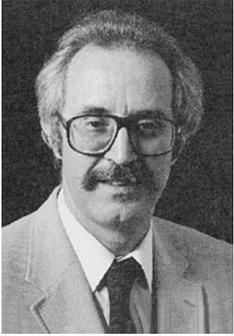

EDITORIAL



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Editor

In my last editorial I discussed the need for an active research community dedicated to pushing out the frontiers of fundamental scientific/technological knowledge. Even if someone agrees with the need, a question arises: Who is to pay? There appears to be only two generic sources: industry and government. I would like to use this space to argue that the major responsibility lies with government.

Certainly industry needs to engage in research to develop new products that keep pace with consumer demand and competitive innovation. This having been acknowledged, one must recognize the inherent constraints. Expenditures and directions for research must be compatible with the business environment in which a company operates. For management to decide to engage in fundamental research related to a company's business, it will likely first have to decide whether or not the endeavor will benefit its own interests. If a manager's evaluation depends on short-term dollar performance, then it is unlikely that he or she will gamble on the outcome of long-term research that, even if successful, will provide benefits ten years in the future.

But why is short-term performance so valued? I've heard numerous economists (and my accountant) argue that short-term evaluation results from demands of the economic system; for instance, quarterly reports and their effect on stock prices. But if this is so,

then emphasis on performance aspects not conducive to research is the responsibility of the government. It is the government that makes the laws regulating economic activity and these laws ultimately determine the principles that management applies in an effort to optimize profits. Were the laws so constituted that industrial profits were enhanced by sustained, long-term activity, then managers would react accordingly.

But, of course, the problem is not so simple. There are constraints on the economic system. Perhaps the government cannot form a viable economic environment and at the same time formulate laws that encourage scientific research. A case in point is the former Soviet Union. There, mathematics and physics were strongly encouraged, both educationally and professionally, but the system itself was not viable in the existing global environment. Just to point out a failed example does not automatically mean there is no solution; nevertheless, it is clear that outstanding scientific research is not a sufficient condition for economic success. In any event, whether for good or bad, the government makes the laws that determine whether or not managers make the large expenditures necessary for scientific advancement.

Granted all this, and granted that the government is making its decisions in the best interests of the society, it then has the concomitant responsibility to foster long-term scientific efforts – if such efforts are for the good of society. It seems to me that this last “if” represents an incontestably true hypothesis. Empirically, one need only imagine our world without the fruits of sustained scientific effort. I would not contest the argument that most research does not, in and of itself, produce results worth the individual cost of the actual research. But I would argue strongly that a vibrant scientific community engaged in serious research provides the context for the striking advances and the broad advancement of knowledge.

I recently listened to a discussion in

which someone was arguing that the fruits of cancer research were not worth the effort insofar as they resulted in successful methods of treatment. The debate got bogged down in whether or not treatment methods had or had not improved substantially in the last twenty-five years. In fact, the negative judgment, as well as the entire debate, missed the point. It is far too early to judge! One need only compare knowledge of the human genome today with knowledge of twenty-five years ago to realize that the ground for cancer diagnosis and treatment has advanced enormously, and it is this ground of fundamental knowledge that will be determinative of success or failure, not the worth of this or that treatment used today. And even with the advance, understanding of the genomic regulatory system is still rudimentary. There likely remains years of investigation in fundamental biology, chemistry, mathematics, engineering, and computer science (and imaging) before genomic understanding is sufficient for successful intervention on a large scale. Given the current state of affairs, how can one draw conclusions regarding success or failure?

Fortunately, genomics is recognized as an important scientific endeavor that requires substantial, sustained governmental support. What we in imaging need to convey is that imaging science is also important and worthy of significant support. In fact, imaging is crucial to practically all areas of science and technology. Companies such as Xerox, Fuji, and Nokia have played major roles in imaging research, especially as it applies to their product lines. But it is not reasonable to ask industry to carry the major burden of basic scientific research (physics, chemistry, mathematics, biology, and engineering). The demands of the marketplace that weigh on industry need to be balanced by government support to unlock the fundamental knowledge required for future advancement in science, engineering, medicine, and industry.