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In the last decade the U. S. economy has been badly damaged by the increasing cost of imported energy, the decline of available domestic natural resources and the competition from imported goods manufactured with low cost labor, increased productivity or innovative improvements. While assessing our economic problems it has become clear that other nations -- Japan in particular -- have maintained a high level of employment, productivity and a favorable balance of payments despite even worse short falls of native energy and other natural resources. These favorable trade conditions are attributed, in part, to the reliance on high technology in the manufacture of products for both domestic and foreign consumption. It is now considered nearly an article of faith among many opinion leaders that technological innovation is crucial to the continued economic vitality of all nations, including our own. Clearly, discussion of "invention" and its application as "innovation" are again fashionable.

This rediscovered axiom has produced competing spokesmen for increased support of high technology. While this competition has already produced some legislative and administrative solutions that point to further fragmentation of policy, major legislation that would be compatible with a national policy of supporting entrepreneurs and new high technology small business enterprises was enacted during the 96th Congress.

The special treatment afforded to entrepreneurs and new high technology small businesses by the 96th Congress was based on referenced reports crediting independent individuals and small businesses as the country's primary source of innovation and new jobs. (I might add that the Japanese also apply special treatment to infant industries until they are prepared to compete) These reports also pointed out that individuals and small business as a source of innovation is being severely handicapped by government regulation and poor access to financial resources.

P.L. 96-517, "An Act to Amend the Patent and Trademark Laws" is the first major patent bill enacted in over 25 years. This beginning effort to restore the former prestige and influence of the patent system on innovation is long overdue. In the beginning days of the Republic the Patent Office held a more significant role in the consciousness of the nation. In days past the government's official report on international events was often the responsibility of the Patent Office. Edward Riddle's report to the Commissioner of Patents on London's, 1851 World Fair stands as an eloquent document on the contrast between the goals and policies of a Democracy against those of Autocracy. At the Fair, American inventors assembled an impressive array of products from the reaper to machine - made boots. Nothing could have shown more clearly America's concern for the welfare of all its citizens than those inventions beside the luxury items displayed by the Europeans.

Hoping possibly to elevate the importance of invention and innovation to the prominence it once occupied in the consciousness of America,

many are now seeking the separate Agency status the PTO occupied when invention was king.

P.L. 96-517, contains three major sections each of which is intended to strengthen the patent system and thereby enhance the proprietary positions of small high technology businesses and the climate for the innovative process.

The first section provides for reexamination of issued patents by the patent office at the request of any party paying a fee estimated to be between \$1000 - \$1500. Reexamination is intended to increase a patent's presumptive validity and significantly reduce expensive infringement suits involving questions of validity. If successful, individuals and small business will be the primary beneficiaries.

The second section permits the PTO to increase its fee schedule at reasonable intervals in order to cover 50% of its operating costs. The increased fees are intended to enable the PTO to better maintain its search files and perform other necessary duties. The small business community will be closely monitoring new fee schedules with the hope that the PTO will assess fees on individuals and small businesses in keeping with their ability to pay (a recommendation believed consistent with the Regulatory Flexibility Act which I will briefly discuss in a moment.)

The last major section P.L. 96-517 embodies S.414 (commonly referred to as the Bayh-Dole bill) which was vigorously supported by the small business - university community. The section gives small business, universities and other non-profit organizations a first right of refusal to title in inventions they have made in performance of government grants and contracts subject only to some limited exceptions.

The Act eliminates approximately 26 conflicting legislative and administrative policies covering the disposition of inventions made by small business universities and non-profit organizations with government support. Clearly the Act is a meaningful response to over regulation! The conditions attached to university licensing of inventions retained under the Act gives small business a preferred position over other prospective licensees.

At fiscal year 1980's rate of funding small business university and non-profit research and development, the Act will cover the disposition of the inventive results from approximately 6.2 billion dollars of grant and contract awards to such organizations. That portion of the 6.2 billion utilized by university and non-profit organizations covers 65% of all basic research conducted in the United States.

In addition, the Act authorizes all the federal agencies to grant exclusive licenses on government-owned inventions. Government-owned inventions will be made up in most part by inventions made by government employees at government laboratories in addition to contractor inventions (other than small business universities and non-profits) to which the government has a right of ownership.

P.L. 96-354 "The Regulatory Flexibility Act" is Congress's answer to complaints of over regulation of small business. The premise of the Act is simply that government regulation does not fall on all business equally. The cost of a regulation impacting on all businesses is presumed to be less on big business than small business since its costs can be prorated over a larger number of sale units. The Act, accordingly requires that all new regulations intended for publication for public comment be reviewed to determine whether

they substantially impact on small entities (small business university, governmental unit, hospitals, etc.) If so, the Agency is required to produce an impact statement indicating what regulatory options were considered to avoid adverse impacts and if the most beneficial option to small entities is not use, a justification for use of its substitute.

In addition, to additional changes in patent policy and regulatory reform spokesmen for entrepreneurs and new high technology enterprises will be continuing to press in the 97th Congress for new tax incentives, and new federal research and development and new assistance policies to further enhance the climate for commercialization of innovative products made by individuals and small high technology enterprises. It is to this latter subject that I will address most of my remaining remarks.

During the past decade, the U.S. experienced the lowest growth in manufacturing productivity of any of the seven major industrialized nations. All the causes of this lag in productivity cannot be easily identified. However, the direct link between productivity growth and innovation requires that every possible effort be made to enhancing innovation. Of the many possible explanations for a low level of innovation, one --- failure to adequately fund basic research --- has been ruled out by many opinion leaders. This finding could well be based on the single fact that the United States has dominated the Nobel Science Prizes with 73 American prizes in physics, chemistry and medicine in the last 20 years contrasted to one similar prize to the Japanese where science also gets strong financial support. During the same period similar prizes were won by four Russians, five Frenchmen and eight West Germans.

The serious deficiencies in our support of innovation appear at the very next steps of the innovation process: the direct transfer of new advances into the marketplace, and their evolution and application to related products and processes. There is little doubt that the Japanese with one Nobel Science Prize in 20 years, with no energy resources and a positive balance of payments is out performing us in applying the results of research. There is some suspicion that results being applied were derived from U.S. supported research dedicated to the public through scientific and government publications. Ezra Vogel author of "Japan as No.1 - Lessons for America" indicates that Japan's success is due more to their superior planning organization and effort than to making inventions. The Japanese scour the world for information and ideas, while "Americans suffer from the not-invented-here syndrome".

It should be clearly understood that these comments are not an attack on federal funding of basic research. Basic research should be strongly supported on the grounds that sooner or later some important application of this research would find its way into the marketplace. Further, absent basic research we would sooner or later reach the point where applications trailed off into insignificance. With the passage of P.L. 96-517, it is anticipated that the incentive of invention ownership in universities and other non-profits will significantly increase the technology transfer of scientific results into practical application if the Executive Branch signals its approval of university and non-profit invention licensing.

The Act creates the possibility of a significant university/non-profit licensing program, that must be made to work if the full benefits of the nation's investment in basic research are to be met. The Senate report accompanying the Act makes clear that a successful program is within reach in light of the experiences gained under the HEW-NSF institutional patent agreement programs which served as the model for the invention disposition section of P.L. 96-517. However, all the progress made to date could be frustrated if executive office involvement does not preclude fragmented application by the Agencies and assure uniform guidance reflecting a National innovation policy. While there has been much advocacy to support basic research within the federal agencies over the years there has been virtually no effort to generate policies that signal the need for application of the results of basic research. In fact, many of the same people who support extended aid to basic research are uncomfortable with efforts requiring attention to applied research (or technology transfer).

Notwithstanding, the anticipated benefits of P.L. 96-517, through the incentive to move the inventive ideas of universities from concepts to practical application only minor federal effort is in place which enables the initial feasibility testing of new high technology products and processes made by individual inventors and small businesses.

Direct federal support for technological innovation has traditionally taken one of two forms in this country: general support for research and development which would ordinarily

entertain proposals in many areas of science or technology, such as that funded by the National Science Foundation (NSF) and the National Institute of Health NIH or support for technology development in furtherance of certain well-defined government goals, such as the defense and space missions, and more recently the search for new sources of energy. It is important to understand the difference between these two forms of support, as the former suggests the funding of ideas proposals covering a broad range of science and technology submitted from outside sources while the latter suggests funding only of ideas the funding agency deems within the agency's mission and likely to have been conceived by Agency personnel.

This policy differs markedly from the practice and procedures of other technologically advanced nations - again particularly Japan -- in which the governments support technological innovation with no other goal than the general economic one of helping particular sectors of industry to grow and to compete in international markets.

The absence of a similar policy in this country has become increasingly frustrating to individual inventors and small business since the general support programs of Agencies such as NSF and the NIH which encompass approximately four billion dollars of potential support annually are closed to profit - making organizations by administrative policy. At the same time the mission oriented agencies will only entertain proposals which fall within their

narrowly drawn needs. Where can an individual on small business with an idea that resolves a problem outside the needs of government go to obtain a test of its feasibility?

In 1842, after five years of beseiging, Samuel B. Morse was granted \$30,000 by Congress to test the feasibility of bringing his concepts on telegraphy into practical application. The grant allowed Mr. Morse to build a test telegraph line between Baltimore and Washington. No conditions were imposed that would impede commercial application of the results. This telegraph serviced as the prototype and incentive for the investment of capital to construct a nationwide network of lines under patent licenses from the invention.

While no one would deny the blessings bestowed on the Nation through the modest assistance afforded to Mr. Morse to implement his ideas, we have done little in the intervening 140 years to devise programs to provide similar grants of seed capital to individual inventors and small businesses for initial feasibility testing of advanced, but risky non-mission-oriented technology.

Statistics gathered from federal agencies that now have loan or small business investment company (SBIC) programs to finance new ventures indicate the government utilized some \$1.3 billion into what were identified as "startups" last year. While the amount of funding available for "start-ups" appears impressive the facts indicate that most of the funds in the loan and small business investment company programs supported by the government flow to prosaic small businesses with limited growth potential or to expansion of existing businesses. Little, if any, of this funding is used for the purpose of establishing the

feasibility of advanced technology.

This may be due to a number of factors. Most certainly the fact that government support must appear to be "reasonably secured" before funding creates a disincentive on the part of lending or investing management to fund in the feasibility of advanced but risky technology. Since the chance of failure is high in development of advance technology concepts it can be expected that there would be a reluctance to fund unless the loan or investment could be secured by existing assets rather than expected earnings. Unfortunately, assets are meager in fledgling high technology start-ups.

Further, in regard to direct loans by the Government it is known that loan officers have little incentive to undertake the responsibility of funding a high risk study as they are untrained to do so, nor would a successful result in anyway enure to their benefit. The absence of a wide array of technical evaluators capable of identifying probable successes also undermines confidence in funding advanced technology ventures.

It seems that even private sources of capital are unwilling or unable to assume the funding necessary to demonstrate the feasibility of many high-technology concepts because they cannot be determined to be reasonable risks. This is based on the assumption that the full cost of attaining a positive showing of a technical concept (or the "big hit") including the funding of failures which need to be undertaken prior to reaching the "big hit", exceed what venture capitalists consider a fair return on their investment.

During the last session of Congress small business opinion lenders made a determined but unsuccessful effort to persuade the Congress to legislate a mandatory set-aside to small business of 10% of all research and development funding within a ten year period. The legislation was considered appropriate in light of the fact that less than 4% of the government's 30 billion dollar research and development budget went in grant or contract awards to small business notwithstanding that small business is responsible for 50% of the GNP. Virtually none of the NSF and NIH 4 billion dollar research and development grant went to small business. In other words, little general non-mission related, R & D support went to small business. Small business was awarded contracts only in mission related areas where invention is normally a by-product of the services provided. Only a few million dollars could be traced to non-mission-related technology in which the government supported further development of ideas proposed by small business contractors.

Although the set-aside legislation failed to be enacted, it appears clear that its passage would not have created a program which supported technological innovation with a goal of aiding industry to grow and face increasingly stiff competition in technology - based products from other nations that have programs for domestic support of technological innovation. While it is clear that opening the general research programs of NSF and NIH programs to small business would raise the prospect of increased feasibility testing of advanced high risk technology, some believe that these bastions of university and non-profit basic research are unlikely environments for applied research aimed at delivery of consumer products to the marketplace.

Further, the problems of running a basic research program are sufficiently different from those of an applied research program to demand different technical managers. Presuming the need for such managers one needs to determine the number or "critical mass" necessary to evaluate proposals for support over a broad range of technologies.

It is now being argued by some that efficiency of personnel and the need for an appropriate environment appear to point to a program set up either as a separate agency or as a function within an existing agency rather than carving out a program for testing the feasibility of advanced technological concepts out of programs existing for other purposes.