

Support of the Individual in Basic Research

Paul H. Kratz

2800 Quebec Street NW, Washington, D.C.

THE project method of support, the block grant, and other methods of research support have various virtues but share at least one disadvantage in common. They do not deal directly with individuals, but with institutions. One knows that really an award is made to an institution only because of the ability and availability of a certain person associated with that institution. True, the institution offers him research facilities and a favorable (in most cases) atmosphere for the prosecution of his research. However, there is no guarantee that this sort of support through such channels is necessarily the best.

An individual of outstanding ability or one possessing the potential ability must be free. What can make him free? If we take what we may consider to be the ideal teacher-scientist or scientist-teacher, we must allow him to have access to the best and broadest training possible. When he has completed his formal training and is entirely dependent upon himself and his contacts with fellow thinkers for future growth, we must allow him to have freedom in such areas as choice of work, choice of content, and choice of atmosphere. We can only request that he shall in some degree be useful to his fellows in the exchange of ideas, and to younger men by such teaching as he may be capable and desirous of doing. It must be up to the man himself to determine which of these two functions he will stress in his career.

A charge may be leveled against many of our present educational institutions, namely, that they no longer are guided by their faculties. To fulfill its mission of being a repository of culture and to fulfill its duties of education, research, and public service, a university must be quite conscious of the value of faculty planning and guidance. At one time the faculty in itself was the university, and learning flourished under such conditions. Today we have the administrator, the aura of big business, and the research-foundation-type of institution. If this be the typical institution of the future, we are perpetuating a growing menace to our islands of learning by channeling the nation's funds through such processing machines. Lack of faculty control may be the reason for the imbalance of education and research, the imbalance of kinds of research, and the stagnation of curriculums, and apparently the inability to make our product quite as good as the European scholar.

If this be so, let us support the individual, whoever or wherever he may be. Let us draw up a system of education and research support for persons who prove themselves worthy of it. As an example, look at the very small program of the American Heart Association. For a person who wishes to train and work in

this area, funds and support are provided in four different fellowship categories: junior, senior, independent investigator, and career fellowship. These provide for training prior to receiving the M.D. or Ph.D., postdoctoral support, research support, and long term research support, respectively. Together, all four programs can carry a person through his entire career and can finally lead to retirement on a level at least as good as standard retirement. In the actual working of such support, the man finds an appropriate atmosphere with which to affiliate himself. He is obviously of service to his faculty home; the only restriction is that he may not teach more than 25 percent of his time. In addition to his salary, he receives some small support for equipment and materials. The career investigator grants are for five-year periods and renewal depends upon the interests of the individual, his desire to stay in some section of this field, and his demonstrated ability and activity.

Thus we have an individual who has chosen his own field, who is not subjected to any institutional or governmental pressures to divert himself to applied problems, who teaches that which he believes himself best fitted to teach, and who is not forced to worry at extremely short intervals about his future. Such freedom, placed in capable and mature hands, appeals to one as being a worth-while goal indeed. An analogy to democracy may be seen here—the combination of personal freedom and personal responsibility, both leading to and enhancing the common good.

This same principle could be carried out on a much wider scale on a national basis. At the present, research and education are supported by various government and private agencies, by means of two separate but related programs. Would it not be feasible that these two aspects of support be merged into one whole by the supporting agency? Fellowship applications are received from individuals; the fellows are selected by a group of men whose interests and accomplishments are close to those of the individual applicant; awards are made that leave the fellow free in all cases to choose his field and location in which to work. Likewise, in research support, an individual proposes work best suited to himself (unfortunately, sometimes with overtones of what he thinks may be attractive, timely, or justifiable in agency terms); this proposal is judged by his peers, primarily on a basis of present or future competence of the man and merit of the problem. But the ward is now made to an institution, acting as a facility and as a bookkeeper.

Besides the fact that institutions would strongly resent award of project support to individuals, on the basis that they would lose control of their faculties and thus that certain disruptions of local government

would ensue, it would seem that a mature individual should be supported at least as freely as a fellow not yet fully matured. The very fact that faculties no longer have much to do with the academic governing of their institutions might be offset by such a free award process, and this process might tend to restore desirable control to faculties.

In the event of a free award process being adopted, it would seem that capable persons of like interests would gather together at various institutions and that, in order to keep them there, the institution would offer a favorable atmosphere for the kind of teaching and research which such persons judge to be most suitable. Slowly the schools would conform to certain acknowledged desirable quanta of curriculums and research. This might be the very process needed to eliminate imbalances, to strengthen faculty control of academic matters, and to restore the universities to their proper mission in society, not in a disruptive sense, but slowly and in a wise and progressive manner. The work of research foundations would gradually be diverted to industrial and government laboratories. University presidents would again become academicians, and the research coordinators would find other spheres of administration.

One could envisage the creation of a junior-investigator type of personal research grant to be awarded for three years, with the restriction that the individual must find a suitable faculty home and that he must teach not less than one-quarter and not more than one-half time. The amount the institution would pay for the time devoted to teaching would increase this stipend. After this, there could be offered a senior-investigator personal research grant, on the same terms and with the same restrictions. This also might be offered for three years, with the option of renewal

depending upon performance and productivity. Finally would come the career-investigator stage. It might be awarded for five-year periods, with the restriction that not more than one-quarter time be spent in teaching. Review of performance and productivity would again be part of the picture. In each case the stipend is augmented by part-salaries for the teaching done.

This system would obviously demand a great deal of sober and wise selection of persons and periodic review of performance, but this is the very place to use the senior men of science. Their time might better be devoted to such judging than to scanning proposals for individual projects.

Although the whole college faculty population could not be supported in this manner, a sufficient number could be so supported as to enrich all faculties and to provide a leavening that would stimulate the teachers and workers who are not so supported or who do not remain in this support cycle all their lives. For those people who are selected to begin such a program or for those who never participate in the program, accessory programs could be developed and administered to stimulate additional young individuals or to furnish small grants for quarter-time and summer-time research support for persons who are primarily teachers. The effect on both teachers and students should be inspiring, and, in due time, it might be hoped that such a system would slowly and painlessly alleviate such problems as now confront the nation—manpower needs, adequate training, betterment of curriculums, increase of basic research, and regeneration of the schools. This program of continued support for superior persons, along with desirable accessory programs, functioning at its optimum would, in effect, be a science policy for the nation.



Longevity under Adversity in Conifers¹

Edmund Schulman

Division of Geological Sciences, California Institute of Technology,² Pasadena

On marginal sites in semiarid regions of the western United States, trees of several coniferous species have been found that far exceed the generally accepted maximum ages for these species. The annual stem growth of such trees is extremely small (1); never-

theless, the width of the annual rings in many of these trees is particularly sensitive to the varying rainfall from year to year (2). This remarkable combination of longevity and sensitivity makes it possible to derive tree-ring indices of past year-by-year rainfall that are more reliable than indices based on the much younger trees found on less arid sites. Field sampling has been largely limited to conifers because, in the areas studied, they live longer than the hardwoods, are far more extensively distributed, and have rings that are easier to date and interpret than the rings in most hardwood species.

During some 15 field seasons, in each of which an intensive search was made for overage coniferous trees, criteria have been recognized that aid in finding

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² Contribution No. 665.