

the Undergraduate and the American Institute of Physics

THE American Institute of Physics, now in its twentieth year, has from its inception been concerned with the general welfare of physicists. It has specifically assumed the responsibilities of encouraging, of coordinating, of stimulating, conserving, and developing their activities; of safeguarding their professional status; and of informing the policy-making groups of government, industry, and education of the contribution that physics and physicists can make to the well-being of the nation, both in times of armed neutrality and of war. Some parts of this program have been accomplished by the concerted efforts of small groups of members acting on temporary or continuing committees, others by the broad program of publication that the Institute has sponsored. The present uneasy international situation, recurring military necessities, the increasing technological bias of civilization in those parts of the world that possess high standards of living, and the manifold potential uses of nuclear energy have combined to place upon physicists a present value which, even if somewhat exaggerated in the popular mind, nevertheless compensates in part for the comparative obscurity in which they languished during the first forty years of the century. Another consequence of these same factors is that the traditional concept of the solitary research physicist has been swept away entirely. In his place there is now a team of which each member, from the most brilliant to the most humble, plays his appointed part. It is, therefore, not only a natural activity but a bounden duty of the Institute to concern itself with the problem of maintaining the necessary flow of physicists at all levels of

competence and of adjusting the flow to the probable future demand.

Since physics is a very specialized subject, only a few undergraduates possess the bent of mind and the temperament requisite for high achievement in the profession. Thus it is a matter of considerable importance, in order to make the best use of manpower, that all young people who appear to have the necessary qualifications should have access to a reliable body of information about various vocations toward which their interests are drawn before making a final choice of lifework. Because the specific tasks of a physicist are often clothed in an unwarranted glamor or mystery in the eye of a layman—more so, indeed, than in most professions—there is added reason for close attention to appropriate methods of making the necessary information available to young people during their undergraduate days.

There is one considerable difficulty, however. Viewed from an external nonacademic point of view, many an undergraduate gives the appearance of a chameleon-like creature. He may change his mailing address from semester to semester within the community that houses his college or university (so large are many universities that they are cities within themselves); communications sent to a student's last known address are likely to be delivered weeks late, if at all, unless the administrative machinery of his alma mater takes pity on him and routes his missives through academic channels that were never designed to be substitutes for U. S. mail service. He may, during one semester, spend a considerable time in classes within a phys-

ics department, by his regular attendance giving the impression that the subject interests him. Six months later he may have vanished, perhaps to explore sociological avenues to a job and the outside world, or to learn foreign languages as a prelude to romantic geographical adventure. Even his appearance changes; he experiments with different hair cuts, with a moustache, with new or borrowed clothes, with hot rods or convertibles. He is, by these circumstances, in many cases partially isolated from the real world, and may therefore be correspondingly immune to its influence.

Let us reassure the reader who detects a note of cynicism in these remarks that all this is just as it should be—a normal stage of transition in the life of an individual who is growing up, part and parcel of the vitality, variability, and sparkle of youth. It is therefore abundantly clear that influences from the outside can be expected to affect all undergraduates directly only under three special conditions: First, if failure on the undergraduate's part to respond is heavily penalized by legal process; second, if the external agent is prepared to spend prodigious sums of money to exert its influence; third, if the undergraduate consciously seeks to remain in contact with a particular segment of the general outside world, that is, if he is appropriately motivated.

At some stage in the student's progress, usually near the end of his four-year stretch, though sometimes much earlier and occasionally much later, the chameleon-like characteristics disappear, and the individual emerges, in an illuminating flash of self-recognition, from the transitional stage of his existence into the status of a real person. One day he wakes up to find that he no longer believes, as he did the day before, that every statement he read in books, every suggestion he received from his teachers, every difficulty he encountered in making decisions, had been preordained for him, long before he appeared in the world, "handed down like the tablets from Sinai". He feels confident of his ability; he is ready to hold his own. If he has previously displayed some aptitude for physics, has enjoyed its intellectual disciplines, has had sympathetic contacts with his instructors and, above all,

has been inspired through occasional friendly contacts with a local physics hero, even in his elementary physics course, he will thereafter dedicate his efforts to physics. His motivation has been complete. In this gradual approach to complete motivation, the inspirational element is of supreme importance. It matters not that the idol, in relation to the great world of science, may be no more than a local celebrity. He serves his purpose well and completely by passing the torch to a younger generation.

In any program of recruitment it is in the stage preceding complete motivation that the greatest effort ought to be expended. But it is just at this stage, as we have seen above, that some undergraduates are virtually isolated from outside influences. It follows, therefore, that most of the effective stimulus that the Institute can give to undergraduate physics should not be aimed directly at the student, but can only be exerted indirectly through his professors. Throughout the whole history of the organization the member societies and individual members of the Institute have been singularly fortunate in having groups of men to guide its course of action who have possessed an infectious enthusiasm for their policy-making job and for their profession. Through all the channels of the Institute's activity this enthusiasm has been transmitted to individual members, including those in colleges and universities, who are thus in possession of the cardinal quality that is needed to inspire undergraduates during their formative years.

Descending from generalities to particulars, it remains to suggest in what specific directions attempts may be made to strengthen the bond between the undergraduate physics major or potential physics major and the Institute of Physics through the good offices of college and university instructors. There is no need to catalog all existing lines of communication, nor to explain in detail what each activity of the Institute may be expected to accomplish. Such matters are already familiar to every enthusiastic physicist.

In the first place, it will be noted that, especially during the last decade, very considerable numbers of young people have entered industrial or governmental work immediately after receiving the BS de-

gree. Thereafter, they develop into active members of the profession partly by attendance at occasional advanced courses, partly by learning on the job, like apprentices of a bygone era. They would be able to enter upon their working lives with increased confidence if they were made familiar with the organization of physics in the U. S. and with the types of journals published before they left their sheltered academic atmospheres. Undoubtedly it is true that in many departments one or more instructors assume this responsibility by conferences with individual undergraduates, if not with groups; but there is little evidence to show that a conscious effort is made in this direction by all departments. No special course or formal indoctrination is needed. Most departments of physics bring their students together occasionally for informal colloquia or for social purposes. What better opportunity could be desired for outlining the scope, the function and the organization of the professional group into which the young people are about to be welcomed?

The second matter that deserves attention in stimulating undergraduate studies of physics is the development of undergraduate physics clubs. Many, if not the majority, of educators will agree that membership in undergraduate subject-matter clubs should be based on interest and enthusiasm rather than upon the achievement of an arbitrarily fixed standard of scholarship. In all but a few cases students who receive high marks in intermediate and advanced undergraduate courses in physics have already made their choice of major subject, and hence are not so likely to require encouragement or motivation as their less brilliant fellows. Furthermore, physicists of all degrees of competence are in demand; there is appropriate work for each at his own level. In September, 1950, the Institute, by authorizing the formation of Student Sections, took a step that will have far-reaching consequences. Quoting from Dr. H. A. Barton, Director of the Institute (*Physics Today*, September, 1950, p. 28), "The broad purpose of our student section organization will be much the same as that in other fields of science and technology—where the value of the activity has been proven by experience. We aim to serve and stimulate the student, to enhance his pro-

fessional pride, and to recruit him as a worthy member of our professional societies, i.e., the member societies of the Institute." As necessary, a column of *Physics Today* should be set aside to serve the interests of Student Sections by making appropriate recognition of their formation, and by maintaining their continuity through the inclusion of brief notes or articles designed not so much to record as to unify their activities. Again it is only too obvious that success will depend upon the enthusiasm and active interest of mature physicists in their own localities, and that recognition by the Institute will serve as much to encourage the faculty advisers of such clubs as the student members themselves. Since active undergraduate physics clubs of the type described are already functioning in several colleges, there is a considerable body of useful experience to draw upon. It is in the young physicists that the great potential strength of the Institute lies.

In the third place it may be worthwhile considering the desirability and feasibility of extending the scope of the valuable employment register now conducted by the Institute, so as to put more emphasis than has been possible before on the placement of young people who possess only the BS degree. Such a service would be of particular value to smaller colleges located at considerable distances from centers of industry. Graduates of such institutions, often very well trained in routine physical measurements, frequently encounter difficulty in obtaining work that utilizes their talents to the full. The embryonic physicist should realize that he is a sturdy plant that will flourish after its first transplanting. The adventurous spirit must be nourished. The youngster who learns physics in the state of Iowa must be made to feel that his knowledge is also valid in California and North Carolina. Thornton Wilder put the matter of choosing a job in a nutshell: "Nothing is eternal save Heaven. Romes existed before Rome, and when Rome will be a waste there will be Romes after her. Seek out some city that is young. The secret is to make a city, not to rest in it. When you have found one, drink in the illusion that she too is eternal." Should we not encourage our young men to follow his advice?

T. H. Osgood