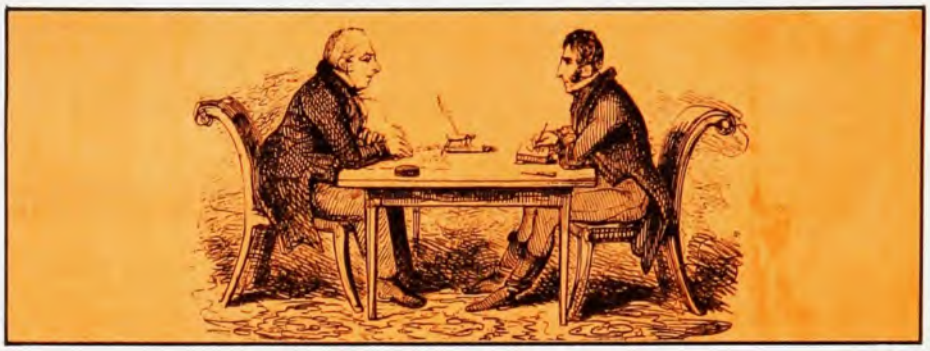
The physicist as consultant–entrepreneur



GUEST COMMENT
by
Lawrence Cranberg

At the present time, almost all physicists who are working at their profession are employed full-time in academe, industry or government. The numbers of full-time, self-employed consultants is unknown, but must be presumed to be very small. Often the status is temporary, and is likely to be a euphemism for unemployment. But there are many reasons to expect that under suitable circumstances the market for the services of the independent physics consultant can be greatly expanded, and that those services can provide major social benefits.

By filling such a role, the scientist not only helps to safeguard his own intellectual and economic independence, but he can make science work more efficiently for the benefit of society; he injects a stimulating leaven of variety into a scientific community whose direction is increasingly dominated by political and bureaucratic decisions, and whose style of work is increasingly dominated by factory-like scale and organization; eventually he can hope to finance work of his own for which the marketplace offers no present support.

The physicist as consultant–entrepreneur is a self-employed professional who functions like consultants in many other fields. He offers his services for hire; he is paid by the job, the hour or the day, and he may retain an interest in the product of his work in lieu of part or all of his fee. The projects on which he works may be those defined by the client, or there may be projects for which the consultant has found the need, and he seeks out support from a client or sponsor.

Studies of the effectiveness of individuals and small companies as technological innovators have consistently shown that they far outperform those employed in large companies, government, academe, and other non-profits.[1]

Two major markets for consulting services can be identified: companies too small to afford a full-time physicist, and large organizations with staff physicists that employ consultants to supplement their staffs.

Companies whose products and services would benefit from the skills and professional knowledge of physicists, but are too small to employ one full time, must number in the thousands or the tens of thousands. But that is practically virgin territory. It is ground that requires pioneering effort to bring under cultivation. Companies that have never employed physicists must learn their uses, and the particular company must be matched to the talents and expertise of the particular physicist. To accomplish this may require the efforts of a specialized agency. Presumably the APS could contribute valuable help in this direction.

Much easier to approach are those companies or government agencies that already employ physicists. The consultant can not only bring supplemental expertise to bear on a particular technical problem, but, even more important, he can bring a fresh approach to existing programs, he can question prevailing assumptions, and he can function as a loyal opposition without fear of political reprisal. In government his advice is relatively untainted by institutional loyalties, which frequently compromise the objectivity of advice the government receives from those otherwise fully employed in academe and industry.

But enlarging opportunities for independent physicists in industry and in government agencies present problems of their own. Competition from those already employed full time in academe is one of them. Some of that competition has been considered unfair by the National Council of Professional Services Firms, which has established a special Standing Committee to deal with it. It is to be hoped that the APS will also give some consideration to this problem.

It might help to redress the balance if academe itself recognized the values of outside physics consultants, particularly those with academic backgrounds. Consultants can function on departmental visiting committees or deal with special problems that now are often treated on an impromptu, ad-hoc basis, with little comparative study of situations at other institutions. Topics might range from decisions on size and design of facilities; to standards and procedures for hire, promotion and retirement; to curriculum, teaching aids and faculty development.

To establish a consulting practice, it is obviously desirable to have a wide range of professional experience, industrial and government contacts, and in the early stages, some independent income. It is a career more suitable for a senior physicist than for one who is just launching a career. But popularization of consulting as a career for seniors can bring in its train very important benefits for the junior members of the profession as well. Thus, once the attractions of a consulting career become apparent, it may encourage seniors to take early retirement from conventional jobs, using retirement income to cushion the transition and thereby creating vacancies for juniors in the organizations they leave behind. And there will almost certainly be opportunities in consulting for junior men and women in association with the senior physicists.

The training and experience of physicists is an important national resource. To apply that training and experience

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more diversely and effectively can only bring benefit to society and to physicists themselves.

Reference

1. See "Technological Innovation: Its Environment and Management," R. A. Charpie *et al.*, US Department of Commerce, Jan. 1967. Also, "The US Patent System," Herbert Holloman, Scientific American, June 1967, page 19.

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7/8/77

More on language requirement

The letter on the "PhD Language Requirement" by Owen Gingerich (November, page 9) was both disturbing and excellent. It was disturbing to learn of the number of schools that no longer have a uniform PhD foreign-language requirement. It was gratifying to read of his concern over the erosion of this significant aspect of graduate education.

His report that astronomy at Harvard has dropped the departmental PhD requirement of preparation in foreign languages brings to mind the correspondence on this subject that I had fifteen or twenty years ago with the Dean of Graduate Studies at Harvard. There was great pressure in our graduate school to abandon our uniform PhD foreign-language requirement, and in support of this move the proponents cited the fact that Harvard had no uniform school-wide requirement. Surely we could do no less than to emulate Harvard. The graduate dean at Harvard replied to my inquiry to the effect that it was true that Harvard did not have a school-wide PhD language requirement for the logical reason that none was needed, because each of Harvard's graduate departments required foreign-language preparation for the PhD degree. Sadly, it appears that this is no longer true, and this leads me to note that the universities that are the great leaders in academic scholarship have a responsibility that they may not have fully appreciated. They should realize that it is the weakest aspects of their programs and requirements that will propagate most rapidly through those other schools that seeks excellence through imitation. We see here the workings of an academic Gresham's Law in which the bad policies drive out the good.

Ten years ago I served as chairman of an *ad hoc* committee of our graduate school that was charged with making recommendations for the improvement of our PhD foreign-language requirement. At that time we had a "tool" requirement that the student demonstrate skill in two languages that were approved by the student's major department and which were tested through the use of the Graduate School Foreign Language Test. One of the most striking things we found was that our "passing" score corresponded to approximately the *second percentile* compared with students enrolled in a fourth-semester college course in the language! As a result of our study the faculty of our graduate school adopted a new uniform language requirement in 1968. Under the new requirement the student should be prepared modestly in one language instead of trivially in two. Because we felt that the language requirement should be a mark of education, not of utility, the stress was shifted from the "tool" concept in which the major department identified which languages were acceptable, to a "communication" requirement in which the student chose the language. Under the new rule, Spanish or Portuguese, which are not major languages of scientific publication, could be submitted by physics students because these are important languages of communication in this hemisphere and on this earth. We made a direct approach to the problem that Gingerich cites when he says that it is "particularly difficult to require a language if a student has not mastered a foreign language before graduate school." Our new (1968) PhD foreign-language requirement is fully satisfied if the student's undergraduate college transcript shows a grade of "C" or better in a three-credit fourth-semester course in a language. The graduate student who does not meet the requirement in this preferred way may meet it by enrolling in a fourth-semester college course in a language and earning a grade of "C" or better, or by passing the Foreign Language Test at or above approximately the 30th precentile when the comparison group is students in a fourth semester college course in the language. A detailed report of our study and recommendations is available.[1]

Shortly after these requirements were adopted, a graduate student in physics expressed to me his enthusiastic approval by noting that he had studied Spanish as an undergraduate because he wanted to teach physics in Latin America, and he was pleased that the new requirement recognized the academic legitimacy of this aspiration.

The new requirements have been in effect for approximately eight years and I believe they are working well.

A few years ago a major force in the guidance of our graduate programs was the need to produce new PhD's in ever increasing numbers to meet the growing demands. One of the costs of that period of pressures "to produce" was the elimination of "frills" such as the PhD foreign-language requirement. These pressures to produce are no longer with us and so now we can focus on quality and on excellence of humane scholarship in the broadest sense. I fully support the recommendation with which Gingerich