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REMARKS PREPARED FOR DELIVERY BY
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In the closing months of 1943, American counter-intelligence agents intercepted a letter which was mailed in Switzerland and addressed to a suspected German agent in Mexico. On the gummed inner seal of this letter they found a photomicrograph -- a tiny particle of photographic film no larger than the period at the end of a typewritten sentence. Such microdots -- as they later came to be called -- would be found in increasing numbers during the months ahead. Unlike the more sophisticated versions which would appear later, this microdot bore a fully-developed image. One had simply to place it under a microscope and read the several paragraphs of text which it contained.

Of the tens of thousands of secret messages which were intercepted and read by the United States during World War II, one sentence on this microdot was ultimately judged to be among the most chilling. It read: "Where are being made tests with uranium?"

I daresay that none of us here this evening would encounter the slightest difficulty in imagining the exhaustive scrutiny accorded these seven words by managers of the Manhattan Project. They would immediately note that the question was phrased in terms of "where", rather than "whether". More importantly, they would fully appreciate the significance of the question's having been raised in the first instance. One does not ask about uranium, at least not in terms of an espionage assignment, without some knowledge of its possible use. While that knowledge might proceed solely from theoretical considerations, it might also proceed from advanced experimental work not unlike our own.

These are but a few of the thoughts which doubtless crossed the minds of our responsible officials during those uncertain days of 1943.

Today, we -- you and I -- are the responsible officials. Our mission is not so easily defined as is priority in the development of nuclear weaponry; rather, it embraces as a goal the fullest expression of scientific excellence within the institutions entrusted to our care.

Unlike our predecessors in the Manhattan Project, we suffer not from a dearth but from an avalanche of information about the environment in which we operate. We cannot afford the luxury of examining seven-word sentences under a microscope. We must integrate vast piles of data and be possessed of the ability to extract meaningful trends. Only then can we begin laying out our strategies with confidence.

There exists one trend which I believe will have an increasing impact on each of our programs over the next several years. Its proportions have now grown so large as to make it easily recognizable. I refer to the increased emphasis being placed by the Congress on the usage of research results.

Rather than attempt a full elaboration of the data from which this trend emerges, I propose simply to refresh your recollection of chilling events which occurred six years ago, one year ago, and one week ago.

Here they are:

. Wednesday, November 19, 1969.

The Defense Appropriations Act signed into law today contains a provision, known as the Mansfield Amendment, which provides that none of the funds being appropriated "may be used to carry out any research project or study unless such project or study has a direct and apparent relationship to a specific military function or operation."

. Monday, November 11, 1974.

Senator William Proxmire today criticized the National Science Foundation for "spending tens of millions of dollars without . . . evaluating the usefulness of the research once it has been completed, and making sure that potentially valuable research results are made available to possible users."

Thursday, October 30, 1975.

A staff report released today by the President's Biomedical Research Panel concludes that patient care mandated by Congress appears to be draining resources and the attention of scientists away from basic research on the causes of cancer.

What does all this mean and what, if anything, should we be doing about it?

Let us dismiss at the outset the notion that proponents of basic research are engaged in a zero-sum battle with advocates of applied research. If there were such a contest, I would be allied with basic research on the grounds that, sooner or later, some important applications of this research would find their way into our market economy. Furthermore, absent basic research, we would sooner or later reach the point where applications trailed off into insignificance.

I believe it would be a serious mistake to conclude that Senator Proxmire, for example, was totally unappreciative of the fundamental importance of basic research. (It should not pass our attention that thus far his "golden fleece" awards have been targeted upon the behaviorial, rather than the physical, sciences.) We, for our part, are no less appreciative than Senator Proxmire of the importance of applied research. Who among us would countenance the abandonment of effort on a promising chemotherapeutic agent simply because a continuation of that effort would pass beyond the borders of basic research?

Let us also recognize that the events being played out around us do not find their genesis in an attack upon scientists by non-scientists. The schism exists in science itself, and finds its most eloquent enunciations within the scientific community. Consider these remarks by Joseph Henry, the first Secretary of the Smithsonian Institution and an ardent advocate of basic research. They are taken from the Institution's Annual Report of 1853.

"As soon as any branch of science can be brought to bear on the necessities, conveniences, or luxuries of life, it meets with encouragement and reward. Not so with the discovery of the incipient principles of science; the investigations which lead to those receive no fostering care from the government and are considered trifles unworthy of the attention of those who place the supreme good in that which immediately administers

to the physical needs . . . . But he who loves truth for its own sake, feels that its higher aims are lowered and its moral influence marred by being continually summoned to the bar of immediate and palpable utility."

As if in rebuttal, Henry Roscoe in his eulogy of Louis Pasteur in 1889 stated:

"For although it is foolish and short-sighted to decry the pursuit of any form of scientific study because it may be as yet far removed from practical application to the wants of men, and although such studies may be of great value as an incentive to intellectual activity, yet . . . discoveries which give us the power of rescuing a population from starvation, or which tend to diminish the ills that flesh . . . is heir to, must deservedly attract more attention and create a more general interest than others having so far no direct bearing on the welfare of the race".

Pasteur, himself a great pragmatist, once observed:

"There is no greater charm for the investigator than to make new discoveries; but his pleasure is heightened when he sees that they have a direct application to practical life".

Clearly the schism is long apparent in our own S&T community. Let us entertain for a moment the thought that the essence of our difficulty resides not in the willingness of the Congress to surrender lasting benefits for short-term relief, nor in the inability of individual Congressmen to grasp the cause-and-effect relationship between today's basic research and tomorrow's miracles. Let us hypothesize that our real difficulty resides in the fact that, however clumsily or inarticulately expressed, the exasperation of the Congress conceals a kernel of truth that no amount of pious indignation on our part or elemental outrage can quench. Our problem may be, simply that we are not 100% right.

Can we assert that the full fruits of our basic research have always and everywhere been made available in tangible form to the people on whose behalf our services were engaged? I do not ask whether these fruits were made available free of charge, but at any price.

If we cannot make this assertion, can we say instead that we have put forth our best efforts to achieve this result? Can we at least say that we have made significant efforts and that these efforts are being increased?

Does it help our cause to point out that universities and other non-profit research institutions are not themselves capable of bringing new products or services to the market place?

Is it sufficient to say that the results of our research efforts are published in the open literature? If you are tempted to answer yes to this last question, I invite you to consider the Salk Institute's experience with somatostatin. This potentially life-saving drug was patented by Salk and then offered, non-exclusively, to anyone willing to prosecute a new drug application. There were no takers,

If you are still doubtful as to whether a problem exists, or if you are sceptical as to its dimensions, it may be profitable for us to review the British experience.

The synthetic dye industry was born in the year 1856, when William Henry Perkin, an eighteen-year-old student at the Royal College of Chemistry in London, synthesized a strong mauve dye from coal tar. The process was not patented. Within a year, Perkin launched a new industry with the aid of his father. The synthesis was made in a laboratory at a technical college, and the ability to put the new science to work depended upon the fact that there was a large number of trained chemists, graduates of the Royal College of Chemistry and of the Techische Hochschulen in Germany -- people who knew how to manipulate and control the many processes involved in the making of organic dyes. By 1862, five years after Perkin began manufacturing, five important industrial colors were being synthetically produced. Snythetic mauve, fuchsia, aniline blue, yellow and imperial purple, which were previously made from their natural analogues, changed the economy of several nations.

Yet, notwithstanding the British preliminary discovery, within a short time, Germany had outstripped England as a producer of organic dyes, and by the end of the 19th century, Germany was exporting synthetic dyes to England.

The inability of the British to participate in the practical returns of a great industry they made possible was even more dramatically duplicated years later. The United States, capitalizing on the findings of Drs. Alexander Fleming and Howard Florey of St. Mary's Hospital of London and of Oxford University some eleven years after their initial report on penicillin, created the antibiotic industry.

One may well conjecture that these major economic losses to the United Kingdom might not have occurred had the investigators involved and their supporting management taken greater note of the world's patent systems and their practical implications. I'll say more on this later but let me note now that the United Kingdom took cognizance of these losses when it established the National Research and Development Corporation (NRDC) following the Second World War.

Experience demonstrates that the mere publication of research results will not guarantee utilization. In the somatostatin case I mentioned earlier, the Salk Institute found that a large number of pharmaceutical houses were willing to undertake further development if they were afforded an exclusive license under Salk's patent.

What they were unwilling to do was to exchange ten to twenty million dollars (the cost of prosecuting a new drug application) for a six-month's head start in the market place. This leads to the obvious conclusion that nonprofit research institutions must be prepared to offer some degree of exclusivity in order to insure commercialization of some of their research results.

Let me suggest that if this policy had been implemented by the United Kingdom as early as 1850, the British might well have shared in the economic reward of the synthetic dye industry for many more years than they were permitted by German competition. More importantly, the antibiotic industry might well have been British rather than American, and penicillin might well have been brought to the public ten years earlier, with the resultant preservation of hundreds of thousands of lives. As I noted previously, the British have attempted to avoid further loss of their economic position by establishing NRDC, a central Government licensing organization. Although we regard the NRDC-type organization as an inadequate substitute for an effective university patent management organization, it has

successfully managed the licensing and development by a British parmaceutical concern of cephalosporin, one of the major second-generation antibiotics generated by Oxford University with Government support.

If I were to conclude my remarks at this point and entertain questions from the audience I would immediately be challenged to explain how universities can give exclusive licenses on patents to which the Government retains title. The short answer is that they cannot.

Nevertheless, on September 23, 1975, the Committee on Government Patent Policy recommended that all agencies of the Executive Branch provide to universities a first option on substantially all inventions generated with Federal support, provided that the inventing institution is found to have an identified technology transfer function. In addition, the Committee also directed that an inter-agency committee be formed for the purpose of joint agency identification of universities having a satisfactory technology transfer function.

I'm delighted we've come this far. Notwithstanding these long-sought positive developments, it should be noted that implementation of the recommendations by agencies which do not presently have such policies has been left to each agency's own discretion. Accordingly, the opinions of each university on these matters will significantly affect the direction that individual agencies may take. I urge you, therefore, to make your views known to the government agencies with which you interact.

In particular, I draw your attention to the opportunity to present views on ERDA's patent policy at the public hearing scheduled for November 18 and 19, at the Germantown facility.

I cannot pass over this mentioning of ERDA without being mindful of the support which your association gave me last year in my efforts to eliminate the major imperfections which were contained in the original Senate-passed version of the ERDA policy bill.

In the long range, I invite your help on the following: As Chairman of the Government Patent Policy Committee, I hope to shepherd through the Executive into Congress legislation to establish a uniform patent policy for inventions emanating from Federally funded research.

As I visualize it, this legislation would enable universities to license patents embodying their inventions much more successfully than is currently the case. I'd be very pleased to hear your views as the legislation takes on form and certainly I'm counting on your support with Congress.

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