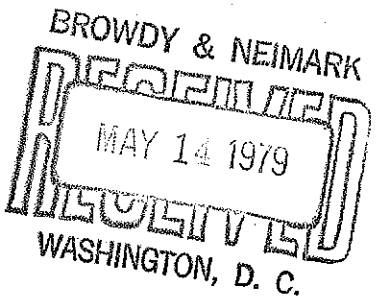
WISCONSIN ALUMNI RESEARCH FOUNDATION

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Mr. Norman J. Latker
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Dear Norm:

Enclosed you will find a copy of the talk I gave at the Eastern Regional Meeting of LES in New York on April 27. I am sure you will recognize many parts of it since I did draw upon several of the presentations which you made. I was particularly pleased to have an opportunity to use the Lippman quotation.

Best personal regards.

Very truly yours,

Howard

Howard W. Bremer
Patent Counsel

HWB:rw
Enc.

ACADEMIA - A PROSPECTIVE BUSINESS PARTNER

Introduction

It appears that even the title of a talk, yet to be given, can cause concern and even perhaps some trepidation. When the announcement of this meeting was circulated among LES members I received a letter from a colleague of mine in academia - a colleague of yours too in that he is a member of LES - with a "note in passing" to the effect that: "Such title can cause cardiac arrest in the ranks of university controllers, the guardians of our tax exempt status."

It is not my intention today, of course, to suggest that the universities should become engaged in or participate as partners in truly commercail enterprises. Nor am I suggesting that academia is for sale through funding procedures from private industry which would serve to make the research function of universities a controlled arm of industry. Rather, I am suggesting an alliance between the universities and industry which will be beneficial to both participants and which will potentially be of benefit to the United States in regaining and maintaining its position of technological leadership in world economy.

Current Climate

There has been much said recently about the state in which U. S. science is today and about the innovation process. There are, in fact, many disquieting proxy measurements which, in summation, give cause

for real concern that in some areas at least we have lost and in other areas are losing our technological leadership. For example,

> Since the 1960s total expenditures for research and development have declined by about 5% in constant dollars while expenditures for basic research are down more than 10%.
>
> Industrial expenditures for basic research have declined more than 20%.
>
> Based upon gross national product, R & D spending in the 10 years from 1965 to 1975 slipped from about 3% to about 2%. During that same period R & D spending in Germany, Japan and Russia increased.
>
> Foreign inventors now receive about 37% of U. S. patents issued, up from about 17% in 1968.
>
> We have a declining balance of trade which, in the manufactured goods area, has been built in part on U. S. technology which was exported.

In fact, today the United States responds to the definition of an underdeveloped nation which is one that exports raw materials to maintain its balance of payments, while it imports finished goods to maintain its standard of living. We are exporting our grain, cotton, timber, coal and other new materials to pay for TV sets, radios, tools, steel, clothing and a host of other finished products. This must change if we wish to retain our standard of living.

In discussing capitalism, Joseph Schumpeter, one of our great economists, stated:

> "Creative destruction is the essential fact about capitalism -- it is, by nature, a form or method of economic change, and not only never is - but never can be stationary ---. The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumer goods, the new method or product ---- the new markets, the new form of industrial organization that capitalist enterprise creates."

In a free society, man's entrepreneurial spirit tells him he has to improve on existing products and processes and procedures if he is to create a competitive edge for himself, or even just meet competition. Such activities, however, absolutely depend upon the willingness of government to welcome the future of such new innovation without the regulatory inhibitions inherent in the Government's efforts to apparently establish a risk-free society. The endless progress known in the United States spawned the expression so often heard from immigrants escaping totalitarian governments - "Only in America." It meant hope; it meant promise; it meant faith - the faith that in America most believed that anything could happen.

The willingness of government to welcome the future of innovation appears to be waning at a rapid rate. Increasing intervention by government, through regulation, has eroded our system of free enterprise to the point of measurably endangering the introduction of new consumer products,

increasing inflation, decreasing productivity and lessening our competitive position in international trade - and that at a time when innovation has become the preferred currency of foreign affairs. The advocates and perpetrators of such governmental activity seem to have no understanding that the innovative processes that bring revolutionary changes in society and to vested interests involve unpredictability, long gestation periods, huge sums of capital, genius and extraordinary perseverance on the part of free individuals and organizations.

As Walter Lippman said:

"The best things of mankind are as useless as Amelia Earhart's adventure...

...They are things that are undertaken, not for some definite measurable result, but because someone, not counting the costs or calculating the consequences, is moved by curiosity, the love of excellence, a point of honor, the compulsion to invent, or to make or to understand...

...In such persons mankind overcomes the inertia which would keep it earthbound forever in its habitual ways. They have in them the free and useless energy with which alone men surpass themselves...

...Such energy cannot be planned and managed and made purposeful or weighed by the standards of utility or judged by its social consequences. It is wild and free...

...But all the heroes, the saints and the seers, the explorers and the creators, partake of it. They do not know what they discover. They can give no account in advance of where they are going, or explain completely where they have been...

...No preconceived theory fits them. No material purpose actuates them. They do the useless, brave, noble, the divinely foolish and the very wisest things that are done by men...

...And what they may prove to themselves and to others is that man is no mere creature of his habits, no mere automaton in his routine, no mere cog in the collective machine, but that in the dust of which he is made there is also fire, lighted now and then by great winds from the sky..."

The regulative mind seems to fail to comprehend that the visibly possible achievements, the clearly available resources, are always limited. All plans based on the calculable present, on existing statistics, necessarily presume a declining field of choice, an exhaustion of resources and a diminishing of returns. The only unlimited resource, the one that

releases us from all the others, is the imagination and creativity of free men.

Innovation is the key - the key to the hope; to the promise; to raise again the belief throughout the world of "Only in America."

The University-Industry Dilemma in the Present Climate

At the universities the cost crunch generated by the bite of inflation has been strongly felt. Also, the Government, which supplies most of the research monies to universities, has pushed for more practical utilization of that R & D money. As a result those massive grants once available for highly esoteric research activities are no longer available. In this climate the universities can say "We have the ability to create new technology, but no one to finance it."

Industry, on the other hand, is faced with the same inflationary cost crunch, with increased foreign competition both at home and in foreign markets, a great deal of which is based upon technology which was originally exported from the United States and last, but certainly not least, the proliferation of Federal regulations calling for vast sums to be spent on R & D in order to comply with those regulations. These latter expenditures seriously divert monies from the R & D needed to create new products and, thereby, true economic progress.

All of these factors have increased the risk for investment in new businesses and facilities and have caused management to focus on the

short term return with a corresponding short term concentration on research. In this situation industry can say "We need new technology but can't afford to develop our own."

University-Industry Cooperation

Emotional Impediments

Although the desirability of getting the universities and industry together because of the complementary nature of their needs and abilities seems apparent, as a general proposition this has not happened and the businessman and the scholar have often been at odds. Each group has erected its own barriers to cooperation and the attitudes which have developed have perhaps been due in part to the fact that each has had its own independent goals. On the university side, the attitude was often that something which interested industry, i.e. something which had either a direct practical application or the probability of such application in the marketplace, was not the goal of "pure science" - an Ivory Tower residuum; while industry often felt that it was easier to rediscover something in its own labs than search for it somewhere else - an attitude concocted perhaps from pride, an unwillingness to move or even think beyond existing products and the ubiquitous NIH syndrome.

> As Dr. Edward E. David wrote in Industry Week (April 7, 1975) -
>
> "Standing between ingenuity and accomplishment is a time-honored but archaic attitude known as the "not-invented-here" syndrome. For too many years the technical community has

looked down its collective nose at applying another man's work to a specific problem.

The Japanese are not so inhibited. They have been buying five times as many technology licenses from U. S. firms as we have from theirs. They have used unabashedly what they learned from others to build themselves into an industrial power."

Another impediment to university-industry cooperation was expressed in this way by Tom Evans, Director of Research at Michigan Technological University:

"Many of the research institutes are qualified to start with ideas and proceed through the development of product prototypes; they seldom get the opportunity, however, to 'do the whole job', usually because they can't find an industrial sponsor who will trust them enough to leave them alone -- and because industrial sponsorship for most new product/process possibilities can almost never be obtained to cover the costs of idea-to-prototype R & D."

That such impediments, fictitious, emotional, or real, have probably caused a drifting apart of universities and industry over the years is supported by the fact that 25 years ago universities received 12% of their research funds from industry while today the figure is around 3%.

The Shadow of the Government

And in the background is the Government which finances, directly or indirectly, much of the research done in the United States. For example, it is estimated that for calendar years 1978 and 1979 the Government will spend over $23.8 billion for R & D which is over 50% of all of the total money spent for R & D in the country. Of this amount about $6.5 billion is earmarked for domestic intramural use while about $16.1 billion is designated for domestic extramural use. Of these latter funds about $11.7 billion will go to profit organizations (industry) and about $4.45 billion to educational institutions.

Also significant is that the Federal R & D expenditures research accounts for about 38%, development 62% and management and technical assistance about 0.3%. In contrast, in the private sector it has been estimated that R & D accounts for about 30% of the cost of bringing a new product, process or service to the point of market acceptance while marketing oriented costs - including investments in plant, equipment and production - account for the bulk of the remaining 70%.

To suggest, therefore, that the private sector is in a position to ignore the innovations generated by government-sponsored research and development and still remain competitive overlooks the fact that the Government is now funding much of the nation's research and development and that its participation may be increasing as the private sector backs away from R & D under the weight of increasing regulation.

The Credible Connection

Given the evidence that industry is spending less and less on basic

research, which requires a long term outlook, and is devoting more effort to product improvements to increase short term gain; and given the evidence that almost all truly basic research is today being done in the university environment; what better alternative for industry than to look to the universities as a source for basic research results to translate into future marketable products.

Why doesn't this connection exist now? What is necessary to establish it? What is necessary to promote it?

Since the innovation process is a chain which must be forged link-by-link from the inventive concept through development to marketing, let us begin by identifying several general premises from which it would be necessary to proceed in forging that chain in the university-industry-government interrelationship.

First: A sympathetic and encouraging Federal climate is essential to technological progress.

The Government, through greater or lesser funding and regulatory practices, can provide a framework within which regular contacts between university and industry can be catalyzed.

Second: The university community and industry, left to their own devices and initiatives, will continue to operate much as they have in the past, each primarily being attuned to its own goals and objectives.

In this regard we must keep in mind that the pressures on industry to maximize profits and minimize risks mitigates against them moving out of their established patterns of operation.

Third: <u>There is an absolute need for industrial collaboration if the results of Government-sponsored university research are to reach the marketplace.</u>

This is true because much of the work performed under Government grants and contracts can be classified as basic research, as opposed to applied research, with the consequence that the inventions arising out of such research are generally embryonic in nature and require much additional development. Since development leading to a commercially acceptable product is not generally within the scope of the university mission, they cannot undertake the development of such inventions to bring them to the point of practical application - nor are funds for such development by universities generally available from Government sources. As a consequence, the development in such instances will only be accomplished where industry has knowledge of them and has an incentive to utilize its available risk capital to bring the invention to the marketplace. Since the universities and industrial concerns are not only physically separated but have pronouncedly different missions and therefore respond to different stimuli one can expect that collaborative development arrangements will not be easy to achieve.

Fourth: The difficulty of collaboration is compounded when those who now have pivotal positions in the innovation chain refuse to modify their operations to meet the needs of the whole system.

The vested interests in academia, industry and the government constitute by far the most serious institutional barriers to socially important innovations.

In view of these premises as applied to the interrelationship between the universities, industry and the Government, it is abundantly clear that the principals involved cannot be ordered to collaborate. Consequently, the problem is how to provide the means for inducing them to integrate voluntarily into a system that performs a socially desirable function.

Technology Transfer-Deterrents and Aids

There are certain deterrents to the voluntary integration of universities, industry and the government into a technology transfer program the removal of which will optimize innovation. Primary among these are believed to be the following:

1. Universities do not generally have an adequate management capability to facilitate the transfer of their inventive results to industry.

It is generally agreed among those involved in the technology transfer process that the mere existence of a body of research outputs and technical knowledge is not

enough to result in significant industrial innovation. Even where an organization has the right to transfer a degree of patent protection desired by industry, utilization of the technology may fail if an organized effort to communicate research results is not made.

2. The not-invented-here syndrome

This deterrent was mentioned earlier as being an emotional impediment to university-industry cooperation. It also, however, has a practical origin.

Industrial organizations have commercial positions in most areas of their research. There is, therefore, in-house incentive to further develop the results of that research as a means to improving the commercial position. This incentive stems from the ability to evaluate the research through all stages of its development. Since research conducted outside the organization, as at universities, will not be subject to the initial review or control of the organization, it is presumed that there will be a lesser incentive to further develop the results of such research. The bias of industrial organizations against accepting ideas from outside sources might be lessened if industry could early on identify university investigators working in areas of interest to the organization.

3. The uncertainty over ownership of inventions made at universities that may be collaboratively developed or are generated through a collaborative relationship.

An example of such deterrent was evident in the industry-wide reluctance of pharmaceutical firms to test compositions of matter synthesized or isolated by Department of Health, Education, and Welfare grant-supported investigators because of the Department of Health, Education, and Welfare's patent policy which, industry felt, failed to take into consideration the large private investment before such compositions could be marketed as drugs. Thus, there tends to be a strong reluctance to collaborate with universities in bringing high risk inventions to the marketplace if some patent exclusivity is not first provided to the developer.

4. Contamination - the potential compromise of rights in proprietary research resulting from exposure of an organization to ideas, compositions and/or test results arising from Government-sponsored research.

5. The absence of a uniform Government patent policy which would permit the granting of a limited-term exclusive license as an incentive to develop.

To overcome these deterrents and promote the transfer of technology from the universities to industry it is essential at the outset that there be provided, within the university, a focus for the results of institutional research from which later dissemination can take place. This could be encouraged and accomplished by the Government guaranteeing to universities, at the time grants or contracts are funded, patent rights in inventions made under those grants or contracts. Such guarantee of patent rights should carry with it the right to license commercial organizations. This would, in turn, create the incentive necessary for development in those situations where collaboration would not otherwise be accomplished and would lessen or eliminate the industry fear of contamination. Moreover, in such circumstance collaborative arrangements could be made where industry's participation is protected before it is even clear whether or not inventions will be made. This capability would tend to minimize the not-invented-here problem since a collaborator would not be viewed as an outsider.

Such actions as have just been suggested would provide the means for the voluntary integration of the universities, industry and the Government into a system which would result in the transfer of a much greater amount of technology since the equities of all of the parties would be recognized.

First: the Government, as the representative of the public, would have created the atmosphere necessary to transfer the results of university research to the marketplace where the taxpayer

may utilize it. Of course, such end products will increase the nation's potential to employ labor and raise the level of its exports. Further, industrial participation will increase the Government's ability to focus public funds on the kinds of research and development which have high, long-run social value, but could not be undertaken by industry alone due to the risk involved and the initial poorly defined profit opportunities. Rights will be reserved under the policy to assure against individual abuse of the privileges retained by the university and industry;

Second: the university will be permitted to recover royalties through the licensing of their inventions. The policy requires that a substantial portion of royalty receipts be utilized for educational or research purposes, with a lesser portion available for distribution to inventors. Further, ownership in the university will permit the university to pursue or direct development of the invention as it seems appropriate; and

Third: industry's investment can be protected through some exclusivity.

We must establish an understanding that, no matter how much money we spend on research and development, the findings are not going to benefit

the public unless there are suitable incentives to invest in commercialization. And because no one knows which venture will succeed, we must strive for a society and an environment ruled by the faith that the guarantee of reasonable profits from risk-taking will call forth the endless stream of inventions, enterprise and art necessary to resolve society's problems. The words of the poet Edna St. Vincent Millay seem most appropos to this situation:

"Upon this gifted age, In its dark hour
Rains from the sky a meteoric shower
Of facts -; They lie unquestioned, uncombined -
Wisdom enough to leech us of our ill
Is daily spun, but there exists no loom
To weave it into fabric.

Technology Transfer-Enhancement

I suggest that the building of the loom which will be the instrument for weaving into a substantive fabric the results of a substantial amount of Government-sponsored research for the benefit of the public has begun in legislation which has now been introduced into the Congress as Senate Bill 414 and House Bill 2414 both entitled "University and Small Business Patent Procedures Act." The object of both bills, the provisions of which are identical, is to establish a uniform Federal patent policy for universities and small business. S. 414, introduced by Senators Bayh and Dole and co-sponsored by twenty-four of their colleagues from all spectrums

of the political arena, and H. R. 2414 introduced by Congressman Rodino and co-sponsored by Congressmen Edwards and Au Coin, are indicative of the broad and growing interest in the apparent lag in innovation in the United States and its adverse effect upon our economic position in the world today.

These bills recognize that it is axiomatic that government research and development funds are only seed money in the creation of invention and that additional risk capital is necessary in order to bring a finished product to the market. In order to assure an environment where this capital will be forthcoming, the Bills provide to universities, nonprofit organizations and small businesses, the incentive of ownership to any future inventions made in performance of government sponsored research and development contracts.

This concept recognizes that inherent to the private sector's decision on whether to do its part in delivery to the public is a determination on whether its risk capital is protected by sufficient intellectual property rights that provide some initial and definitive lead over its competitors. The Bills correctly reject the concept of permitting the government to make a determination of rights after the invention is made, since review of the results of such policies indicates the government's apparent inability to make such decisions at all or on a timely basis. Also significant is the fact that the Bills end the unworthy act in a democratic society of making supplicants of our

creative few for control of their own innovations, because they have been touched with government seed money. The principle of the Bills recognizes the simple economic fact that on many occasions venture capital must come from sources other than the innovating organization or its licensee. No bank or lender would provide development funds against an innovation that is not controlled by the developer.

The Bills are, moreover, of special importance in light of the increase in pre-market clearance regulations for new products which, in turn, elevate the need for risk capital to generate the data necessary to gain clearance and increase the developer's need for initial market protection.

But probably of greatest importance, and not obvious from a mere reading of the Bills, is their inherent ability to bring together industry and the nonprofit sector during the entire innovative process. There must be more independent assessment and mastery of the whole of the innovative process by industry, working closely with universities so that they can work as equal partners with government in defining and enhancing the system. Such creative collaboration would help overcome the often negative influence of special interest groups and of naive generalizations about science and engineering in setting regulatory policies that now so obviously effect the working of the innovative process.

The Bills follow the eminently sensible formula of closing the

feedback loop of research, invention, patenting, production, public benefit and then support of additional research through royalty returns or profits.

It is our considered opinion that this legislation is fundamental to establishing a climate in the United States which will encourage innovation and which is necessary to the long range solution to the slump in innovation and productivity. It will aid in establishing an environment which will permit the process of innovation to go to completion.

The Partnership

Although industry has been relatively generous with academic institutions it has never supported substantial amounts of research at those institutions. There have, of course, been some contributions for specific purposes but, for the most part, the connection has been philanthropic - there has been no real working connection.

Passage of the University and Small Business Patent Procedures Act will remove a major impediment to true collaborative arrangements between industry and the universities for it will effectively remove the dark shadow of the Government which has long had a chilling effect on such arrangements. Industry and the universities will then be relatively free to engage in truly joint research efforts or more freely enter into meaningful licensing arrangements the provisions of which can reflect a working partnership. The whole approach to the process of innovation can be fundamentally changed.

The possibilities which present themselves remind me of a story about a group of Boy Scouts who were attending a summer camp. Near the camp area ran an abandoned spur line railroad with a long segment of track still in place. It quickly became a daily practice among the Scouts to see for how great a distance they could walk the rails without falling off, the ultimate goal being to walk the full length of the track segment. The days went by and no one had succeeded in such attempt. One day when a large group of Scouts was attempting to perform this particular feat, two of the boys were seen on the perimeter of the group holding a whispered conversation. They then approached the group and announced that they would walk the full segment of track without falling off. Needless to say, they were greeted with all the usual expressions of disbelief characteristic of boys of that age group. Undaunted, each of the boys got on a rail, reached across the roadbed to take hold of his partner's hand and easily walked the rails for the full distance of the track segment.

The moral is, of course, that cooperation is the key to success. I suggest that the time is ripe for industry and the universities to join hands in the innovation process. To be sure, there will be many problems which will require solution before a mutually satisfactory working arrangement is reached through understanding and compromise. The benefits can,

however, be enormous.

For industry it can mean:

Proprietary protection while evaluating new product projects for corporate diversification;

Reduced rsk because of the possibility of beginning with demonstrated novel research results;

Substantially shortened time from discovery to development or from development to sale;

The possibility of creatively expanding existing programs and product lines;

Viable alternatives in technology to solve current problems and public needs;

A supply of good and well-trained scientists for industry.

For universities it can mean:

Crucial dollar input;

A recognition of the universities as a source of invention;

An enhancement of prestige for the university;

An increased ability to engage the best research people;

An opportunity to stimulate the young scientist-researcher to seek university employment.

For the country it can mean:

The ability to muster the best scientific assets to attack current problems;

Utilization of resources with the greatest efficiency;

Reestablishing world technological leadership in the United States; and

Reestablishing a more favorable economic climate and a positive balance of trade.

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Talk given by Howard W. Bremer, Patent Counsel, Wisconsin Alumni Research Foundation, Madison, Wisconsin, at Eastern Regional Meeting of the Licensing Executives Society, April 27, 1979.