ences to all the more important relevant published material; also summaries and cross-references to aid in finding things.

The scope proposed is North American invertebrates. It goes without saying that Apis and Bombyx are not to be discussed beyond laboratory usages, since their culture has long passed the stage of pioneering that we are to record.

This call goes out to all American zoologists. Let any one who has tested out a reliable method of culture maintenance, or any device that he has found to be particularly useful to that end, write it up and submit it for a place in this book to any member of the committee.

JAMES G. NEEDHAM,
Chairman

CORNELL UNIVERSITY

REVERSAL OF THE PINHOLE IMAGE

IT was my good fortune to be associated with Dr. Oliver J. Lee, director of Dearborn Observatory, in a problem he investigated at the time of the solar eclipse in August, 1932. He wished to obtain information regarding temperature changes produced by the moon's shadow at various altitudes. For elevations of 700, 3,000 and 10,000 feet, this information was furnished by recording meteorographs carried by airplanes, which cruised at constant altitudes in circles about a mile in radius. Lieutenant Baker and I were in the highest plane, which stayed at 10,400 feet most of the time, but rose to 15,000 feet for a while. The report of the observations which I made to Dr. Lee that evening included one phenomenon which I have not seen described by any of the observers who were in airplanes during the eclipse.

For about fifteen minutes preceding totality, while the solar crescent was very narrow, whenever I looked where the shadow of the airplane would have been cast on the clouds more than a mile below, I saw a halo about five degrees in diameter, red on the outside, yellowish on the inner side, with a dark, shadow-like crescent at its center. The angular diameter of the shadow crescent was the same as that of the solar crescent. The thickness at the middle was somewhat greater. What attracted my attention particularly was the fact that the cusps of this shadow crescent pointed eastward, while those of the solar crescent pointed westward. After totality the whole appearance was repeated, except that the cusps of both crescents were reversed in direction.

It was a phenomenon similar to that seen by Edwin Edser in England during the partial eclipse of 1912 and described by him in *Nature* for May 2 of that year. It was the reverse of the familiar pinhole image. A huge screen with a relatively small hole at the position of the airplane would have caused a bright, inverted crescent against a dark background on the clouds, crescent image and solar crescent having the same angular dimensions as seen from the screen. Interchanging screen and hole would interchange image and background, giving the dark crescent which I saw on the bright clouds.

I have repeated, with some modifications, the experiment Edser described. A piece of ground glass close to the condenser of a stereopticon was nearly covered with a circular disk of black paper, leaving only a bright, narrow crescent exposed. The objective of the lantern was removed. A screen with a small hole placed ten feet from the lantern produced a pinhole image on the crescent on the wall an equal distance from the screen. Then a brass ball about the size of the hole was used in place of the screen and a dark, shadow-like crescent appeared on the wall, corresponding exactly to what I saw on the clouds. A small square of black paper substituted for the ball gave the same dark crescent. A little airplane made of black paper also produced the same result. The shadow crescent was independent of the shape of the obstacle, as a pinhole image is independent of the shape of the pinhole, provided obstacle or hole is small enough in comparison with the object. As stated by Edser, in order to obtain the shadow image, the screen must be beyond the apex of the umbra of the shadow cast by the obstacle.

ERNEST C. BRYANT

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THE ADRENAL GLANDS IN AN EDITOR'S OFFICE

A DISTINGUISHED physiologist wrote to the editor of SCIENCE on April 14:

> At the recent meetings of the American Physiological Society in Cincinnati Dr. Britton of the University of Virginia made the statement in open meeting that SCIENCE had published an article on the adrenals by Professor Swingle of Princeton University, the publication of which was paid for by Professor Swingle, and that the pages of SCIENCE have been subsequently closed to Professor Britton and possibly others on the subject of Professor Swingle's original paper or article. If true, this appears to me both a curious and serious situation. I had the understanding that SCIENCE was an organ of the American Association for the Advancement of Science. If scientific articles published in SCIENCE are paid for by authors, that fact should be stated, it seems to me, in connection with the article as it appears in SCIENCE, because otherwise we appear to be in danger of under-cover paid propaganda.

A distinguished physicist wrote on April 19:

> From a number of influential and reputable sources, I have run into a considerable amount of irritation over the article by Swingle, Pfiffner, Vars, Bott, and Parkins

in SCIENCE for January 13. This irritation is on the following grounds: First, that the article implies that the discoveries there reported were made by the authors; second, that the material was rushed to publication through a subsidiary of [subsidy to] SCIENCE; and third, that replies to this article by recognized leaders in the field have either not been accepted or have not been acknowledged.

I admit that the field is entirely outside my own knowledge. Nevertheless, I am assured by men who are the leaders of similar work at the Harvard Medical School and in Massachusetts hospitals that every one of the 12 points published by Swingle, et al, had been published by others, as indicated in part in the enclosed bibliography. I am further informed that this is not the first instance in which Swingle has been in a similar position.

Under these circumstances, therefore, I can not but feel that this incident has reacted unfavorably to the Association and in particular, will be a handicap to the cooperation which we hoped to secure next winter.

The letter from the physiologist was sent to Professor Britton with the following request:

Please be so kind as to let me know whether Professor ——— reports correctly what you said at the meeting of the American Physiological Society. In case he does not state correctly what you said, please let me know what this was.

In his reply Professor Britton wrote:

In prefacing my paper at Cincinnati, since Swingle coming just before me had again neglected to recognize the earlier work of others, I remarked that a recent situation which had come up in connection with the adrenal controversy should perhaps be aired at that time; that Swingle and his associates had recently published an article on a circulatory theory of cortico-adrenal function in which they had stated that all other theories were practically valueless, and gave no reference at all to the previous theories of others, although the paper had been greatly extended over several pages; that the article had been paid for apparently out of special research funds as stated in their foot-note; that other workers in the field (excepting Freeman's partial reply, of course) wishing to reply to the article found that publication could not be secured; that we ourselves could not at first get a reply published on offering to pay for it, but that eventually a short article had been accepted by the journal; and further, that subsidizing or paying for research publications set up a very unfortunate precedent, to say the least. Later, in question time, I asked Swingle if he would mind telling *why* he found it necessary to pay for science publications, and he declined to answer. To my knowledge, this is all I said on the subject.

The facts of the case are these. Professor E. G. Conklin, of Princeton University, wrote (he permits the quotation) on December 22:

I am sending you herewith a manuscript by Professor Swingle and his associates on the physiological activity of the adrenal cortex. I think that this is an extraordinarily important discovery, comparable in many ways to the discovery of insulin, and likely to be of very great service in medicine and surgery.

Professor Swingle had written:

The contents of this paper should be placed before biologists and medical men at the earliest opportunity since there can be no question but that the adrenal cortical hormone is specific in the treatment of surgical and traumatic shock. This form of shock costs the lives of thousands of people yearly and now that the cortical hormone is available for use, it seems a pity that the facts should not be made known and lives saved as speedily as possible.

To Professor Conklin the editor of SCIENCE replied:

I am pleased to learn of the important work of Professor Swingle and also that you and he regard SCIENCE as the best place of publication. As you know, we can not under ordinary circumstances print longer research articles in SCIENCE. . . . The Physical Society has adopted a plan, which is also used in connection with other journals and will I dare say become general in the future, of making the cost of publication part of the cost of the research. . . . If SCIENCE could be enlarged to the extent of the length of the paper it could be printed at once, it being stated that the cost of printing had been defrayed by the institution from which it came. However, this is something that has never been done and I suppose that it is not worth while to take up the possibility at the present time.

After conversation with Professor Conklin at the Atlantic City meeting of the American Association, the editor wrote to him on January 7 as follows:

I have been a good deal bothered about Professor Swingle's article. The journals that I edit have not charged for illustrations, tables or proof alterations, and it is a very considerable departure from long usage to enlarge the journal and charge the cost to the author or institution. Scientific journals, however, seem to be coming to this policy, even when the journal is not enlarged for the purpose of prompt publication, and I expect that it will be generally adopted.

In the case of Professor Swingle's article, it is not only the question of the cost, though under existing conditions that is somewhat serious, but of giving precedence to a long article over the other articles that we have been compelled to hold for a considerable time and especially over the addresses and other material presented at Atlantic City to which we aim in January and February to give most of the space in SCIENCE.

The situation could be explained by a footnote to the effect that SCIENCE had been enlarged to publish this article, the cost having been defrayed by the Macy Foundation or the Princeton Laboratory, as the case may be. On the whole, therefore, though not without reluctance, I shall accept Professor Swingle's offer.

After the publication of Professor Swingle's article three criticisms were received. One of them, abusive and probably libelous, was returned; one by Dr. Norman E. Freeman was promptly printed; the third, by Dr. Britton, was too long for publication in SCIENCE, but a shorter reply was published. After this had been accepted Professor Britton wrote: "Let me again assure you of my gratitude in granting this privilege of reply in your much-esteemed journal." A counter reply by Professor Swingle containing new data was not accepted, though he was informed that a short reply would be.

Professor Britton has published within the last two years five articles in SCIENCE. Indeed the adrenal glands and the whole field of chemical physiology have received, not more attention than their importance deserves, but more space than has been given to other subjects equally important. Now it is necessary to print more words (it costs three cents each to print a word in SCIENCE) on the adrenals; but that and the troubles of an editor are obviously small matters compared with the saving of thousands of lives (see above).

J. MCKEEN CATTELL

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A NEW FORM OF CENTRIFUGE-MICROSCOPE FOR SIMULTANEOUS OBSERVATION OF CONTROL AND EXPERIMENTAL MATERIAL

IN centrifuge studies on the effect of substances on the viscosity or the tension at the surface of living cells, comparison of experimental conditions with control conditions is a necessity. This can be accomplished by a slight modification of the centrifuge-microscopes[1] previously described, which very greatly adds to the convenience and usefulness of the instruments. In the same field of view a perfect image of control and experimental material side by side can be obtained for any power of the microscopes (except oil immersion objectives) and for any rate of rotation that will not shatter the materials of which the instrument is made. Adaptation to the Beams air turbine is possible.[2]

As illustrated in Fig. 1 the device is a special head in the form of a bar, fitting on the ½ inch shaft (A) of a high speed electric motor. At the two ends of the bar are depressions for the special slides S, S[1], which hold the living cells, two microscope objective systems mounted horizontally, and small right angle reflecting prisms to reflect the images to the axis of rotation. Here two ½ inch right angle prisms ¼ inch wide are mounted facing in opposite directions, so as to reflect from both ends of the bar vertically to the stationary ocular (Oc.).

If the lights (L, L′) are incandescent filaments whose images are thrown on the slides parallel to a radius of rotation, the distance of S and S′ to the axis of rotation must differ by 3 to 5 mm, so that S will not be illuminated by L′ and *vice versa*. Since

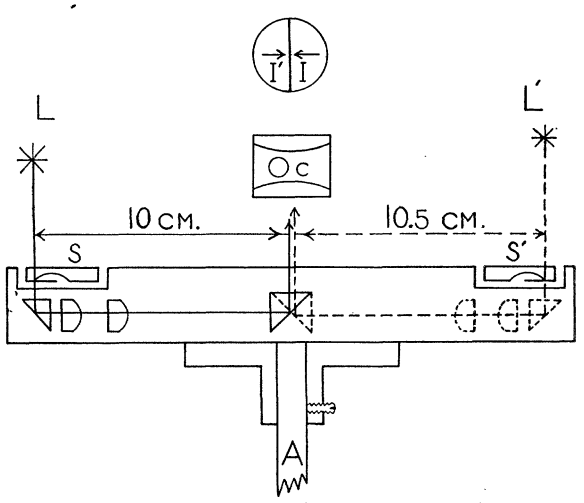

FIG. 1. Diagram of centrifuge-microscope for simultaneous observation of control and experimental material.

the radius of rotation may be 100 mm, this makes a difference of only 3 to 5 per cent. in the centrifugal force on the two slides. The image of material in S′ appears in the left field of the ocular, I′, and the image of material in S appears in the right field, I, the direction of the centrifugal force being indicated by arrows. For successive observation of S and S′, only one light need be used, say L. It is moved 5 mm further from the axis for observation of S′ and back again for observation of S.

If a high voltage condenser discharge in Hg. vapor is used as the source of illumination, L and L′, the distance of S and S′ from the axis may be exactly the same, but the contact surfaces which set off the lamps are arranged at different radial distances from the axis, so that lamp L discharges only when over S and lamp L′ only when over S′. The mercury discharge lamp gives a clearer image over the whole field of view, but necessitates a more complicated accessory mechanism.

[1] E. N. Harvey and A. L. Loomis, SCIENCE, 72: 42, 1930; E. N. Harvey, *Jour. Franklin Inst.*, 214: 1, 1932. I express my sincere thanks to Mr. Alfred L. Loomis for the generous hospitality of his laboratory at Tuxedo Park, N. Y., where the new head was made. The Bausch and Lomb Optical Company will place the standard centrifuge-microscope on the market.

[2] J. W. Beams, SCIENCE, 74: 44, 1931; E. N. Harvey, SCIENCE, 75: 267, 1932.