach. . . . Brief report of Com. on Membership was presented. Com. believes that graduate students continue to represent an important source of new members. . . . Chairman Papenfuss of Darbaker Awards Committee reported that the committee was making no award in 1957. . . . Chairman Creighton of Com. on Corresponding Members reported committee's desire to nominate the following for corresponding membership: Isabel Cookson (Univ. of Melbourne); Lothar Geitler (Univ. of Vienna); Rene Soueges (Paris); Walter Zimmerman

(Univ. of Tübingen). Council approved these nominations. Chairman Boke of Committee on Merit Awards recommended the following for Certificates of Merit: Barbara McClintock (Carnegie Institute of Washington), Donald F. Jones (Univ. of Conn. and Conn. Agr. Exp. Sta.), Paul Mangelsdorf (Harvard), and William H. Weston (Harvard). (NOTE: the complete citations for these 4 botanists are published elsewhere in this number). The committee was thanked and discharged; a new committee is to be appointed. . . . Committee on National Herbarium made no report and was dissolved. . . . Committee on Use of Botanists in National Emergency had nothing significant to report, was dissolved. . . . A report was received from R. E. Cleland, Bot. Soc. representative to Governing Board of AIBS. . . . A brief report was read from P. B. Sears, representative to Council of AAAS. . . . E. L. Little, Jr., representative to Chem.-Biol. Coordination Center, sent a written report indicating discontinuance of the Center on July 1, 1957. . . . Status of Bot. Soc. Guidance Booklet was reviewed. Pres. Avery was asked to revise the booklet and to present it to Executive Committee of Council, which is to explore ways of financing its publication. . . . Requirements for retired membership were discussed. Sec. was instructed to circulate a proposed amendment to the By-laws to replace Art. II, 1-e: "All members of the Society who have held membership in the society for 25 years and who have retired from their positions may apply for Retired Membership in the Society by writing the secretary. Retired members shall continue to receive the publications of the Society without further payment of dues". . . . Council made the following appointments: Representative to Div. of Biology and Agric., NRC, for a 3-yr. term—David Goddard; Representative to Council of AIBS 1957-1960—Oswald Tipppo; to Board of Governors of AIBS—Ralph Cleland. . . . Sec. was instructed to offer Society's good offices to Dept. of State in screening foreign botanists who might be seeking admission to the U. S. at time of 9th International Bot. Congress in 1959. . . . Sec. was instructed to quote a fee of \$25 to those requesting a run of the Society's addressograph plates. ~~The Sec. is to arrange for Treas. to pay AIBS for this service and to deposit the balance to the society's credit. Sec. is authorized to sell Yearbook at \$5 per copy. . . . Council ruled that the Society should not officially support the candidacy of any person for an honorary degree. . . . Council heard a proposal to make the Society's fiscal year coincide with the calendar year, but took no action. . . . Secretary was instructed to determine the cost of microfilming the Society's records and to report it to the Council. . . . In view of a request transmitted to the Society by Dr. Cleland in 1956 that it increase its annual contribution to AIBS, Sec. was instructed to find out the amounts contributed by other plant science societies to AIBS and to Biological Abstracts and to report this information to the Council at the 1958 meeting. . . . Discussion revealed that a special registration fee of \$3 (instead of \$5) is available to graduate students who register for AIBS meetings in~~

advance. . . . Sec. was instructed to determine sentiment of members regarding meetings of Bot. Soc. in 1959, year of the 9th Int. Bot. Congress. . . . Sec. reported results of his poll of members concerning abstracts. Majority of about 1,000 members responding indicated that they would like abstracts of papers presented at meetings published in advance of meetings and that they would be willing to pay increased dues for such abstracts. Council decided to devote further study to the matter of abstracts. . . . Chairman Creighton of Com. on 9th Internat. Bot. Congress reported no activity of that committee, stating that Canadian botanists are assuming complete responsibility, although they may delegate some items to some American botanists.

Minutes of Botanical Society Business Meeting

Stanford University,
August 26 and 27, 1957

Meeting called to order by Pres. Avery at 1:05 p.m. in Cubberly Hall. . . . Sec. Bold presented results of second nominating ballot, showing top candidates based on ballots from about 1200 members. Sec. was instructed to cast a ballot for those receiving highest number of votes. Officers for 1958 are therefore: Pres.—F. W. Went; Vice-Pres.—H. J. Fuller; Treas.—A. J. Sharp; Member of Editorial Board—Ralph Wetmore. Sec. Bold continues in his office until 1959. . . . Sec. reported on results of poll of members on abstracts, showing that majority of members favor publication of abstracts before annual meeting. No action taken; further study will be made of this question. . . . Retired Editor W. C. Steere of Amer. Jour. Bot. presented his report, announced that H. J. Fuller would succeed him on Sept. 1, 1957. Membership voted to accept Dr. Steere's report and to express its appreciation of his services. . . . Editor Fuller of Pl. Sci. Bull. presented a brief report, announcing that that journal would appear on a bimonthly schedule in 1958. . . . Adriance Foster, speaking for Harlan Banks, reported on the 1957 Summer Institute of Botany held at Cornell, stated that Sec. Bold had been authorized to begin study of plans for a similar institute in 1959. . . . Treas. Fuller presented an interim report, the budget for 1958, and a report on membership. Reports accepted. . . . Bus. Mgr. Canright of Amer. Jour. Bot. presented an interim report of financial aspects of AJB. Report accepted. . . . Chairman Creighton reported for Com. on Corresponding Members, which recommended election of Isabel Cookson, Lothar Geiter, Rene Soueges, and Walter Zimmerman. Membership voted to approve election of these 4 botanists. . . . Reports were made by Ralph Cleland, Bot. Soc. representative to Governing Board of AIBS, Elbert Little Jr., Bot. Soc. representative to Chem.-Biol. Coordination Center. . . . At banquet, held at 7 p.m. Aug. 28, at Rickey's Studio Inn, the names of recipients of 1957 Certificates of Merit were announced; these persons are Barbara McClintock, Donald F. Jones, Paul Manglesdorf, and William H. Weston.

IXth International Botanical Congress

(These notes are addressed to members of a special U.S. advisory committee and to secretaries of botanical societies of N. Amer. in order to bring them up to date on progress of organization).

1. IXth International Botanical Congress will be held in Montreal Aug. 19-29, 1959.

2. Officers of the Congress are: President—W. P. Thompson (U. of Sask.); 1st vice-pres.:—Pierre Dansereau (U. of Montreal); 2nd vice-pres.:—K. W. Neatby (Science Service, Ottawa); 3rd vice-pres.:—Muriel V. Roscoe (McGill Univ.); Sec.-general—Clarence Frankton (Science Service, Ottawa); Associate sec.-general—R. Pomardeau (Science Service, Ottawa); Treas.—A. J. Skolko (Science Service, Ottawa); Secretary-mgr.—H. L. Berlyn (Science Service, Ottawa); Officer for liaison with U.S. botanists—Pierre Dansereau; Chairman of Program Committee—H. A. Senn (Science Service, Ottawa); Chairman of Field Trips Com.—Marcel Raymond (Montreal Bot. Gard.); Chairman of Finance Com.—K. W. Neatby; Chairman of Local Organization—Muriel Roscoe; Chairman of Publications Com.—D. L. Bailey (U. of Toronto); Chairman of Publicity Com.—Jean Beaudry (U. of Montreal).

3. On Mar. 23-24, 1956, a meeting was held in N.Y. which brought together representatives of AIBS, AAAS, Bot. Soc. of America, NSF, NRC, and NAS. All features of the Congress were discussed and many suggestions made, esp. with reference to U.S. collaboration in organization of field trips and invitation of foreign botanists to U.S. campuses before and after congress. NSF made a grant to defray expenses of this meeting and of a second held Nov. 1957.

4. The Congress is *not* jointly sponsored by Canadian and U.S. botanists. Many U.S. botanists, however, have been asked to serve on committees and have agreed to do so. Responsibility for the Congress rests with Canadian botanists.

5. Numerous subcommittees have been set up (names of chairmen are in parentheses): 1. Nomenclature (J. Rousseau); 2. Taxonomy and exp. taxonomy (R. D. Gibbs); 3. Phycology (J. Brunel); 4. Mycology (J. W. Groves); 5. Medical mycology (F. Blank); 6. Pathology (W. F. Hanna); 7. Lichenology and Bryology (J. Kucyniak); 8. Microbiology (H. Katznelson); 9. Taxonomy of Pteridophytes and Phanerogams (M. Raymond); 10. Morphology and anatomy (M. W. Bannan); 11. Paleobotany (N. W. Radforth); 12. Physiology (G. H. Duff); 13. Phytogeography (P. Dansereau); 14. Cytology and genetics (J. Beaudry); 15. Forest Botany (J. H. Bier); 16. Agricultural and economic botany (C. Frankton); 17. Ethnobotany and history (F. Verdoorn).

These subcommittees do not necessarily correspond

to sections of the congress. Decisions regarding the sections will be made later.

6. No special meetings of societies will be allowed to run concurrently with Congress sectional meetings or to be jointly sponsored by them. No exception can be made to this rule in an International Congress. Separate meetings of societies may be held immediately before and after the congress, but the Congress administration cannot undertake to organize them.

7. A preliminary announcement, now being prepared, will be sent to some 600 botanical periodicals.

8. All correspondence concerning the congress should be sent to C. Frankton, Science Service Bldg., Dept. of Agric., Ottawa, Ont., Canada.

1957 MERIT CITATIONS

At its Golden Jubilee banquet in August 1956, Bot. Soc. presented Certificates of Merit to 50 botanists for their distinguished contributions to our science. At that time, Bot. Soc. announced its plan to present such certificates to additional botanists in succeeding years. Those botanists who received Certificates of Merit at Bot. Soc.'s 1957 banquet and their citations are the following:

BARBARA MCCLINTOCK, early student of radiation-induced chromosomal aberrations, pioneer in the use of such aberrations for purposes of genome analysis, important contributor to the theory of gene structure, world leader in the broad field of cytogenetics.

DONALD FORSHA JONES, through many years an outstanding geneticist, plant breeder and horticulturalist, a profound and versatile student of a wide range of hereditary phenomena, especially known for his contributions to an understanding of hybrid vigor, and for his pioneer role in the development of hybrid corn.

PAUL CHRISTOPH MANGELSDORF, leading investigator in the fields of agronomy, genetics and economic botany, foremost authority on the history and evolution of maize, for his contribution to the classification, morphology and genetics of corn, and for his role in the development of maize breeding programs throughout the Americas.

WILLIAM HENRY WESTON, master of the spoken and written word, for his contributions to the lower fungi, which are models of perfection in execution and writing and particularly for his unselfish devotion to his students and his superlative ability as a graduate teacher.

BIOLOGY AT WISCONSIN

Botany and zoology at U. of Wisc. are expanding their quarters for the first time since 1912. They have moved into a new addition to Birge Hall. The extra space provided by this new wing doubles the space available to these departments.

FUTURE MEETING OF AIBS

R. E. Cleland, Bot. Soc. representative to Governing Board of AIBS, reported at Bot. Soc. Council meeting at Stanford that the next 4 AIBS meetings will be held in these places: 1958—Indiana Univ., Bloomington, Indiana; 1959—Pennsylvania State Univ., University Park, Pa.; 1960—Oklahoma State Univ., Stillwater, Okla.; 1961—Univ. of Massachusetts, Amherst, Mass. The 1958 meeting will be held Aug. 24-28; dates for other meetings will be announced later.

ANDRE DREYFUS FOUNDATION

Board of Directors of the Andre Dreyfus Foundation invites geneticists to register as applicants for its International Genetics Prize for 1958, valued at 150,000 cruzeiros (\$1500). The prize is available to individuals or groups from any country working in genetics or related fields. The prize is intended for the development of research programs, research travel, and publication of research results. Applications should be accompanied by the candidate's *curriculum vitae*, list of publications, detailed plan of proposed research program or a copy of the ms. for publication. In case of equality of qualifications, preference will be given to the project which may have more direct influence on the development of genetics research in Brazil. Applications and supporting documents should be received by Secretary General of the Foundation not later than Jan. 31, 1958. (Jenny Dreyfus, Secretaria Geral da Fundacao-Premio Andre Dreyfus, Rua Belfort Roxo 40, apto. 502, Copacabana, Rio de Janeiro, Brazil).

LALOR FOUNDATION AWARDS FOR SUMMER 1958

The Labor Foundation will offer 40 awards to college and univ. faculty members for biological research in summer 1958. The awards are primarily for research involving chemistry and physics in attacking biological problems. Upper age limit for applicants is 40. Awards will be approx. \$900 for a single person, \$1,100 for a married man at his home institution, and \$1,250 for a married man working at another institution. In recent years, the foundation has maintained a number of post-doctorate fellowships at Marine Biol. Lab., Woods Hole, Mass.; these have been consolidated into the present program, and scientists wishing to work at Woods Hole should submit applications under the new program. Inquiries should be addressed to Lalor Foundation, 4400 Lancaster Pike, Wilmington 5, Del. Final date for receipt of applications is Jan. 14, 1958. Notification of appointments will be made about March 15, 1958.

Among recipients of Lalor awards in 1957 were: Charlotte Ayers, Univ. of Miami; Norman Bishop, Univ. of Chicago; Theodore Cayle, Washington Univ.; Gordon Christiansen, Connecticut College; Robert Levine, Harvard Univ.; Karl Maramorosch, Rockefeller Inst. for Med. Research; Raymond Wolfe, Univ. of Oregon; Marko Zalokar, Yale.

PERSONAL

Harold St. John, first Wilder Prof. of Botany at Univ. of Hawaii, has been elected an Honorary Member of the Botanical Society of Japan, according to Dr. S. Hattori, president of the society. Election was made at the Diamond Jubilee of the society in Tokyo, Oct. 1957. . . . Ernest Artschwager, Senior Botanist, USDA Field Station, Las Cruces, N. Mex., died on June 21, 1957, at his home. He was an outstanding contributor to knowledge of anatomy, morphology, and taxonomy of sugar cane and sugar beet. He was engaged for many years in preparing detailed descriptions of the hundreds of varieties of sugar cane in various parts of the world; at the time of his death, this work was at the Govt. printer and will soon appear as a handbook on the taxonomy of sugar cane varieties. Modern work on morphology and anatomy of sugar beets is largely his work. . . . Howard C. Reynolds was recently appointed assistant prof. of botany and curator of the Elam Bartholomew Herbarium at Fort Hays Kansas State College. He will continue his research on vascularization in leaves of members of Andropogoneae. Prof. Reynolds submits this profundity from a student exam. paper: "Determiners of hereditary characteristics are called Taxonomists". . . . Frans Verdoorn, managing editor of *Chronica Botanica*, is director of new Biohistorical Institute of Univ. of Utrecht, Netherlands. The institute, to operate in conjunction with the Botanical Museum and Herbarium, will center activities on cultural, historical, and other humanistic aspects of pure and applied biological sciences, chiefly botany. The institute will be housed in a new building adjacent to Utrecht Hortus Botanicus. *Chronica Botanica* publications will be taken over by Ronald Press. Verdoorn will act as consulting editor to John Behnke of Ronald Press.

DARBAKER PRIZE IN PHYCOLOGY FOR 1958

The Committee on the Darbaker Prize will accept nominations for an award to be announced at the annual meeting of the Society in 1958. The award is to be made for meritorious work in the study of algae. Persons not members of Bot. Soc. are eligible for the award. The Committee will base its judgment primarily on the papers published by the nominee during the last two calendar years previous to the closing date for nominations. The award will be limited to residents of North America. Only papers published in English will be considered. Nominations for the 1958 award, accompanied by a statement of the merits of the case and by reprints of the publications supporting the candidacy, should be sent to the Chairman of the Committee to be received by May 1, 1958. The value of the Prize for 1958 will depend on the income from the trust fund but is expected to be about \$200.00

Harold C. Bold, Univ. of Texas; Robert W. Krauss, Univ. of Maryland; Ruth Patrick, Academy of Natural Sciences, Philadelphia; Richard C. Starr, Indiana Univ.; George F. Papenfuss, *Chairman*, Univ. of Calif., Berkeley, Calif.

REGIONAL CORRESPONDENTS

In order to make more effective the news-gathering facilities of PLANT SCIENCE BULLETIN, the Editorial Board is setting up a system of Regional Correspondents who will aid in gathering news items, manuscripts, and other materials of especial interest to botanists from fellow-botanists in their respective regions. The March number of PSB will bear a list of all these Regional Correspondents and the areas for which they will have reportorial responsibility. Members of Bot. Soc. are urged to communicate with their Regional Correspondents when they have news to report: promotions, resignations, changes in institutions, deaths of botanists, fellowship awards, scientific honors, research requests, professional travel, etc. The success of PLANT SCIENCE BULLETIN will depend in large degree upon the extent to which Bot. Soc. members inform their correspondents of notable and newsworthy items. Watch the March 1958 number of PSB for the name of your Regional Correspondent!—Ed.

NOTE ON 9th INTERNATIONAL BOTANICAL CONGRESS

Pierre Dansereau, first vice-pres. and liaison officer with U.S. botanists, reports, apropos of October, 1957, PSB's note on the Congress, that his institution, Univ. of Montreal, as well as McGill Univ., will be a center for sessions of the Congress.

UNIVERSITY OF ALABAMA

Univ. of Alabama has recently received 136 acres of government land valued at \$176,000. About 3 miles north from the univ. campus, the area will be variously used; 90 acres are to be developed by the biology dept. into an arboretum for teaching and research. E. Gibbes Patton is director of the arboretum.

GEORGE COOLEY AWARDS

The Cooley Award in taxonomy for the best paper presented at the Stanford meeting of Amer. Soc. of Plant Taxonomists was divided in 1957 between John B. Haller, Univ. of Calif. at Santa Barbara, for his paper on "The relations of *Pinus ponderosa* and *P. jeffreyi*" and Kenton L. Chambers, Yale, for his paper on "Cytogenetic evidence of the relationships of *Microseris scapigera*."

EDITORIAL

It has begun. The launching of two Russian satellites has brought demands from the editorial writers and magazine scribes, from the statesmen and politicians, from military leaders, from scientists and scientific organizations, from other spokesmen of our society, that we must have more and better education in the sciences, that we must discover scientific talent in young people at an earlier age and more assuredly, that we must insure that talented young people of limited financial resources be granted more scholarships and

other monetary aids for the support of their sound scientific education. All to the good, but the problem is far from simple. Better scientific education requires better, more stimulating, more perspicacious teachers of science. Increasing the quantity of science education will avail us little if its quality is not at the same time improved. Thus, better training of science teachers at all levels of our educational system becomes an essential feature of the improvement of science education. Further, in our desire to improve both the quantity and quality of science education we must not lose perspective to the extent that we encourage, or even allow, increased science education to plasmolyze education in the humanities and in the more respectable and less carminative social studies. To do so would be to effect the loss of certain great values in education.

One of the real dangers attendant upon the current enthusiasm for expanded science education is that of confusing science with technology. There is already evidence in the daily press and in the columns of magazines that such confusion is growing. Scientists of all subspecies must make clear at every opportunity that technology, true, is a part of science but that it is not the major part, that its growth and achievements are derivative of the work and discoveries of investigators in the "pure sciences," of men and women, that is, who are motivated primarily by human curiosity about this strange and wondrous universe in which we live, not by their desire to produce more impressive technological gadgets. The physicists, of course, have a golden opportunity to point out this relationship in describing the contributions of Enrico Fermi, Arthur Compton, Albert Einstein, and other "pure" physicists to the development of the atomic bomb. At first glance it would appear that botany and botanists can play only a minor role, if any, in the advance of those features of science that may lead to the improvement of American satellites (unlaunched at this writing) and to the development of intercontinental missiles. But botanists do have the opportunity to emphasize the contributions of "pure science" discoveries to practical applications, and they should take advantage of that opportunity to implant in the minds of their students and all other laymen that lesson, which, clearly understood, can reduce or eliminate confusion and can promote the support of the basic, fundamental sciences. We have many examples of research in the plant sciences to emphasize that idea: the discovery of plant hormones by men whose only desire was to explain features of the internal regulation of plant growth; and the resulting practical applications, such as promotion of the rooting of cuttings, prevention of pre-harvest fruit drop through growth-regulator sprays, and the killing of weeds by 2,4-D and related compounds; the debt of modern practical plant breeders to the fundamental discoveries of a gentle and obscure Austrian priest; the improvement of modern fertilizers as a result of investigations of the basic features of mineral nutrition of plants by plant physiologists intent upon finding out more about how plants live; the use of artificial lighting to control the flowering of greenhouse crops, a technique derived

from the original work on photoperiodism; the dependence of the control of plant diseases upon basic knowledge of the physiology of parasitic fungi and other pathogens. Botanists should sing this theme song at every opportunity; this harmonizing will help to indicate to the public at large and to lawmakers that, in all programs of improving technology, "pure research" is fundamental and that technological advances may continue only to the degree that basic research is encouraged and supported.

FINANCIAL NOTE

Don't forget that the new treasurer (as of Dec. 1, 1957) of Bot. Soc. is A. J. Sharp, Dept. of Botany, Univ. of Tennessee, Knoxville, Tenn. All dues payments, address changes, new membership applications, etc., should be sent to him henceforth, *not* to the retired treasurer, H. J. Fuller, Univ. of Illinois.

THE LYNN INDEX

The late Dr. E. V. Lynn, Dept. of Chemistry, Mass. College of Pharmacy, spent many years searching the literature for references to phytochemistry. The results of his work are to be found on some 80,000 index slips, covering references through 1954, at Mass. College of Pharmacy. This collection is known as the Lynn File. Professors John W. Schermerhorn and M. W. Quimby of that institution have undertaken the organization and editing of the material for publication as THE LYNN INDEX. This work has been in progress since June 1957, under a grant furnished by Smith, Kline, and French Laboratories. Monograph I of the index, consisting of 46 pages, has been published recently and is now available. It is estimated that 70 to 80 issues will be needed to complete the project. The contents of each monograph will be arranged so that one can determine what work has been reported on a given plant and what constituents have been isolated and identified. The bibliographies will be annotated so that the reader can quickly determine whether a specific citation deals with a phase in which he is interested. Each monograph will center upon species from a single family or from a group of related families. Monograph I treats the order *Centrospermae* and includes nearly 400 references to species in 60 genera among the Aizoaceae, Amaranthaceae, Caryophyllaceae, Chenopodiaceae, Nyctaginaceae, Phytolaccaceae, and Portulacaceae. Announcements will be made later as further issues of THE LYNN INDEX are published. Monograph I is available at \$1 per copy. A check or money order should accompany each order. Address orders to THE LYNN INDEX, Mass. College of Pharmacy, 179 Longwood Ave., Boston 15, Mass.

PERGAMON INSTITUTE

July 1957 PSB carried information about Pergamon Institute, without, however, stating the U. S. address of that organization. This information has just reached the editor: Pergamon Institute, 122 E. 55th St., New York 22, N. Y.