Even within the individual female the ripe ovarian eggs may vary in amount of nutriment. This variation appears in the deposited eggs.[6,7] In such eggs the loss in nutriment is an effect of the oosorptive or egg degenerative process. In many species of Hymenoptera, the processes of oogenesis and oosorption form a cycle. Only by ovulation, that is, passage into the oviduct, does the ripe ovarian egg escape the final effect of oosorption. In the chalcidoid *Metaphycus helvolus* the generation of an egg requires three days, its degeneration less than one day at temperatures about 80° F.[6]

Since oogenesis and oosorption, when the female is in a gravid condition, form a continuous process and since this proceeds at a relatively constant rate, the amount of nutrient removed from each egg and the proportion of nutrient deficient eggs deposited would vary with the rate of egg deposition. Schmieder[3] in a study of the dimorphism of the ichneumonid wasp, *Sphecophaga burra,* suggested that it might be the rate of egg deposition which determined which of two inherently possible lines of development was followed.

Oosorption probably is the basis of polymorphism in the ant. Differential rates of egg deposition account for the variation in size of the eggs deposited by a queen. Since it seems certain that trophic conditions in the ripe ovarian egg determine the line of development, the rate of egg deposition may determine the proportion of castes developing from any sequence of deposited eggs.

In ants, as in many of the parasitic Hymenoptera, it is probable that the sex ratio of a sequence of eggs is also determined by the rate of their deposition, provided of course, the parent female is mated.[8] In such species the higher the rate of egg deposition the higher the proportion of eggs escaping fertilization and therefore the higher the proportion of males.

It follows that if differences in the rate of egg deposition by the queen ant determine the occurrences of the various castes, the males and queens will be produced when the rate is high, that is, when the ripe eggs are retained in the ovary for a relatively short time, while the sterile female castes and associated anomalies will be produced when the rate is low, that is, when the ripe eggs are retained in the ovary for a relatively long time.

The number of eggs deposited by the queen during any given period is regulated, in part, by the number of ovarioles which make up her ovaries and, in part, by the environment, an environment which may include the several castes in varying proportions.

[6] Stanley E. Flanders, *Ent. Soc. Amer. Ann.,* 35: 251–266, 1942.

[7] Anna R. Whiting, *Am. Naturalist,* 74: 468–471, 1940.

[8] Stanley E. Flanders, *Ent. Soc. Amer. Ann.,* 32: 11–26, 1939.

The hypothesis, as here advanced, is that rate of egg deposition (in so far as it affects the nutrient content of the egg) determines caste differentiation. Although based on studies of parasitic Hymenoptera this hypothesis may prove to be a suitable "explanation" for the sequence of castes of any Aculeate colony established by a single queen. The first brood always consists of small workers, those of succeeding broods gradually increase in size, and only after the largest workers have appeared are the queens and males produced.[9]

It is significant that the bee (*Melipona* sp.) has two sharply defined female castes in spite of the fact that all members of the colony undergo uniform treatment during their post-embryonic development.[9]

STANLEY E. FLANDERS
CITRUS EXPERIMENT STATION,
UNIVERSITY OF CALIFORNIA,
RIVERSIDE

STAFFING SCIENCE DEPARTMENTS AFTER THE WAR

IN SCIENCE, for February 16, 1945, M. H. Trytten expresses forcefully the frequently heard fear that it will be difficult for universities to staff their science departments after the war because of competition with industry.

It is undoubtedly true that industry can afford to pay much higher salaries and sometimes also to provide better research facilities. I think, however, that universities need not be afraid of the future if they remain true to their traditions. They will still be able to attract first-rate scientists, not with money but by offering them time and leisure, the stimulating contact with students that forces them to revise their views constantly and to express them with clarity, the inspiring intercourse with colleagues from other faculties, physicians, philosophers, historians, sociologists, the long summer vacations that permit them to travel and continue their work in other institutions and countries, all the many imponderables that constitute what used to be called the academic atmosphere.

This presupposes, however, that universities have the courage and vision to reorganize their administrative and departmental structure and to resist trends that tend to turn them into speed-up, high-pressure schools with purely utilitarian purposes. No serious researcher will accept the position as head of a university department, if he knows that he will be crushed with petty administrative duties or with a load of routine teaching. Men should not be selected to fit a job, but the position should be made to fit a man, because it is not regulations and curricula that con-

[9] William Morton Wheeler, "The Social Insects." 378 pp. New York: Harcourt, Brace and Co. 1928.

stitute higher education but the men to whose influence students are exposed.

There will always be scientists who prefer industrial research and the higher salaries that go with it, but if the university succeeds in remaining what it originally was, a Universitas Litterarum and an active center of independent research, it will continue to attract the best minds and need not be afraid of competition.

HENRY E. SIGERIST
THE JOHNS HOPKINS UNIVERSITY

SCIENCE TALENT IN AMERICAN YOUTH[1]

A RECENT note on the Science Talent Search states that "the methods which are being used, and the conclusions which are being derived, deserve the careful examination of every scientist and of every teacher of science," and that "the sponsors of the examination have an excellent opportunity to gain for science a quantity of data which may determine just what makes a scientist."[2] Such ideas have always been basic in the thinking, planning and operation of this annual competition for the Westinghouse Scholarships, conducted by Science Clubs of America and Science Service. The objectives are:

1. To discover and foster the education of boys and girls whose scientific skill, talent and ability indicate potential creative originality and warrant scholarships for their development.

2. To focus the attention of large numbers of scientifically gifted youth on the need for perfecting scientific and research skill and knowledge so that they can increase their capacity for contributing to the task of winning the war and the peace to follow.

3. To help make the American public aware of the role of science in war and in the post-war reconstruction.[3]

As has been pointed out on numerous occasions[4]—including one conference on the methods of the Science Talent Search attended by Mr. Brandwein—surveys are being made annually of the social, physical and professional development of all the entrants in the first and second contests. This includes detailed information on trip winners, honorable mentions and *non*-winners; similar surveys are being made of all winners in additional years. The resulting materials will be useful in tracing the growth of several thousand young people interested in science as a career, and will also supply significant data regarding selection procedures so that these can be improved if so indicated. As a hypothetical example, if it is found that a significant number of non-winners have made greater progress in science than winners and honorable mentions, it will mean that the factors or evidences on which selections are made in future years will be modified or weighted accordingly.

The 120 who placed highest in the first three contests have been above the average in their scientific studies and endeavors. We are confident that some of them will be great scientists in a creative sense; it is too much to expect that all will. The boy winner of the Westinghouse Grand Science Scholarship in the first year (1942), a recent Phi Beta Kappa, is now in medical school; and the top girl winner of the same year, also a Phi Beta Kappa, has been outstanding in her college career. It is too early yet to arrive at any general conclusions, especially considering the fact that at least 2,088 boys and 39 girls among the contestants in the first and second years are known to be in the military service. In fact, 44 of the 88 boy winners in the first three contests are now in the armed services.

The author of the critical note inquires whether non-winners might become successful scientists, "especially if they obtained the publicity and opportunities afforded the winner."[5] The only way to make a comparison of winners and non-winners and at the same time keep the variable of publicity approximately the same for both groups would be to give equal scholarships also to those who are *not* believed to be potential future scientists—of course keeping the basis of their selection unheralded and unsung—and then to compare the two groups over the years ahead. We wonder how acceptable such an idea would be to our leading colleges and technical schools; would they like to give financial scholarships for probable future scholarly attainment to students who it is thought will *not* be successful in their academic pursuits?

In the meantime we are obtaining a variety of information that may be useful in answering a question recently asked of Dr. Vannevar Bush by President Roosevelt: "Can an effective program be proposed for discovering and developing scientific talent in American youth so that the continuing future of scientific research in this country may be assured on a level comparable to what has been done during the war?"[6] Able young men traditionally have been selected for training at West Point and Annapolis in military

[1] The opinions or assertions contained herein are the private ones of the writers and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

[2] Paul F. Brandwein, SCIENCE, 101: 117, February 2, 1945.

[3] "Science and the Future," Washington, D. C., Science Service, 1943, 126; "Scientists of Tomorrow," Washington, D. C., Science Service, 1944, 134. Copies of these books, containing the essays of all trip winners in the Second and Third Annual Science Talent Searches may be obtained free of charge from Science Service, 1719 "N" St., N.W., Washington 6, D. C.

[4] Harold A. Edgerton and Steuart Henderson Britt, *American Scientist*, 1943, 31, 55–68, p. 67; SCIENCE, 99: 319–320, April 21, 1944; "Science and the Future," *op. cit.*, 114–115. Also, "Scientists of Tomorrow," *op. cit.*, 130.

[5] *Cf.* Brandwein, *op. cit.*

[6] SCIENCE, 100: 542, December 15, 1944.