Physics and Engineering in a Free Society

3. THE PUBLIC

By ***Gerard Piel***

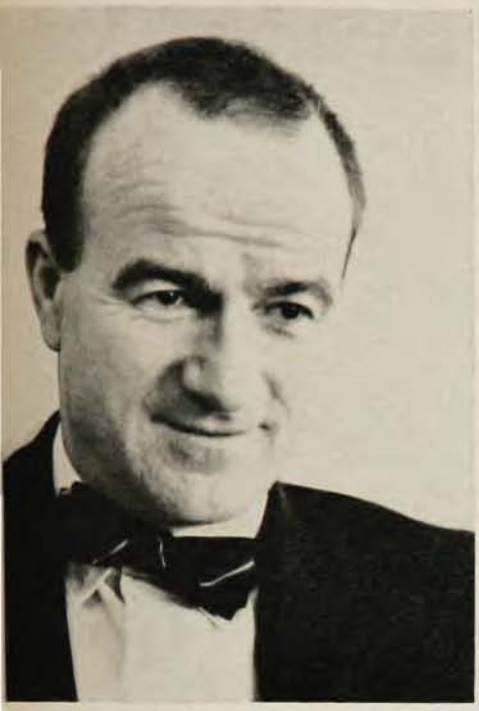
HOW shall the universities of our free society meet the demand for quality and quantity in the scientific training of the next generation? That question has been well defined for our consideration by Julius Stratton. In the assignment of the next two speakers to the function of representing the interest of industry and of the public, respectively, there is just the barest hint that there might be an adversity of interest here. Since I have brought this possibility out in the open, I should assure you at once of my conviction that what is good for the US is good for General Motors. Moreover, I am willing to go the distance with the former Secretary of Defense and declare that the same is true vice versa—necessarily so in the long run. But in the long run, as John Maynard Keynes once observed, we are all dead.

Those of us who are engaged in the management of business enterprises find ourselves under special compulsion to operate and make our decisions in the short run. By and large, we find that the challenge to maximize the returns from our enterprise is a great simplifier of what might otherwise be difficult decisions. The profit motive is a universal solvent for the moral, social, and political issues that so often become entangled in business affairs. This simplification of the decision-making function has, I think, come to play a bigger role in our business culture as ownership has become divorced from management. In our brief term in office, we owe our primary duty to the interests of our stockholders. Management is not empowered to subordinate those interests to some notion, perhaps its own, of the public interest.

Each of us, of course, has a sufficient sense of rectitude to discover grounds on which to be convinced that the private interests we serve are congruent with the public interest or we would find another line of work. Besides, we have the reassuring word of the Rev. Adam Smith—who was a moral philosopher before he was an economist—that the rational pursuit of private interest by all parties secures the maximum of public interest.

Nonetheless I am compelled to confess a disturbing sense that we are confronted here today with a degree of adversity between the private and the public interest. In the field of education there is laid before us a clear demonstration that the long-run interests of our society may be short-changed in the short-run time-scale in which our business and industrial enterprises are necessarily managed. The consequences of this situation can be seen most plainly in the condition of the institutions of higher learning from which our country expects so much today.

A FEW statistics will give you the picture. It is a fact, for example, that expenditure per student in our universities has declined over the past 30 years. Enrollment is up three times; expenditure, after a conservatively modest discount for inflation, has little more than doubled. It is an equally disturbing fact that the salaries paid to our university faculties have de-



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clined by 50 to 75 percent relative to the incomes of the community at large. The decline in the professor's income is an index of the downgrading in his status as a member of society.

In our colleges we have some 250 000 teachers, of whom some 80 000 are qualified as teachers of the sciences. That 80 000 constitutes one third of our faculty. But half of the students are concentrating in the fields of learning that are taught by that one third.

From this disadvantaged position our universities must somehow, in the next 10 years, cope with a doubling of their enrollments, from three million students to six million. To meet the demand for science education they must find 120 000 more teachers qualified to teach science at the college level. At the present rate at which advanced degrees in the sciences are being attained, it is plain that there will not be many PhD's among that 120 000.

Our system of higher education thus shows symptoms of serious neglect. Of course, the responsibility is to be laid to our society as a whole. The misplacement of values represented by the contrast between the $3.3 billion expended on higher education in our country and the sums laid out for cosmetics, soft drinks, et cetera has often been cited. But it is also true that the short-run demands of our business system have collided in this period with the long-run needs of our educational system, and the educational system has come off second best.

Over the past 15 years, our industrial economy has used up important elements of our scientific capital. The most tangible embodiment of those assets is people. The shortage of science teachers has been cited. The destination to which the missing university scientists have migrated need scarcely be named. When a new PhD is able to take his degree to a job in industry that pays him a starting salary equal to or greater than that of his professors, it is clear that the idealism of the young—so warmly spoken for by Mr. Stratton—must work against a pretty steep economic gradient.

Now the urgent demands of armament programs may be advanced in justification of this diversion of talent from the long-run interests of science. And there is no doubt that enlightened elements in industrial management have sought ways to offset the dissipation of resources. They have sent some bachelors of science, prematurely hired away from their training, back to school, and they have persuaded their stockholders that contributions to universities represent a sound investment as well as tax-deductible outlet for corporate earnings.

Morever, the workings of our market economy have brought some amelioration of conditions within the university itself. The academic scientist is not as well paid as the industrial scientist, but he is beginning to be better off than the academician in other fields. This is especially true of the university physicist or chemist; the biologists, being more remote from exploitable technology, have lagged somewhat behind. Our scientific faculties, in fact, are beginning to arrive at the special status so long enjoyed by our medical faculties—in competition with the rewards of private practice, full professorships in the medical schools have traditionally carried higher stipends than equivalent positions in the faculties of arts and science. Besides, there are consulting fees from industry, research contracts.

Some observers are troubled, however, by the question of whether these developments are all to the good. They wonder whether the functions which generate such outside income for the academic scientist might not distract him from his primary activity as a teacher and investigator. There is a new cursus honorum in our universities: the assistant professor now seeks as rapidly as possible to divest himself of teaching obligations in order to devote time to research; when his distinction in research has won him tenure as associate professor he begins to be in demand as a consultant to industry and government; by the time he has advanced to full professor he can scarcely find time for research in a schedule crowded by his distinguished and rewarding associations outside of the university.

THE situation of the academic scientist today may be taken as a model in microcosm for the situation of the university as a whole. A major portion of

the recent increase in the funds available to universities has gone to science. Apart from the $200 million or so that are administered by our universities in associated research institutes, another $300 million enters their own budgets via research contracts and grants-in-aid. The overwhelming preponderance of these funds comes from government and industry. But even the grants-in-aid from these sources carry no tenure, and they must be promoted from year to year. Since many smaller institutions have seen none of or little of these funds, it is clear that some few of the largest universities have come in for huge sums. These great institutions have become heavily dependent, therefore, upon what is called "soft" or short-run income.

One may ask how responsible administrators can take such risks with the future of their institutions as to commit them to dependence upon short-run funds. The answer is that no one expects the flow of funds to stop.

The record does support this optimistic view. But, for the present at least, those funds must be promoted. Even in our most hallowed institutions, it has become the custom to permit and encourage individual investigators to go out and promote the contracts and grants that support their departments. In many of our universities, a professorship has come to be primarily a hunting license. The standard of performance in this line of enterprise is to achieve a ratio of three to one as between outside funds and the free funds supplied to a department by the university.

Of course, if science is to be supported simply as a mysterious and puzzling prelude to technological growth or as a talking point in psychological warfare, there is no need to be concerned by the terms on which it is presently financed. If, on the other hand, science is to be supported for what it truly is—the advancement of knowledge and so the highest activity of a civilized community—then the terms of its support by the public treasury must be re-examined and completely overhauled.

One would like to see a revival of the spirit in which—as the story goes—Abbott Lawrence Lowell returned a check for one million dollars to the Rockefeller Foundation. The check had come escorted by a letter stipulating the purpose for which the grant was to be used. Mr. Lowell sent a covering letter in return, telling the trustees of the Foundation that he would ask their counsel about the administration of his university when he felt the need for such assistance. But that was 40 years ago. Nowadays we are assured that those research contracts are really not so dubious as they appear because they are really just camouflage for grants-in-aid to the scientist to go on doing the work he would be doing anyway. And, with government funds accounting for two thirds of all the research expenditures in universities, we still hear university people discussing in a gingerly manner the propriety of federal aid to higher education. Such rationalization and wishful thinking has served only to obscure the serious issues that are raised by the transfer of universities to public support.

If a contract is really a grant, it should be called a grant and administered as such. The only proper way to finance the work of a scientist is with no questions asked, for the rest of his active life, and for doing the best he knows how. A full re-examination of the terms of support would lead to the conclusion that the bulk of public funds should be turned over in lump sums to the universities, in the form of institutional grants, renewed in perpetuity as a matter of settled public policy. This is neither starry-eyed nor subversive. It is the way the great universities of Europe have been supported for generations.

The issue must be faced now. During the next decade our universities will have to double or triple their total income if they are to handle the impending increase in enrollment, offset inflation, and restore or maintain their standards of excellence. The principal source for these increases will necessarily be the public treasury, state and local as well as federal. If such dependence upon public funds threatens the independence of the universities, the threat must be dealt with in the open. The necessary political and legal safeguards will be provided by an electorate that is informed and enlightened by honest controversy.

There are signs of progress. We are assured, for example, that the institutional grant is now coming into acceptance as the proper form for the disbursement of federal funds. But the agencies that are making or are about to make these grants are the National Institutes of Health and the National Science Foundation. There has never been any doubt about their relation to the picture except that they are too small. Together they furnish little more than $100 million to the universities, compared to the $150 million expended via the universities by the Department of Defense. There is no sound fiscal reason why a distinguished biochemical laboratory at one of our foremost universities should depend for more than half of its support upon the Quartermaster General, the Office of Naval Research, and the Air Force. There are many reasons why such arrangements are improper.

I have talked about fiscal questions to the exclusion of the other more profound issues that beset the welfare of science in our country. I have done so as the speaker charged with the presentation of the public interest. The fiscal problem is the one that the public can do something about. The other problems must be solved within the universities themselves. But the universities must be solvent first. They must regain in full their status as self-governing, autonomous institutions if they are to function as centers of initiative, change, and progress in our civilization, as the primary custodians of the long-run interests of society.