ganda. Only in the realm of science one fails to trace any kind of scientific organization worthy of the importance of science; and in this way much time, energy and economy of means is wasted.

This is especially conspicuous in the production of scientific literature. Science, whilst it is one and international, appears in publications in more than twenty languages, in hundreds of magazines, in thousands, even tens of thousands of pamphlets, in a year. The themes of research work are left mostly to chance, thousands of problems are worked up without any logical discrimination, without intrinsic power, often occasioned by purely external circumstances, for reasons which have nothing to do with the research itself. And these millions of pages are poured out over us like a flood, they cover and swamp us, they inundate us so that we stand continually in a despairing struggle to keep our heads above this sea of papers.

The way out of this chaos is the same as that taken by economics and by the state, namely, rationalization or so-called scientific management. One need not think that through rationalization intuition, the creative faculty, will be suppressed; on the contrary, it will then first obtain a real facility for its awakening, and will then first be able to develop itself satisfactorily. The less energy required to be expended on overcoming difficulties, the more there will be for creation, for invention, and the higher will be the quality of its output.

I have tried for some years to apply to the realm of science the principles of scientific management in industry, administration and politics, and have worked out a system for the means of rationalizing the scientific institutes for research activities and for the collective scientific institutions.

The whole refers to the following system of subjects:

I. Scientific laboratory management:
  (1) Administration of scientific institutes.
  (2) Application of specific scientific activities:
    Practical arrangements.
    Economy of time.
II. Work of research-workers:
  (1) Physical and psychic hygiene of mental work.
  (2) Systematic method in research, especially time- and plan-schedules.
  (3) Application of the card system for collecting scientific data and ideas.
III. Collective scientific activities:
  (1) Congresses—their organization and general plan of research.
  (2) Scientific literature—systematization of periodicals, libraries, reports, scientific treatises, schedules and card indices.
  (3) Scientific language and standardization of expert expressions.

I suggest that an International Committee might consider these problems systematically and make definite propositions.

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## COOPERATION AMONG AMERICAN ZOOLOGISTS TOWARD A COMPENDIUM OF CULTURE METHODS FOR INVERTEBRATE ANIMALS

AT the Atlantic City meeting of the American Association for the Advancement of Science, this matter again came up. Vice-president Zeleny, chairman of Section F—Zoology, appointed as a committee to consider it Dr. Frank E. Lutz, of the American Museum of Natural History, Dr. Paul S. Welch, of the University of Michigan, and Dr. J. G. Needham, of Cornell University.

At the present time there is difficulty in finding information about culture methods. Much more experience has been gained by individuals than has ever been made available through publication. Much also undoubtedly exists in papers whose titles give no clue of its presence. Such information if gathered together and made available to the many whose work nowadays demands the use of living materials in continuous supply would be a great aid to biological research.

The committee has found a very general feeling of need for such a compendium and is proceeding with plans for it. Its plans are as yet wholly tentative. A book is contemplated, to contain the information that is needed by the one who is trying to rear and maintain cultures. It is proposed to have a short introductory chapter on general principles of management, with the main body of the book made up of signed articles, volunteered by individual workers and based on their own practical experience.

It is hoped that for at least one species of each considerable group of invertebrates there may be included a fairly complete account of maintenance requirements, covering collecting methods and devices, cages and breeding quarters, plans for feeding and watering, cleaning and aerating quarters, breeding management, and all else that enters into the maintenance of the species through successive generations. Such full accounts, however, will be few, and less comprehensive items will be welcome.

The committee reserves the right to condense and to combine where necessary to avoid duplication. An effort will be made to include bibliographical refer-

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.

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*Chairman*

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## 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.

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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