course is really impossible or at least undesirable. There is some evidence that it is neither, provided that the problem presented by the mixture of students is recognized and honestly faced.

Because the rank and file of the scientific profession consists of very busy and preoccupied individuals, it may be well to make clear the occasion for any study of science instruction in relation to general education. In general the colleges and universities of America are performing an excellent task in training professional scientists. On the other hand, there is abundant proof that the general public is not scientifically minded except in a very superficial sense. In particular it does not realize how science might contribute much more to social well-being than at present.

The scientist himself is well aware that society derives much less from the discoveries of science than it might. Though the more salable discoveries of science are usually taken up with remarkable speed, others that might be of even greater benefit to society are neglected because they are of a less commercial character. In private, at least, the scientist often expresses his disappointment that men in positions of authority do not adopt a more scientific and impersonal attitude in approaching social problems. Often, too, he is distressed to know that his budgets are the first to suffer when expenses have to be cut.

While science has produced revolutionary changes in our manner of daily living it has scarcely touched many aspects of our behavior and attitudes of mind which were developed under far different conditions from those which science has made possible. The persistence of these older forms of thought and behavior into the modern world to which they have little relationship is a source of increasing maladjustment. People are not as able as they should be to adapt themselves to the conditions of modern living and to contribute to the intelligent direction of public affairs. As is always the case when a culture is not well harmonized throughout, there are tragic and unnecessary conflicts within society and within the individual.

Increasing numbers of thoughtful people are becoming concerned over this unhappy lack of harmony in our culture, at the same time being aware that this culture is depending increasingly upon science. Some seriously believe that harmony can be achieved only by slowing down the activity of the sciences. Others believe that the remedy will come only through the unremitting prosecution of scientific research and its application in technology.

Either of these view-points represents an extreme. The basis of the problem is neither a matter of less nor more rapid scientific development, but a better integration of scientific attitude with individual and social behavior. The scientist himself represents a very small minority of society. In consequence, the problem is largely one of educating the general public. It is to the study of this problem that the new committee has addressed itself. As has been said, it can hope to make little progress without the activity of its professional colleagues. Whether these view the problem from the narrow angle of enlightened self-interest or the broader basis of citizenship in a troubled modern world, it is hoped that their generous aid will be forthcoming. Without anticipating the specific questions which the committee will propound in its forthcoming statement, it may be pointed out here that recent studies give a basis for hoping that good may be accomplished. Reliable techniques have been developed for estimating the extent to which the aims of any educational program are achieved. In a recent study, for example, it was found that

(a) Many teachers have given so little thought to formulating their conscious aims that they find at first considerable difficulty in doing so.

(b) There is a great diversity of aims as stated by those who teach general courses in the same subject.

(c) Once the aims of any particular course are stated clearly it is quite possible to measure the degree to which they are being achieved.

(d) Such inquiry results in measurable improvement in the general teaching of a science.

There is thus reason to hope that similar inquiry extended over a broader field might make it possible to discover some measure of common aim and to suggest means by which these aims would be better achieved in the interest of general education than at present.

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GRANTS IN SUPPORT OF RESEARCH ON THE BIOLOGICAL EFFECTS OF RADIATION

IN this journal indications have been furnished, from time to time,[1] regarding grants in support of research on the effects of radiation on organisms. During a period of somewhat more than eight years the Committee on Radiation of the Division of Biology and Agriculture, National Research Council, has been able to make these grants as a result of contributions made specifically for this purpose. In continuation of the program of the last three-year period, 1935–38, on the Biological Effects of Radiation, the committee announces a limited program for 1938–39 (July 1, 1938, to June 30, 1939) made possible through a new contribution of $25,000 from the Rockefeller Foundation.

[1] W. C. Curtis, SCIENCE, 69: 9–10, January 4, 1929; SCIENCE, 73: 643–645, June 12, 1931; B. M. Duggar, SCIENCE, 82: 125, August 9, 1935.

The purpose of these grants is to encourage and assist in maintaining researches directed primarily to the solution of fundamental biological problems, and to the development of apparatus essential in such studies. In making short-term grants, as for 1938–39, special consideration will be given to work in progress or to programs definitely formulated. Next in importance to the scientific promise of the project is the availability of facilities and of cooperation in case the work involves other fields, such as special chemical or physical techniques. The committee endeavors to keep in touch with interested industrial corporations manufacturing apparatus or materials used in such biological studies, and in the past the cooperation of these agencies has been valuable both for the loan of certain types of apparatus and for assistance in the construction of special facilities.

Applications for grants should be made promptly, and these should include an adequate statement of the status of the problem or project, the extent of the support received or promised, or the time offered, by the university or institution with which the applicant is associated and the character of the apparatus available or obtainable for the work.

The conditions under which grants of money or apparatus may be made are essentially the same as those made by the Committee on Grants-in-Aid of the National Research Council, and in brief are as follows:

1. Grants will cover such expenses as apparatus, materials and supplies, technical assistance, and, to a limited extent, field expenses.

2. Ordinarily, grants will not be made for any part of the personal salary of the grantee, for expenses of publication, for the purchase of books or for travel in attendance upon scientific meetings.

3. In general, preference will be given to the support of investigations, (a) requiring a moderate allotment, (b) from which definite results may be expected with the aid of the grant, (c) which are supported in part by the institution with which the applicant is associated, and (d) for which it is reasonably certain that the facilities are available or procurable, or in which cooperation is arranged between the biological and physical interests.

It is expected that allotments for 1938–39 will be made in late August. Those planning to apply for grants should immediately request application forms from the Division of Biology and Agriculture, National Research Council, 2101 Constitution Ave., Washington, D. C. The applications, together with any supporting documents, should be sent promptly, preferably by July 15, 1938, to the Division of Biology and Agriculture.

B. M. DUGGAR,
Chairman, Committee on Radiation

NEWTON'S THIRD LAW

THE recent discussions of "Osgood's Mechanics," by J. W. Campbell and H. M. Dadourian (SCIENCE, November 12, 1937, and April 29, 1938) prompts me to add a comment. In my experience students usually fail to distinguish between the equality of opposite forces in equilibrium and the equality of forces expressed by Newton's third law. It is therefore disconcerting to find this confusion on page 1 of Osgood's excellent text. He says: "Thus if a barrel of flour is suspended by a rope (and is at rest), the attraction of gravity—the pull of the earth—will be represented by a vector pointing downward and of length W, the weight of the barrel. On the other hand, the force which the rope exerts on the barrel will be represented by an equal and opposite vector, pointing upward. For, action and reaction are equal and opposite."

But the weight of the barrel and the force which the rope exerts on the barrel are not related as action and reaction. The reaction to the weight is not the force exerted by the rope, but the pull of the barrel on the earth. Forces in equilibrium act on the same body, whereas action and reaction act on different bodies. A principle of equilibrium is therefore not derivable from the third law. I remark that "An Advanced Course in General College Physics" by Bayley and Bidwell contains a precise statement of the distinction.

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SOCIETIES AND MEETINGS

SOUTHWESTERN DIVISION OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE Southwestern Division of the American Association for the Advancement of Science held its eighteenth annual meeting at Albuquerque, New Mexico, from April 25 to 28, 1938. The University of New Mexico was host institution.

The meetings were very well attended in all sections. The following organizations met in conjunction with the division: The Mathematical Association of America, Southwestern Section; Society of American Foresters, Southwestern Section; American Association of University Professors, Rocky Mountain Region; and New Mexico Section, American Society of Civil Engineers.