# SCIENCE

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## THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

### REPORT OF THE SECRETARY OF THE COMMITTEE ON GRANTS FOR RESEARCH

To the Executive Committee of the Council, American Association for the Advancement of Science.

*Gentlemen:*

In accordance with your request I submit the following report of the Committee on Grants for Research, this being a summary of the activities of the committee during the five years since its organization.

By the settlement of the Colburn estate in 1916 the association received cash and securities valued at about $76,000, bequeathed by Richard T. Colburn, a fellow of the association, the income of which is to be devoted "to original research in the physical and psychic demonstrable sciences." The association had accumulated a fund of about $25,000, mainly from the fees of fellows, life members, and members. The income from these funds being available for grants for research, the sum of $4,000 was, at the New York meeting of the association, on the recommendation of the treasurer, set aside for this purpose by the council, to be expended during the year 1917.

At the same time a Committee on Grants for Research was appointed, consisting of seven members under the chairmanship of Edward C. Pickering. These members, as well as their successors, were chosen so as to represent as far as possible the different sections of the association. At the meeting of the association in December, 1918, the committee was enlarged to include nine members, while a year later, with the adoption of the new constitution of the association, the number was changed to eight, the term of each member to be four years, with the arrangement of rotation so that two members should be succeeded by new appointees

each year. In 1920 the executive committee of the council voted that the Committee on Grants should thereafter elect its chairman and secretary.

Following is a list of persons who have served as members of the Committee on Grants, with the inclusive years of their respective terms:

| | |
|---|---|
| Edward C. Pickering | 1917-1918 |
| E. C. Franklin | 1917-1919 |
| N. L. Britton | 1917-1919 |
| J. McKeen Cattell | 1917-1919 |
| W. B. Cannon | 1917-1920 |
| R. T. Chamberlin | 1917-1920 |
| Henry Crew | 1917-1921 |
| Louis I. Dublin | 1919-1919 |
| G. N. Lewis | 1919-1921 |
| G. H. Parker | 1919-1921 |
| Joel Stebbins | 1919-1921 |
| George T. Moore | 1920-1923 |
| Robert M. Yerkes | 1920-1923 |
| Arthur B. Lamb | 1921-1922 |
| C. Judson Herrick | 1921-1924 |
| David White | 1921-1924 |

The chairmen of the Committee on Grants have been Edward C. Pickering (1917-1918), Henry Crew (1919-1920), and Robert M. Yerkes (1921-); and the secretaries, J. McKeen Cattell (1917-1918), and Joel Stebbins (1919-1921).

The committee has held its meetings annually, at first in Washington during the month of April, but recently in December in connection with the meetings of the association. Although the members are widely separated geographically, it has been possible to get enough of them together once a year to have an intelligent discussion of the business of the committee. Experience has shown that while a good deal of preparation can be carried on by correspondence, the final decisions and the apportionment of money for grants can be made satisfactorily only with the personal exchange of views at a meeting.

From the beginning it has been the policy of the committee to apportion the annually available amount as a number of small grants to individuals; in fact, with a total of about four thousand dollars each year, to cover all the sciences, there was no other choice than to apportion a number of small sums. Although other methods of procedure have been suggested, the council of the association has formally approved the policy of the committee in assigning miscellaneous grants to individuals, without undertaking to support specific lines of investigation which might stand as projects of the committee alone.

At the time of its organization the committee adopted a number of rules for its own guidance and for the information of those to whom grants are made. These rules, adopted in April, 1917, are as follows:

1. Application for grants may be made to the member of the committee representing the science in which the work falls, or to the chairman or secretary of the committee. The committee will not depend upon applications, but will make inquiry as to the way in which research funds can be best expended to promote the advance of science. In such inquiry, the committee hopes to have the cooperation of scientific men and especially of the sectional committees of the association.

2. The committee will meet at the time of the annual meeting of the association or on the call of the chairman. Business may be transacted and grants may be made by correspondence. In such cases the rules of procedure formulated by the late Professor Pickering and printed in the issue of SCIENCE for May 23, 1913, will be followed.

3. Grants may be made to residents of any country, but preference will be given to residents of America.

4. Grants of sums of $500 or less are favored, but larger appropriations may be made. In some cases appropriations may be guaranteed for several years in advance.

5. Grants as a rule will be made for work which could not be done or would be very difficult to do without the grant. A grant will not ordinarily be made to defray living expenses.

6. The committee will not undertake to supervise in any way the work done by those who receive the grants. Unless otherwise provided, any apparatus or materials purchased will be the property of the individual receiving the grant.

7. No restriction is made as to publication, but the recipient of the grant should in the publication of his work acknowledge the aid given by the fund.

8. The recipient of the grant is expected to make to the secretary of the committee a report

in December of each year while the work is in progress, and a final report when the work is completed and published. Each report should be accompanied by a financial statement of expenditures, with vouchers for the larger items when these can be supplied without difficulty.

9. The purposes for which grants are made and the grounds for making them will be published.

At least once each year announcement is made in SCIENCE inviting applications and suggestions for grants. Although this procedure naturally results in the receipt of a considerable number of requests for support of work which is trivial or scientifically unsound, it is also true that members of the committee have in this way learned of various places where small expenditures would produce valuable results, both by direct aid to struggling investigators and by bringing to the attention of authorities of institutions the importance of some of the work which is being carried on by members of their staffs.

Each person who accepts a grant signs an agreement to the following conditions:

(1) The work as outlined will be begun in the near future and efforts will be made to complete it at as early a date as possible.

(2) A report will be made to the secretary of the committee on the completion and publication of the work, and in December of each year until the work is completed. The reports will include a financial statement with vouchers for the larger items.

(3) In the publication of the results the grant from the research fund of the American Association for the Advancement of Science will be acknowledged.

Shortly before December 1 of each year the secretary of the committee sends out a reminder to each recipient of a grant that a report is due, and a list of these reports is kept in the files of the committee. By a vote of the committee the account of each grant is kept open until it is formally closed by action of the chairman, secretary, and member of the committee in whose field the grant lies. Every grant is thus followed up until the work is completed and published.

As the committee was organized just prior to the entrance of the United States into the war, there was considerable delay at first, during 1917 and 1918, in getting the work of the different grants started. In fact, some of the assignments were returned because the work was postponed on account of the war, and other investigations have not yet been brought to conclusion for the same reason.

In the following table is given a summary of the grants that have been made during the past five years together with a summary of the present state of the accounts, and there is given as an addendum to this report a detailed list of the different grants which have been made:

| Year | Amount apportioned | Number of Grants | No. of Grants for Which Work is Completed | No. of Grants for Which Work is Completed and Published | No. of Papers Published |
|---|---|---|---|---|---|
| 1917 | $ 2,350 | 14 | 9 | 6 | 10 |
| 1918 | 2,900 | 9 | 6 | 5 | 12 |
| 1919 | 4,000 | 16 | 9 | 5 | 12 |
| 1920 | 4,500 | 19 | 9 | 4 | 3 |
| 1921 | 5,000 | 24 | 3 | 2 | 2 |
| Totals | $18,750 | 82 | 36 | 22 | 39 |

Most scientific men will no doubt agree that the only test as to whether or not a given investigation is successful, is the actual publication of the results. The last column in the foregoing table shows how many papers have thus far been published as wholly or in part due to grants from the association for the corresponding year. In the second addendum to this report is given a bibliography of these papers. This list is growing rapidly, and as time goes on it will present a real measure of the success of the work of the committee and of the policy of the association.

Respectfully submitted,

JOEL STEBBINS,
*Secretary, Committee on Grants*
UNIVERSITY OF ILLINOIS,
DECEMBER, 22, 1921

*First Addendum*

LIST OF APPROPRIATIONS MADE BY THE COMMITTEE ON GRANTS, 1917-1921

1917

1. Ralph C. Benedict, Brooklyn, New York. Botany. For the continuation of the investigation on the Boston fern..... $100
2. R. S. Woodworth, Columbia University. Psychology. For compiling anthropometric data..... 100

3. F. C. Blake, Ohio State University, Physics. In aid of his work on electric waves ..... 100
4. Richard C. Tolman, Fixed Nitrogen Research Laboratory, Washington, D. . Physics. For further testing and extending his work n the electromotive force produced in a conductor subjected to mechanical acceleration..... 300
5. H. L. Fairchild, University of Rochester. Geology. To defray traveling expenses in a study of the post-glacial land uplift in New England and the maritime provinces of Canada..... 300
6. S. W. Williston, University of Chicago, Geology. Toward the expenses of an artist to help draw the figures of the many new Permian fossil vertebrates which Dr. Williston discovered..... 100
7. Ralph W. Chaney, State University of Iowa. Geology. Toward field expenses of further studies upon the Eagle Creek flora of the Columbia River gorge..... 100
8. Frederick P. Gay, University of California. Pathology. For animals and materials to be used in the study of the specific treatment of tuberculosis in animals, especially in the use of taurine derived from the muscles of certain shell fish..... 500
9. John B. Watson, Johns Hopkins University. Psychology. Toward the study of the development of the reflexes and instincts of infants..... 100
10. Robert M. Yerkes, Harvard University. Psychology. Toward the cost of apparatus and care of animals in the study of ideational behavior. (Returned) ..... 100
11. Ales Hrdlička, U. S. National Museum. Anthropology. For anthropometrical investigations on the tribe of Shawnee in Oklahoma..... 100
12 Bruno Oetteking, Museum of the American Indian, New York. Anthropology. For the purpose of completing the investigation of skeletal material from the Pacific coast of America 100
13. Herbert M. Richards, Barnard College. Botany. For the continuation of the investigation of the physiology of succulent plants..... 250
14. C. H. Kauffman, University of Michigan. Botany. To aid in his studies of the fungus genus *Cortinarius*..... 100

1918

15. American Association of Variable Star Observers. Astronomy. For the purchase of a telescope of 5-inch aperture 300
16. A. E. Douglass, University of Arizona. Botany. For determining the record of the Sequoias..... 250
17. C. H. Eigenmann, Indiana University, Zoology. For the study of the fresh water fishes of South America..... 500
18. Edwin B. Frost, Yerkes Observatory. Astronomy. For the measurement and reduction of stellar spectrograms..... 500
19. R. A. Porter, Syracuse University. Physics. For the explanation of the hysteresis which has been observed in the potential gradients of the calcium-cathode vacuum tube..... 200
20. E. W. Sinnott, Connecticut Agricultural College. Botany. For experiments to determine the ratio between root, stem, leaf and fruit in the bean plant 200
21. O. F. Stafford, University of Oregon. Chemistry. For research on the distillation of wood ..... 500
22. Herman L. Fairchild, University of Rochester. Geology. For the continuation and completion of his studies on the post-glacial continental uplift in New England and the maritime provinces of Canada. (Additional)..... 200
23. Seismological Society of America. Geology. To enable the society to dispatch capable men to study the phenomena of earthquakes as promptly as possible after their occurrence..... 250

1919

24. Edwin B. Frost, Yerkes Observatory. Astronomy. For the measurement and reduction of stellar spectrograms. (Additional) ..... 500
25. A. L. Foley, Indiana University. Physics. For experiments on the speed of sound very close to the source..... 150
26. Orin Tugman, University of Utah. Physics. To determine the change of conductivity in a thin metallic film when exposed to ultra-violet light..... 100

27. E. M. Terry, University of Wisconsin. Physics. For work on the modulation of radio-energy employed in wireless telephony ..... 150
28. F. C. Blake, Ohio State University. Physics. In aid of his work on electric waves. (Additional) ..... 100
29. Gerald L. Wendt, University of Chicago. Chemistry. For the investigation of the photo-chemical reactions of hydrogen and chlorine ..... 350
30. Seismological Society of America. Geology. For the investigation of earthquake phenomena. (Additional) ..... 250
31. Roy L. Moodie, College of Medicine, University of Illinois. Geology. For the preparation of sections of fossil bones which show lesions of ancient disease, and for the making of photomicrographs of these sections ..... 200
32. C. H. Eigenmann, Indiana University, Zoology. To defray part of the expenses of the Irwin expedition to western South America. (Additional) ..... 500
33. P. W. Whiting, St. Stephens College. Zoology. For investigations on the Mediterranean flour-moth and its hymenopterous parasite, *Hadrobracon* 200
34. *Botanical Abstracts.* Botany. For aid in establishing this new and important periodical ..... 500
35. Gilbert M. Smith, University of Wisconsin. Botany. For aid in a study of the plankton of the lakes of southwestern Ontario ..... 100
36. Ales Hrdlička U. S. National Museum. Anthropology. For *The Amerian Journal of Physical Anthropology* ..... 200
37. Myra M. Hulst, Washington, D. C. Social Science. For investigations into the mortality of graduates from American colleges for women ..... 200
38. Leslie B. Arey, Northwestern University Medical School. Medicine. In support of his study of the origin, growth and fate of the giant cells, or osteoclasts, usually held responsible for bone dissolution ..... 400
39. S. A. Courtis, Detroit, Michigan. Education. Toward the expenses of securing a comparison based upon a survey of Boston schools in 1845 with present-day schools from Maine to California ..... 100
40. Solomon Lefschetz, University of Kansas. Mathematics. To assist in the publication of his memoir on algebraic surfaces, which was awarded the Bordin prize of the Paris Academy of Sciences ..... 300
41. Olive C. Hazlett, Mount Holyoke College. Mathematics. In support of her work on the theory of hypercomplex numbers and invariants ..... 100
42. A. A. Knowlton, Reed College. Physics. In aid of a determination of the relation between chemical composition and magnetic properties in Heusler alloys 200
43. John C. Shedd, Occidental College. Physics. In aid of a further study of snow crystals, similar to that which he has already published ..... 100
44. Philip Fox, Dearborn Observatory. Astronomy. In support of his work on the photographic determination of stellar parallaxes ..... 600
45. Anne S. Young, Mount Holyoke College. Astronomy. For the determination of the positions and proper motions of stars from photographic plates already taken ..... 100
46. Ferdinand Canu, Versailles, France. Geology. To carry forward completion his studies upon the classification of bryozoa ..... 250
47. Frank B. Taylor, Fort Wayne, Indiana. Geology. For a field study of the moraines of recession in the St. Lawrence Valley ..... 250
48. S. I. Kornhauser, Denison University. Zoology. For a continuation of his work on the sexual characteristics of the membracid insect *Thelia bimaculata* ..... 250
49. P. W. Whiting, St. Stephens College. Zoology. For breeding outfit and temperature apparatus to be used for genetic and cytological researches on *Ephestia* and *Hadrobracon* ..... 200
50. *Botanical Abstacts.* Botany. For editorial and office expenses in connection with the preparation of manuscripts. (Additional) ..... 500
51. I. W. Bailey, Bussey Institution. Botany. For an investigation upon: (1) Myrmecophytism; (2) Relations between ants and fungi; (3) Cytology of the cambium ..... 500

52. S. D. Robbins, Boston, Massachusetts. Psychology. For a study of a trephined stammerer ..... 100

53. Daniel W. LaRue, Stroudsburg State Normal School, Pennsylvania. Education. In support of experimental work on a phonetic alphabet..... 200

54. Margaret F. Washburn, Vassar College. Psychology. For a study of emotional characteristics of certain racial groups in New York City..... 200

55. Joseph Peterson, George Peabody College for Teachers. Psychology. In support of a study of the qualitative differences in the mentality of whites and negroes ..... 200

56. A. A. Schaeffer, University of Tennessee. Psychology. In support of an experimental study of orientation and the direction of movement of animals, and particularly of th "spiral path" in man ..... 200

57. Theodore Hough, University of Virginia. Physiology. In support of his studies with Dr. J. A. Waddell on blood changes after severe hemorrhages. (Returned) ..... 100

58. Carl J. Wiggers, Western Reserve University. Physiology. In support of his investigations of the cardiac function by optical registration..... 150

1921

59. Solomon Lefschetz, University of Kansas. Mathematics. In support of his work in algebraic geometry..... 150

60. Gerald L. Wendt, University of Chicago. Chemistry. For the purchase of apparatus for investigations at high temperatures. (Additional)..... 200

61. Graham Edgar, University of Virginia. Chemistry. For the purchase of a quartz mercury arc lamp for research in photo-chemistry..... 200

62. Sebastian Albrecht, Dudley Observatory. Astronomy. In support of his investigation of the variation of wavelength of lines in different types of stellar spectra ..... 200

63. Caroline E. Furness, Vassar College Observatory. Astronomy. For assistance in the measurement and reduction of photographic plates ..... 200

64. Frank B. Taylor, Fort Wayne, Indiana. Geology. For a field study of the moraines of recession in the St. Lawrence Valley. (Additional)..... 300

65. Seismological Society of America. Geology. For the investigation of earthquake phenomena. (Additional)..... 200

66. P. W. Whiting, St. Stephens College. Zoology. To add to his microscopic equipment for the study of genetics in insects. (Additional) ..... 200

67. N. A. Cobb, Falls Church, Virginia. Zoology. For aid in a series of researches into the physiology of the cell, or to defray cost of publication of results already on hand..... 450

68. George B. Rigg, University of Washington. Botany. For work on the sphagnum bogs of the Puget Sound region ..... 300

69. J. M. Greenman, Missouri Botanical Garden. Botany. In part payment of expenses of a collecting trip to Central America..... 500

70. T. R. Garth, University of Texas. Psychology. For a psychological study of Indian children in the United States schools at Chilocco, Oklahoma, and Albuquerque, New Mexico..... 150

71. E. G. Boring, Clark University. Psychology. For the preparation of a set of steel acoustic cylinders to be used in determining the nature of sensory response under conditions of normal psychometric situation ..... 150

72. A. L. Kroeber, University of California. Anthropology. For bibliographical and clerical assistance in connection with an ethnological investigation to determine the culture areas of aboriginal South America..... 200

73. Helen H. Roberts, New York City. Anthropology. For a study of negro folk music in Jamaica..... 150

74. Frank A. Hartman, University of Buffalo. Physiology. To aid in the study of suprarenal insufficiency..... 150

75. W. E. Garrey, Tulane University, Physiology. For the puchase of apparatus for hydrogen-ion determinations..... 200

76. Frank P. Knowlton, Syracuse University. Physiology. To aid in the study of the blood flow and gaseous metabolism of the thyroid gland..... 150

77. Carl J. Wiggers, Western Reserve University. Physiology. In support of his investigations of the cardiac function by optical registration. (Additional) ..... 150

78. W. F. G. Swann, University of Minnesota. Physics. For investigation of electric phenomena in the upper atmosphere ..... 150

79. H. M. Randall, University of Michigan. Physics. In support of his study of rotational spectra of gases obtained by absorption..... 250

80. Walter G. Cady, Wesleyan University. Physics. In support of his study of electrical reactions by piezo-electric crystals in high frequency circuits..... 200

81. Paul F. Gaehr, Wells College. Physics. In support of his work on specific heat of tungsten at incandescent temperatures ..... 100

82. A. L. Foley, Indiana University. Physics. For experiments on the speed of sound very close to the source. (Additional)..... 100

*Second Addendum*

LIST OF PAPERS REPORTING WORK SUPPORTED BY APPROPRIATIONS FROM THE COMMITTEE ON GRANTS

(To December 31, 1921)

American Association of Variable Star Observers. Observations by C. Y. McAteer in monthly reports. *Popular Astronomy*, Vols. 27-29, 1919-1921.

Arey, Leslie E. The origin, growth and fate of osteoclasts, and their relation to bone resorption. *American Journal of Anatomy*, 26: 315-346, 1920.

Benedict, Ralph C. The origin of new varieties of *Nephrolepsis* by orthogenetic saltation. Progressive variations. *Bulletin Torrey Club*, 43: 297-234, 1916.

Blake, F. C. On the effective capacity and resistance of a condenser for high frequency currents. *Physical Review*, 16: 540-557, 1920.

On electrostatic transformers and coupling coefficients. *Journal of the American Institute of Electrical Engineers*, 40: 23-29, 1921.

Chaney, Ralph W. The flora of the Eagle Creek formation. *Contributions from Walker Museum*, 2: No. 5, 115-181, 1920.

Cobb, N. A. *Contributions to a science of nematology*, IX: 217-343, 1921.

Douglass, A. E. Climatic cycles and tree growth. *Carnegie Institution of Washington, Publication* No. 289, pp. 127, 1919.

Eigenmann, Carl H. The Irwin Expedition to Peru, Bolivia and Chile. *Indiana University Alumni Quarterly*, January, 1920, pp. 20.

The fishes of Lake Valencia, Caracas, and of the Rio Tuy at El Concejo, Venezuela. *Indiana University Studies*, 7: No. 44, 1-13, 1920.

South America west of the Maracaibo, Orinoco, Amazon and Titicaca basins, and the horizontal distribution of its fresh water fishes. *Indiana University Studies*, 7: No. 45, 1-24, 1920.

The fishes of the rivers draining the western slope of the Cordillera Occidental of Colombia, Rios Atrato, San Juan, Dagua and Patia. *Indiana University Studies*, 7: No. 46, 1-19, 1920.

The fish fauna of the Cordillera of Bogota. *Journal of the Washington Academy of Sciences*, 10: No. 16, 1920.

The fresh water fishes of Panama east of longitude 80° W. The Magdalena basin and the horizontal and vertical distribution of its fishes. *Indiana University Studies*, 7: No. 47, 1-34, 1920.

The origin and distribution of the genera of the fishes of South America west of the Maracaibo, Orinoco, Amazon and Titicaca basins. *Proceedings of the American Philosophical Society*, 60: 1-6, 1920.

The American characidæ. *Memoirs of the Museum of Comparative Zoology, at Harvard College*, 48: Part 3, 209-319, 1921.

Fairchild, Herman L. Post-glacial continental uplift. SCIENCE, 47: 615-617, 1918.

Glacial depression and post-glacial uplift of northeastern America. *Proceedings of the National Academy of Sciences*, 4: 229-232, 1918.

Post-glacial uplift of northeastern America, *Geological Society of America Bulletin*, 29: 187-238, 1918.

Post-glacial sea-level waters in eastern Vermont. *Report of the Vermont State Geologist for 1917-1918*, 52-75, June, 1919.

Pleistocene marine submergence of the Hudson, Champlain and St. Lawrence valleys. *The New York State Museum Bulletin*, Nos. 209-210 (May-June, 1918), April, 1920.

Post-glacial uplift of southern New England. *Geological Society of America Bulletin*, 30: 597-636, 1920.

Foley, A. L. A photographic method of finding the instantaneous velocity of spark waves. *Physical Review*, 16: 449-463, 1920.

Garrey, W. E. The relation of respiration to rhythm in the cardian ganglion of *Limulus polyphemus*. *Journal of General Physiology*, 4: 149-156, 1921.

Gay, Frederick P. The treatment of experimental tuberculosis in guinea-pigs and rabbits by taurin, alone and in combination with gold chlorid and sodium oleate (by M. Takeoka). *Journal of Infectious Diseases*, 20: 442-456, 1917.

A method for the preparation of taurin in large quantities (by C. L. A. Schmidt and T. Watson). *Journal of Biological Chemistry*, 33: 499, 1918.

On the elimination of taurin administered to man (by C. L. A. Schmidt, E. von Adelung and T. Watson). *Journal of Biological Chemistry*, 33: 501, 1918.

Hrdlička, Ales. The vanishing Indian. SCIENCE, 46: 266-267, 1917.

Kornhauser, S. I. The cytology of the sea-side earwig, *Anisolabis maritima* Bon. *Denison University Bulletin, Journal of the Scientific Laboratories*, 19: 234-246, 1921.

Moodie, Roy L. Concerning the fossilization of blood corpuscles. *American Naturalist*, 54: 460-464, 1920.

Ancient bacteria and the beginnings of disease. *Scientific Monthly*, October, 1920.

Microscopic examination of a fossil fish brain. *Journal of Comparative Neurology*, 32: 329-333, 1920.

A variant of the sincipital T in Peru. *American Journal of Physical Anthropology*, 4: 219-222, 1921.

Porter, R. A. The relation of potential distribution to hysteresis effect in the Wehnelt tube. *Physical Review*, 13: 189-196, 1919.

Robbins, Samuel D. A plethysmographic study of shock and stammering in a trephined stammerer. *American Journal of Physiology*, 52: 1-24, 1920.

Seismological Society of America. The San Jacinto earthquake of April 21, 1918 (by S. D. Townley and others). *Bulletin Seismological Society of America*, 8: 45-73, 1917.

The Inglewood earthquake in southern California, 1920, June 21 (by Stephen Taber). *Bulletin Seismological Society of America*, 10: 129-143, 1920.

Watson, J. B. *Psychology from the standpoint of a behaviorist*, Lippincott, 1919. Summary of work in Chapters VI, VII and VIII.

Wendt, Gerald L. Triatomic hydrogen (with R. S. Landauer). *Journal of the American Chemical Society*, 42: 930-946, 1920.

Young, Anne S. Proper motions of certain long-period variable stars. *Astronomical Journal*, 33: 194, 1921.

## THE ELEMENTARY COURSE IN GENETICS[1]

THE elementary courses in botany and in zoology have recently been the subject of considerable discussion. One might think that subjects as old and as well established as these which have been taught for many years should long ago have become definitely organized upon the proper pedagogical basis. But these subjects with their various subdivisions have grown so large that it is becoming increasingly difficult to give adequate treatment even in an elementary manner to all phases of either of these two primary biological sciences in the time that is ordinarily available for the beginning course. Teachers of these subjects are, therefore, confronted with the choice of making the beginning course an elementary survey of the entire field of their subject or of bodily eliminating certain phases, leaving their consideration to later and more specialized courses.

Genetics may properly be regarded as one of these subdivisions or phases of biology—a phase of applied biology if you will. But it can not properly be regarded as a phase either of botany or zoology alone, nor can it be adequately treated in a course of instruction by confining one's attention exclusively to one or the other kingdom. The genetics instructor must be free to select his illustrative material from any source, plant or animal, economic or non-economic, as he sees fit. While the greater number of forms of animal life of economic importance are to be found among mammals, birds and fishes, and of plants among the

[1] Paper No. 95, Department of Plant Breeding, Cornell University, Ithaca, New York. Read before the Conference of Geneticists interested in agriculture at the Toronto meeting of the American Association for the Advancement of Science.