November 1, 1978

Mr. Alan Parker
General Counsel
House Judiciary Committee
2137 Rayburn House Office Building
Washington, D.C. 20515

Dear Alan:

Thanks for giving me the time to discuss the Juvenile Justice and Delinquency Prevention administration program for a National School Resource Network. I look forward to hearing from you or another member of the staff if it appears that we have some justification for further complaint.

As I mentioned to you, Rutgers and Princeton Universities are very supportive of the Small Business Nonprofit Organization Patent Procedures Act that was introduced in the Senate last year. Although Senators Dole and Bayh were the major sponsors, 14 other members of the Senate cosponsored including Senators Williams and Case. Attached are reprints from the Congressional Record, a copy of the bill (S 3496), a background paper and a sectional analysis of the bill. If you and other members of the Judiciary staff agree that it is a worthwhile bill, I hope that you will encourage Mr. Rodino to introduce a similar bill at the beginning of the 96th Congress.

On December 1, 1978 I will be leaving Rutgers to take a position with a company in New York, so future contacts regarding the patent legislation should be with Donald Edwards, Vice President for Administration and Public Affairs at Rutgers (201-932-7741) and Allen Sinisgalli, Associate Director, Office of Research and Project Administration, Princeton University (609-452-3091).

Thank you for the assistance you have given to me and to Rutgers in the past.

Cordially,

WT

William T. Lyons
Director of Federal Relations

WTL:bf

Attachments

cc: Donald Edwards
Allen Sinisgalli

bcc: Newton Cattell
Norman Latker

April 6, 1978

The Honorable William Proxmire
United States Senate
Washington, DC 20510

Dear Senator Proxmire:

I have recently been made aware of important new considerations concerning the management of inventions which are generated by research investigators supported by federally funded agencies such as the National Science Foundation and the National Institutes of Health (NIH). This is of particular importance to me for a variety of reasons. First, I am the holder of a major program-project grant from NIH as well as other federally funded research grants. Secondly, I have been able to generate, over the course of the past 15 years, some 25 U.S. patents and over 80 foreign patents on new active forms of vitamin D which will be used to benefit mankind in treating bone disease. In fact, one of my patents was among those initially negotiated with the NIH and was the forerunner of the current institutional agreement between HEW and the University of Wisconsin.

I understand that some congressional leaders feel that inventions from research investigators supported by federal funds should be in the public domain and be available to all interested parties royalty free. This includes foreign companies as well as U.S. companies. However, U.S. companies would not have the same privilege as regards royalties on inventions in foreign countries. We now enjoy a $4 billion advantage in terms of balance of payments from patent royalties. An important segment of this will be jeopardized if inventions originating from scientists supported by federal funds are eliminated by such a policy change. Our balance of payments are already a serious problem and this change would place our industry at a great disadvantage.

If inventions are held in the public domain, I am confident that very few inventions would be disclosed. What incentive would there be for an inventor to file for patents if they would not benefit him or his institution? Patents are never used as a basis for grant renewal and they are not recognized by the intellectual community as an achievement like regular publications are. If my patents could not be assigned to the Wisconsin Alumni Research Foundation (WARF), I am confident I would not apply for them.

If patents are available to all companies they are not likely to be developed for commercial use. In the pharmaceutical industry, for example, millions of dollars are expended to make a single drug commercially available. No company would routinely invest such money in a drug if their market was not protected at

by patents at least to some extent. Thus the inventions generated by tax support would never reach the taxpayer. This would actually shortchange the taxpayer more than the small royalties which are funneled back into research. Under the present patent policy of HEW and NIH, patents may be filed through a nonprofit organization such as WARF and the royalties returned to the University. Furthermore, the government has royalty-free use of the fully developed inventions and retains march-in rights. The public is fully protected under the present permissive legislation. Please note that WARF has been and is an important supporter of the University of Wisconsin-Madison, contributing $4-5 million annually for research in all fields. These funds come from the patents on inventions such as those now under debate. I do not believe that the Senators would want to jeopardize this important support for the University or deny this excellent support for all fields of intellectual endeavor.

Finally, I would like to pose to you, whom I regard as a great champion of human rights, the question of whether an invention is anyone's property except the person who conceives of it? Is it fair that someone or some agency that provides financial support for an individual to carry out his or her work should thereby own the concepts and ideas generated by the inventor? I believe it is a violation of human rights to usurp these inventions simply because the individual was financially supported to carry out work which he delivered but in addition conceived of inventions. It is my position that these inventions should remain as the property of the inventor and no company or federal agency should be able to demand those inventions which are a spin-off of the investigator doing his required work.

I am sure your concern is that the taxpayer should not be shortchanged. I submit that a policy which would discourage patent application and development in our free enterprise system would be the best way to shortchange the taxpayer who invests in reseach investigators to combat disease or provide important technological advances which will ultimately benefit them. I see no other way to greater benefit the American taxpayer than to protect the inventor, encourage his inventiveness and to encourage companies to develop the inventions so that they will be reduced to practice at the earliest possible time.

I sincerely hope you will give adequate consideration to this important line of reasoning before acting on any legislation which would prohibit institutional agreements with federal agencies regarding patents generated from research grant and contract support. I would like to remind you that the current policy is permissive; that is, a federal agency can enter into institutional agreements for the development of patents but it does not necessarily have to do so. At the very least, I would hope that this situation would be allowed to prevail. I would very much appreciate an opportunity to explain my position to you.

Sincerely yours,

H. F. DeLuca
Professor and Chairman

HFD/bjj

United States Senate

SELECT COMMITTEE ON SMALL BUSINESS
WASHINGTON, D.C. 20510

April 20, 1978

H. F. DeLuca,
Professor and Chairman
University of Wisconsin-Madison
Department of Biochemistry
420 Henry Mall
Madison, Wisconsin 53706

APR 2 6 1978

Dear Mr. DeLuca:

Thank you for your very thoughtful letter on Institutional Patent Agreements and the study of Government patent policy undertaken by the Monopoly and Anticompetitive Activities Subcommittee of the Senate Select Committee on Small Business.

As you may know, the Office of Management and Budget has granted my request for a stay in the effective date of a procurement regulation which would authorize and encourage Government-wide use of an Institutional Patent Agreement. The stay of 120 days from March 20 will allow the subcommittee to hold hearings on the history, legal basis and implications of the Institutional Patent Agreement as an implement of Government patent policy.

I am enclosing a copy of my letter to the administrator of OMB's Office of Federal Procurement Policy requesting the stay. I think you will find that the case I made for staying the regulation does not deny that there are reasons for and advantages to current practice in the allocation of rights to Government-sponsored inventions.

Certainly, the University of Wisconsin has benefited from its Institutional Patent Agreement with the Department of Health, Education and Welfare through your discoveries and the patent management services of the Wisconsin Alumni Research Foundation.

One of the questions to be asked at our forthcoming hearings is the very one you raise about the campus inventor's rights in his own discoveries. You ask whether it is fair "that someone or some agency that provides financial support for an individual to carry out his or her work should thereby own the concepts and ideas generated by the inventor," yet that is standard practice in private industry.

Further, the proposed Government-wide Institutional Patent Agreement would allow an institution to retain "the entire right, title, and interest throughout the world" in a research investigator's invention. I believe that is a greater assumption of rights by the institution than is sanctioned by the standard agreement HEW has been using.

I would welcome an opportunity to discuss these matters with you. Committee staff member Gerald Sturges is preparing for the hearings, and I will have him get in touch with you.

Sincerely,

Gaylord Nelson

GAYLORD NELSON
Chairman

GN/gsy
Encl.

MAY 0 8 1978

United States Senate

COMMITTEE ON APPROPRIATIONS
WASHINGTON, D.C. 20510

May 3, 1978

Professor H. F. DeLuca
University of Wisconsin-Madison
Department of Biochemistry
420 Henry Mall
Madison, Wisconsin 53706

Dear Professor DeLuca:

Thank you so much for a very fine letter in which you make a number of excellent points regarding Federal patent policy.

Although I do feel that the taxpayer who foots the bill should be the primary beneficiary of the research and development performed with Federal dollars, I agree with you that there must be proper incentives to get the patents marketed and into the public mainstream.

In any event, you raise some important issues that will receive my careful consideration. I am unaware of any legislative efforts at this time to alter the present patent policy criteria among Federal agencies, but I would welcome any additional information you might have regarding Federal patent policy and specifically, its effect on non-profit organizations and the universities.

It was good of you to share your thoughts with me in this regard.

Sincerely,

William Proxmire

William Proxmire, Chairman
HUD-Independent Agencies
Subcommittee
Senate Appropriations Committee

WP:rmk

Jack Anderson

Small Firms Stinted on Research

Following their ephochal 1903 Kitty Hawk flight, the Wright brothers got a five-year runaround from Washington before receiving any government financial help to pursue their aeronautical research. Small-time inventors and innovative businessmen today are getting the same short shrift, even though billions are being doled out by the federal government for research and development.

Butter-fat corporations lap up the cream from the research subsidies, even though they're interested more in profits and cost-cutting than new inventive breakthroughs. Small companies with fewer than 1,000 employes get skim milk from the federal churn.

Yet the little enterprising businesses rather than the corporate giants have been responsible for such developments in this country as insulin, zippers, power steering, ball point pens and self-winding watches. This was in keeping with the tradition of individual inventive geniuses symbolized by the Wright brothers, Alexander Graham Bell, Samuel Morse and Thomas Edison.

The superiority of small business research has been cited in a study which the Office of Management and Budget strangely never published. The study credited firms having than 1,000 employes with almost half of the industrial innovations between 1953 and 1973.

According to the study, 16 small technology firms created 25,558 jobs for American workers during the 20-year period because they came up with new ideas. Yet the budget office was advised that small firms were drawing inadequate funding from the government, getting less than 4 percent of the research and development layouts.

Spurred by the report, the budget office drafted a memo intended for all federal agencies, urging vigorous efforts to channel more of the research to small businesses "which are having difficulty in competing in the big leagues."

The memo added, "there is considerable evidence that the small proportion of federal research and development work that is being awarded to small technologically based firms is contributing to a serious loss of high technology capabilities in our nation. It is important that we see some real progress within the first 18 months of the administration."

This ringing call for a new deal was never sent to the agencies. Les Fettig, head of the office that was supposed to be directing the crusade, said the report and the memo were news to him until we asked what happened. He explained that the documents "fell through the cracks" during the transition period between the Ford and Carter administrations.

Fettig said his office is alert to the problem and is taking steps to make it easier for small businesses to get research and development help.

Footnote: Investigation shows that the Energy Department under James Schlesinger has been perhaps the worst offender in government in encouraging research at the Little League level. The department claimed it awarded 10.3 percent of its research contracts to small operators in the 1977 fiscal year. The General Accounting Office has challenged the statistic. GAO auditors found the amount was about 2.6 percent, because the Eenergy Department has counted subcontracts that trickle down from the big corporations.

Postal Proposal — An idea that could help reduce the postal deficit and provide the pay increase postal workers are demanding has been run up the flagpole for Postmaster General William F. Bolger. He seems ready to salute it.

Bolger is giving serious attention to the imaginative proposal of Miami public relations wizard Hank Meyer that the hundreds of thousands of mail boxes and postal delivery trucks throughout the United States be used as advertising space.

Meyer stressed in his private presentation to Bolger that he wasn't suggesting the Postal Service provide billboard-style space for promoting junk products. Under his plan, the advertising and public service messages would be subject to approval of the postal authorities.

Vacant space is available on an estimated 180,000 postal vehicles and 400,000 street deposit boxes, which could be rented for advertising.

Bolger still hasn't made a decision but if the Postal Service adopts the idea, an advertising agency would be selected by competitive bidding to run the ad operation.

On the last page of the Business Week article, there is a story about a small company who wouldn't take Government funds because of possible loss of invention rights. The company gave the Japanese 49% of the company for the necessary venture capital rather than lose these rights.

Norm.

VANISHING INNOVATION

A hostile climate for new ideas and products is threatening the technological superiority of the U. S.

A grim mood prevails today among industrial research managers. America's vaunted technological superiority of the 1950s and 1960s is vanishing, they fear, the victim of wrongheaded federal policy, neglect, uncertain business conditions, and shortsighted corporate management. They complain that their labs are no longer as committed to new ideas as they once were and that the pressures on their resources have driven them into a defensive research shell, where true innovation is sacrificed to the certainty of near-term returns. Some researchers are bitter about their own companies' lax attitudes toward innovation, but as a group they tend to blame Washington for most of their troubles. "[Government officials] keep asking us, 'Where are the golden eggs?'" explains Sam W. Tinsley, director of corporate technology at Union Carbide Corp., "while the other part of their apparatus is beating hell out of the goose that lays them."

That message—and its implications for the overall health of the U. S. economy—is starting to get through. Following months of informal but intense lobbying led by such executives as N. Bruce Hannay, vice-president for research and patents at Bell Telephone Laboratories Inc., and Arthur M. Bueche, vice-president for research and development at General Electric Co., the White House has ordered up a massive, 28-agency review of the role government plays in helping or hindering the health of industrial innovation. "Federal policy affecting industrial R&D and innovation must be carefully reconsidered," wrote Stuart E. Eizenstat, the White House's domestic policy adviser, in a recent memo outlining the review's intent.

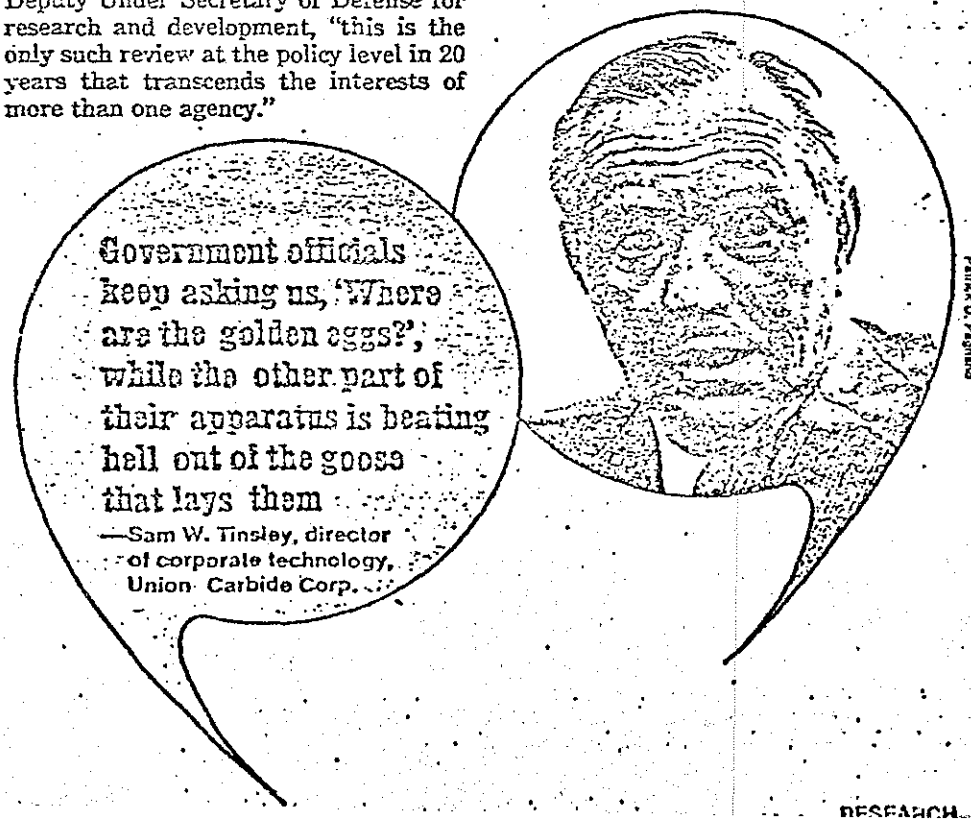
One thing that the study clearly will not accomplish is a quick fix for the deepening innovation crisis. The problem is regarded as immensely complex by the Administration, and is inextricably tied to other economic dilemmas now facing Carter's White House.

"Historically, the government's role has been to buy more science and R&D," says Martin J. Cooper, director of the strategic planning division at the National Science Foundation (NSF). "Now maybe we better go with investment incentives." Says Jordan J. Baruch, Assistant Commerce Secretary for science and technology, who will be the review's day-to-day manager: "This study developed in an environment of people concerned about economics, business, and technology."

The Administration's concern is underscored by the fact that it is organized as a domestic policy review, the highest sort of attention a problem can receive within the executive branch. Among its objectives, such a review must produce options for corrective action by the President. According to Ruth M. Davis, Deputy Under Secretary of Defense for research and development, "this is the only such review at the policy level in 20 years that transcends the interests of more than one agency."

The White House also seems determined not to conduct the study in a governmental vacuum. Baruch is soliciting input from groups such as the Industrial Research Institute (IRI), the Business Roundtable, and the Conference Board. "We want both CEOs and R&D vice-presidents," says a White House official. Labor groups have been asked to participate, too, along with public-interest groups. Congressional leaders such as Senator Adlai E. Stevenson (D-Ill.), chairman of the Senate subcommittee on science, technology, and space, have been brought into the early planning. And the 28 agencies involved extend beyond obvious candidates, such as the Environmental Protection Agency, to the Justice Dept. and even the Small Business Administration.

The study's scope is so sweeping, in



fact, that some federal officials are talking about a "thundering herd" approach to policymaking. But one government science manager demurs. "It beats having one guy write a national energy program in three months," he sniffs.

Philip M. Smith, an assistant to Presidential science adviser Frank Press and an early organizer of the study, concedes that "a lot of people have told us that we are likely to fail." But such skepticism, he believes, does not take into account the considerable clout of those involved in the effort. Commerce Secretary Juanita M. Kreps, for example, is chairing the study, and she heads a coordinating committee whose members include Charles L. Schultze, chairman of the Council of Economic Advisers, Administration inflation fighter and chief trade negotiator Robert S. Strauss, and Zbigniew Brzezinski, Carter's national security adviser. Even more important is the support of Eizenstat, who, says Smith, "is very interested in this particular review."

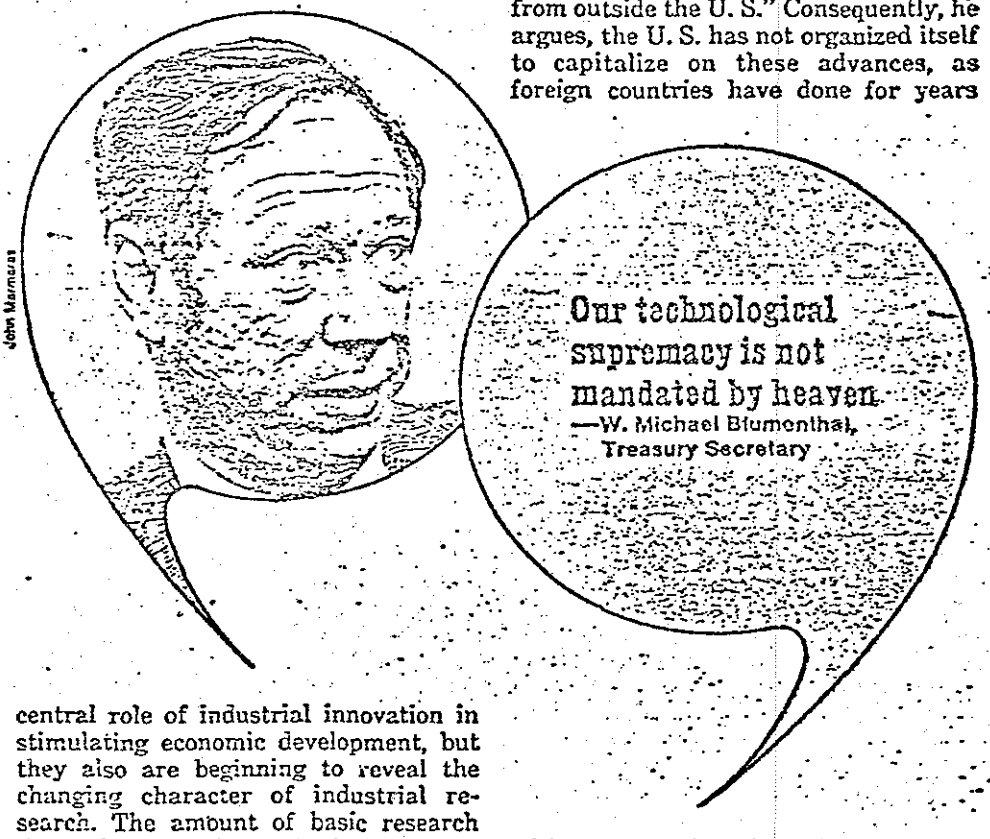
Finding 'new directions'

On the other hand, there is already grumbling within the Agriculture Dept., which was left off Kreps's committee. "We are red-faced," says a high-ranking Agriculture official. "We are out of the project because this Administration and those before it do not place any priority on agricultural research." However, Jordan Baruch insists that the department will play a role in the study. Agriculture experts point out that farm commodity exports of over $24 billion play a key role in the U. S. balance of payments. They note also that superior technology is the basis of the commanding American position among world food exporters.

Whatever its outcome, the White House policy review is being undertaken at a time when, as Frank Press puts it, "we badly need some new directions." Many experts view with alarm the declining federal dollar commitment to R&D, which has dropped from 3% of gross national product in 1963 to just 2.2% this year. For its part, industry as a whole has more or less matched the inflation rate and then some with its own spending. But such macroscale indicators do not tell all. "We've got to find out what the story is sector by sector, because each industry is going to be different," says Press. "We also have to find out what's going on abroad."

Better data on the relationship between industrial innovation and the health of the economy are becoming available. According to a 1977 Commerce Dept. report, for instance, technological innovation was responsible for 45% of the nation's economic growth from 1929 to 1969. The study went on to compare the performance of technology-intensive manufacturers with that of other industries from 1957 to 1973, and found that the high-technology companies created jobs 88% faster than other businesses, while their productivity grew 38% faster.

The numbers help to establish the central role of industrial innovation in stimulating economic development, but they also are beginning to reveal the changing character of industrial research. The amount of basic research that industry performs, for instance, has dropped to just 16% two years ago from 38% of the national total in 1956.



And a new IRI survey of member companies for the National Science Foundation demonstrates how federal policy has directly altered the nature of the research effort in another way, making it more and more defensive. The study shows that surveyed companies increased R&D spending devoted to proposed legislation by a striking 19.3%, compounded annually, from 1974 to 1977. And the rate was 16% a year for R&D devoted to Occupational Safety & Health Administration (OSHA) requirements. "When overall R&D spending is not growing nearly this fast," note the survey's authors, George E. Manners Jr. and Howard K. Nason, "other categories of effort—especially research—must be suffering."

Other observers compare the viability of industrial innovation in the U. S. with that of foreign countries. One expert is J. Herbert Hollomon, director of the Center for Policy Alternatives at Massachusetts Institute of Technology. According to Hollomon, a reason the U. S. is losing its leadership is that "we're arrogant—we have an NIH [not invented here] complex at the very time a majority of technological advances is bound to come from outside the U. S." Consequently, he argues, the U. S. has not organized itself to capitalize on these advances, as foreign countries have done for years with American knowhow. Since as much as two-thirds of all R&D is now conducted by foreign laboratories, Hollomon says, it should be no surprise that they have taken the lead in such technologies as textile machinery and steel production.

"We essentially prohibited West Germany and Japan from defense and space research," says Hollomon. "So it's no accident they concentrated on commercial fields." He adds: "I believe other nations better understand that the innovation process is important."

Says a research director for one high-technology company: "For a country like ours, the technology leader of the world, what has been happening is downright embarrassing." Indeed, even the presumed sources of strength in a consum-

er-oriented society are today under intense pressure. "Our experience with Japan in the consumer electronics industry—namely televisions, radios, audio, and transceiver equipment—shows some of our weaknesses," testified Gary C. Hufbauer, a Deputy Assistant Treasury Secretary, before a congressional subcommittee. In 1977, he said, "we had a $3.6 billion trade deficit with Japan in high-technology goods, and about two-thirds of this was accounted for by imports of consumer electronic goods."

The role of regulation

The cumulative response to these developments has been alarm. "The system has now sharpened its pencils in a way that discourages changes that are major," worries Robert A. Frosch, head of the National Aeronautics & Space Administration. "We have been so busy with other things that we may have inadvertently told the people who think up ideas to go away."

Even labor unions, which historically have left R&D decision-making up to corporate board rooms, now are complaining about lack of innovation. "Having helped to develop and pay for this technology," says Benjamin A. Sharman, international affairs director of the International Association of Machinists, "American workers have a right to demand government responsibility for using it to create new products, more jobs, better working conditions, and general prosperity." And Charles C. Kimble, research director of the Electrical, Radio & Machine Workers union, goes so far as to suggest that labor should now have a say in how industrial research money is spent.

Among research managers themselves, excessive or contradictory federal regulatory policy is the single greatest complaint. Hannay of Bell Labs points to Food & Drug Administration requirements as a case in point. According to one study, says Hannay, a 1938 application for adrenaline in oil was presented to the FDA in 27 pages. In 1958, a treatment for pinworms took 439 pages to describe. "By 1972," he says, "a skeletal muscle relaxant involved 456 volumes, each 2 in. thick—76 ft. in total thickness and weighing one ton."

Regulation, says Tinsley of Union Carbide, has put a bottleneck on new-product development in the chemical industry and has so added to the cost of getting any new chemical approved that only those targeted at a vast, assured market are attempted today. Food and drug industry researchers echo that complaint. "Today," says Al S. Clausi, director of technical research at General Foods Corp., "our industry does work that is fostered by unreal and invalid public concerns."

But regulation can have less obvious impacts, such as forcing an industry to stick with old technology rather than to experiment with new approaches to problems. "The overall effect of regulations on the auto industry has been to build an envelope around the internal-combustion device and the whole car structure," says Harvard Business School Professor William J. Abernathy, who specializes in technology management. "'Don't do anything really new, don't change.' That's what these regulations say." Paul F. Chenea, vice-president for research at General Motors Corp., agrees. "You just don't have time to explore wild new ideas when a new rule is so closely coupled to your current business," he says.

'The science of the matter'

In Congress, where the regulatory laws are written, such thinking has so far found a small audience. "A great number of the regulations that we would call environmental . . . may actually be self-defeating," muses Harrison H. Schmitt, the former astronaut from New Mexico who is the ranking Republican on Stevenson's Senate subcommittee. "Instead of looking at pollution controls, if we were looking at building a more efficient and therefore less-polluting engine, we would not only be solving our environmental problems, but we would be producing a new thing for export."

Schmitt is one of only three federal legislators with the semblance of a science background. "We probably have

How antitrust charges can limit R&D payoffs

Companies that make it across the development minefield and bring superior technology to market still may find a threat on the other side: monopolization charges that keep them from fully exploiting the technology. As old as that problem is, such charges can come as a shock, as they did to Du Pont Co. last April.

Courts established decades ago that the Sherman act prevents a company with a hammerlock on a particular industry from making sound, otherwise perfectly legal business decisions that would, however, perpetuate its dominance. In 1945, for example, Judge Learned Hand found evidence that Aluminum Co. of America unlawfully monopolized its industry by its tendency to "double and redouble capacity" as demand increased. That, said Hand, locked would-be competitors out of the expanding market.

In a similar vein, the Federal Trade Commission said three months ago that Du Pont had used "unfair means" to keep competitors from increasing their share of the expanding market for titanium dioxide, a widely used paint pigment. "The complaint is wholly without basis," says Irving S. Shapiro, the company's chairman.

40% share. Superior technology clearly contributes to Du Pont's dominance. In the 1950s, the company devoted a decade of work—and what a spokesman will peg only at "many millions of dollars"—to develop a new way of making TiO_2. Although the highly automated, continuous process went on stream more than 20 years ago, it still tops the processes used by such competitors as NL Industries, SCM, and American Cyanamid, because it uses cheaper raw materials and produces less acid waste.

The problem with the government arises because Du Pont's 40% share of the $700 million-a-year market is still growing. That alone is enough to send government lawyers poking about for actions that can be attacked. According

Joan Sydlow

Du Pont's Shapiro: The FTC's "complaint is wholly without basis."

to Alfred F. Dougherty Jr., head of the commission's antitrust arm, even a 30% chunk of the market "could be a dominant position if all the other firms in the market had a much lower share." In fact, Justice Dept. antitrust chief John H. Shenefield asked his staff to look at Du Pont's TiO_2 policies only to find the FTC there ahead of him.

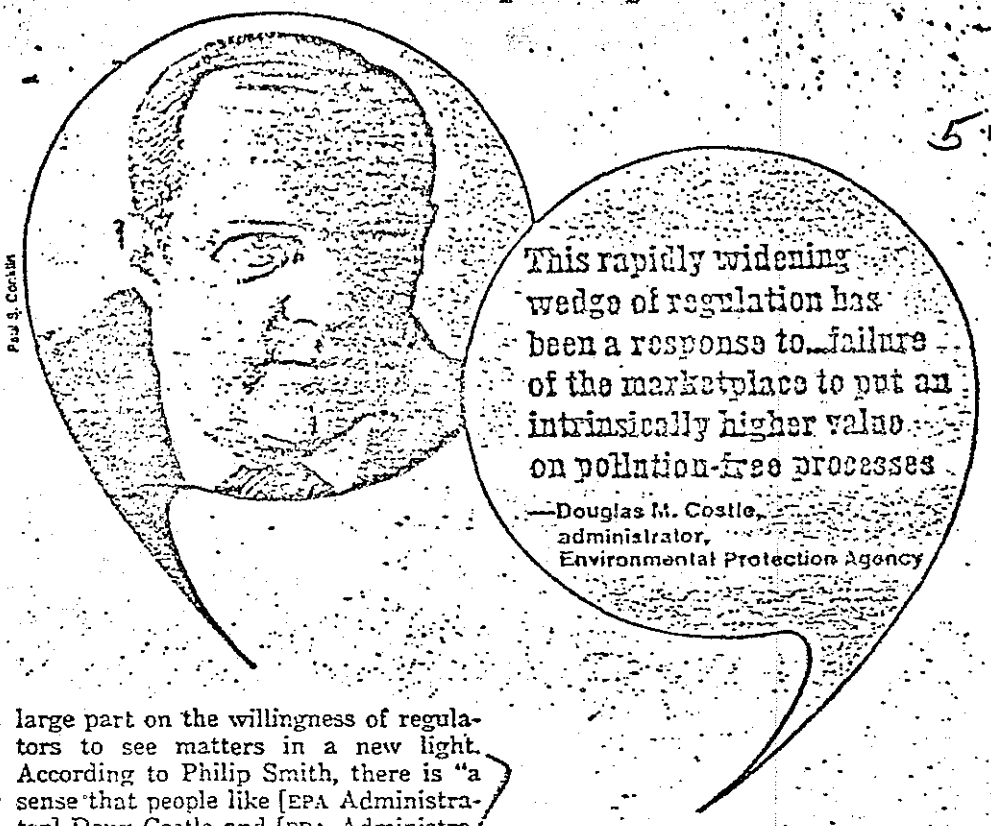
Basically, the FTC says that Du Pont keeps its market share by expanding capacity before the market is ready for more production, thereby forestalling competitors' expansion plans. Du Pont, says the FTC, should get rid of one of two current TiO_2 facilities and a new plant at De Lisle, Miss., that would begin production next year. The FTC staff also wants the company to take competitors under its wing by giving them, royalty-free, the superior technology and knowhow it has built up over the past 25 years.

exercised very poor judgment in the past," he says, "because the Congress overall—members as well as staff—have not been able to understand what is possible technologically and what is not, and therefore not been able to relate the costs [of legislation]."

Jason M. Salsbury, director of the chemical research division at American Cyanamid Co., pleads, "Before the lawyers write the legislation, let them know the science of the matter." Not only may some mandates be beyond what industry can legitimately perform, he says, but the rules force a conservative approach to science. One key indicator of this trend is the increasing number of toxicologists now employed in chemical company research labs. "Toxicologists don't innovate," notes Frank H. Healey, vice-president for research and engineering at Lever Bros. Co.

Then there is the regulatory bias against new ideas. In the EPA's grant programs for waste-water treatment at the municipal level, for instance, equipment specifications must be written so that gear can be procured from more than one source. That means a company with a unique process is discriminated against. What is more, the mandate for cost effectiveness precludes trying out innovative approaches whose value can only be measured if someone is willing to gamble on them.

If the domestic policy review is to solve such questions, it will depend in large part on the willingness of regulators to see matters in a new light. According to Philip Smith, there is "a sense that people like [EPA Administrator] Doug Costle and [FDA Administrator] Don Kennedy want to work with industry, and they don't want to fight all the time. I think we have a team of people now in government that may be able to do something."



The investment climate

But industry should not expect a major overhaul of regulatory practices to emerge from the study. EPA Administrator Douglas M. Costle concedes "a tremendous growth in the last decade in health and safety regulations—13 major statutes in our area alone." Though Costle agrees that the economic impact of such rules should be more closely quantified, he contends that "this rapidly widening wedge of regulation has been a response to a massive market failure—failure of the marketplace to put an intrinsically higher value on pollution-free processes."

Most regulators agree that not enough research has been done on the true nature of the environmental problems they are empowered to combat, but they also argue that regulation has led to cost-saving practices, especially in the area of resource recovery, where closed-cycle processes now help capture reusable material. OSHA officials also cite examples where the agency has laid down rules that have led to cost-cutting innovations. But Eula Bingham, the OSHA administrator, emphasizes that the "legislatively determined directive of protecting all exposed employees against material impairment of health or bodily function" requires tough regulation without quantitative weighing of costs and benefits. "Worker safety and health," she insists, "are to be heavily favored over the economic burdens of compliance."

Bingham and her boss, Labor Secretary Ray Marshall, may represent an increasingly isolated view, however. Economic issues have come to dominate thinking within the Carter Administration, and it is precisely these questions that industry has stressed in its discussions with science adviser Press and other White House officials. Just over a month ago, Treasury Secretary W. Michael Blumenthal told a meeting of financial analysts in Bal Harbour, Fla., "We are now devoting a very sizable chunk of our private investment to meeting government regulatory standards . . . and in some of these areas we may well be reaching a breaking point." Blumenthal also noted: "Our technological supremacy is not mandated by heaven. Unless we pay close attention to it and invest in it, it *will* disappear."

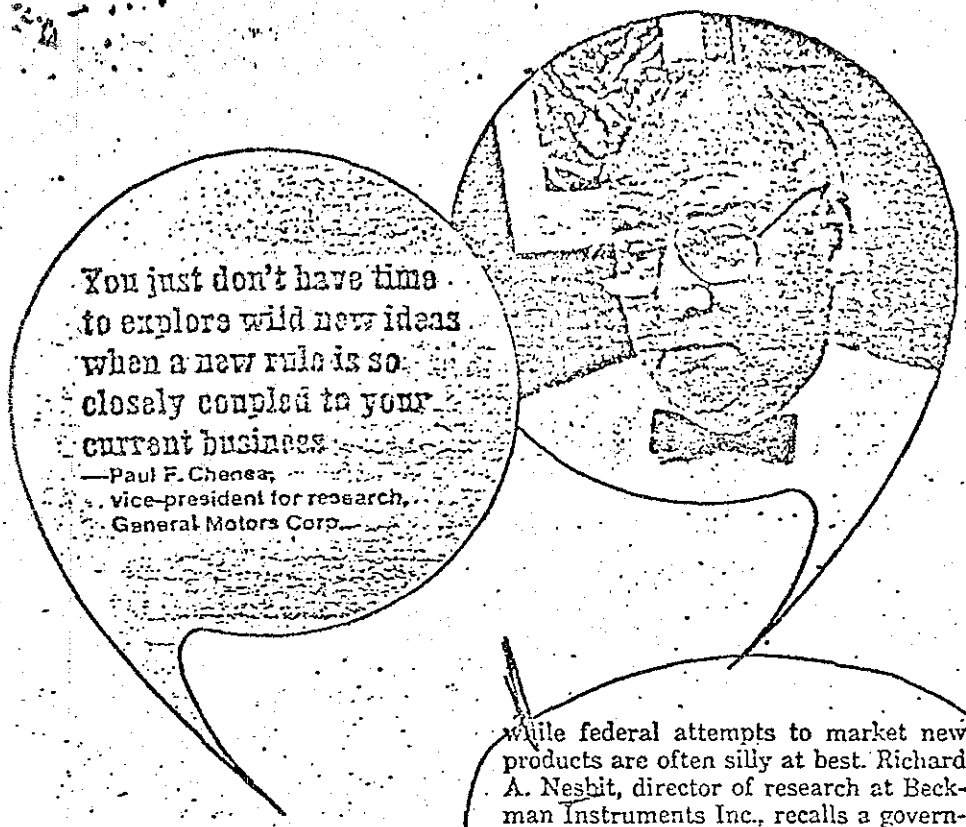
A month before the Blumenthal speech, GE's Bueche suggested to an American Chemical Society gathering that "we step back and look at R&D for what it really is: an investment. It is an investment that, like more conventional investments, has become increasingly less attractive."

Bueche, along with most other research managers, rejects the idea of direct federal subsidies to industrial R&D. Instead, he points out that "perhaps 90% of the total investment required for a successful innovation is downstream from R&D, [and thus] it becomes . . . clear why we must concentrate on the overall investment climate." Bueche attacks Administration proposals to eliminate special tax treatment of long-term capital gains, plumps for more

Whether the need for such onerous penalties can be established—before an FTC judge, the full commission, then a court of appeals and, perhaps, the Supreme Court—may take years to determine. But the approach is not unusual in monopolization cases.

The Xerox case. Just a year ago, the Justice Dept. ended such a suit against Industrial Electronic Engineers Inc. by getting the California company to promise royalty-free licenses to all comers on patents it had used to dominate the market for rear-projection readout equipment for electronic data-processing systems. And three years ago, the FTC settled a complaint by getting Xerox Corp. to open its portfolio of 1,700 copier patents to competitors. Xerox had to license three patents—chosen by the competitors—free. Fees for use of the rest were strictly limited by the FTC.

As severe as those measures may seem, and as discouraging to innovation, the antitrusters contend that it is the only way rivals can eat into a monopolist's dominance of a market. Says Alan R. Palmer, assistant director of the FTC's antitrust arm: "We have to look to what relief will really be effective."



rapid investment write-offs, and says "it is extremely important to provide stronger incentives for technological innovation by making permanent and more liberal the 10% investment tax credit."

Critics in industry

Bueche's arguments suggest the broad—yet often indirect—way in which federal policy runs counter to the best interests of innovation. Fear of antitrust moves from the Federal Trade Commission or the Justice Dept., for instance, has prevented many companies from sharing research aimed at a problem common throughout an industry—including new technology aimed at solving regulatory questions. At General Electric, the legal staff must now be notified if a competitor visits a company research facility, even if no proprietary material is involved.

For their part, Justice Dept. trustbusters claim that fears that their policies stifle innovation are not justified. They say they are flexible enough to recognize the differences in the pace of innovation from industry to industry, and that is why they allow a fair number of mergers among electronics companies. "That's an industry where you don't have to worry about someone cornering the market," says Jon M. Joyce, an economist in the Justice Dept.'s antitrust division. "There's just a lot of guys out there with good ideas."

Industry further claims that the inability to secure exclusive licenses on government-sponsored research leaves much good technology on the shelves, while federal attempts to market new products are often silly at best. Richard A. Neshit, director of research at Beckman Instruments Inc., recalls a government circular that waxed rhapsodic over the federal commitment of billions of dollars to R&D. Included with the letter was a syringe for sampling fecal matter, and the suggestion that Beckman might want to license the technology. "I wondered if they spent billions to develop that," Nesbit recalls. "The contrast was ludicrous."

Even national accounting procedures draw criticism from industry. A major target is the 1974 ruling by the Financial Accounting Standards Board that stipulated that R&D spending could no longer be treated as a balance sheet item, but must be listed as a direct profit or loss item in the year spent. R. E. McDonald, president and chief operating officer at Sperry Rand Corp., recently told an executive management symposium, "The ramifications of that rule change are quite complex, but the net effect has been to dry up a lot of potential venture capital investments. . . . I can say quite candidly that Univac would not be here today if we had not had the advantage of the old rule for so many years."

The shortage of risk capital has had a tremendous impact on small, technology-oriented companies trying to arrange new public financing. According to a Commerce Dept. survey, 698 such companies found $1.367 billion in public financing in 1969. In 1975, only four such companies were able to raise money publicly, and their numbers rose to just 30 in 1977. Equally ominous is the experience at Union Carbide, which, according to Tinsley, has not been able to compete for venture capital and has thus canceled plans to start a number of small operations built around interesting new technology. Years ago, says Tinsley, Carbide was reasonably successful at getting such funding. "And you must remember that these ideas are perishable," he says. "They don't have much shelf life."

The Treasury Dept., in fact, has an ongoing capital-formation task force that will be integrated into the policy review under the direction of Deputy Secretary Robert Carswell. Carswell notes that "you can't draw a clear line" between R&D support and investment in general, but "if it turns out that we find some form of capital formation gives the economy a greater multiplier effect than another form, we at the Treasury would not shy away from whatever policy would help most."

Washington's changing role

Even as it has pursued policies detrimental to industrial R&D, the federal government has withdrawn as a major initiator of innovation. Research managers generally believe that companies are better equipped than government to bring new technology to society because they are more attuned to market pull. But Lawrence G. Franko of Georgetown University, an international trade expert, recently pointed out to a congressional committee that the U. S. government has in the past played an important role "as a source of demand for new products and processes, and as a constant, forbearing customer in computers, semiconductors, jet aircraft, nuclear-power generation, telecommunications, and even some pharmaceuticals and chemicals. . . ."

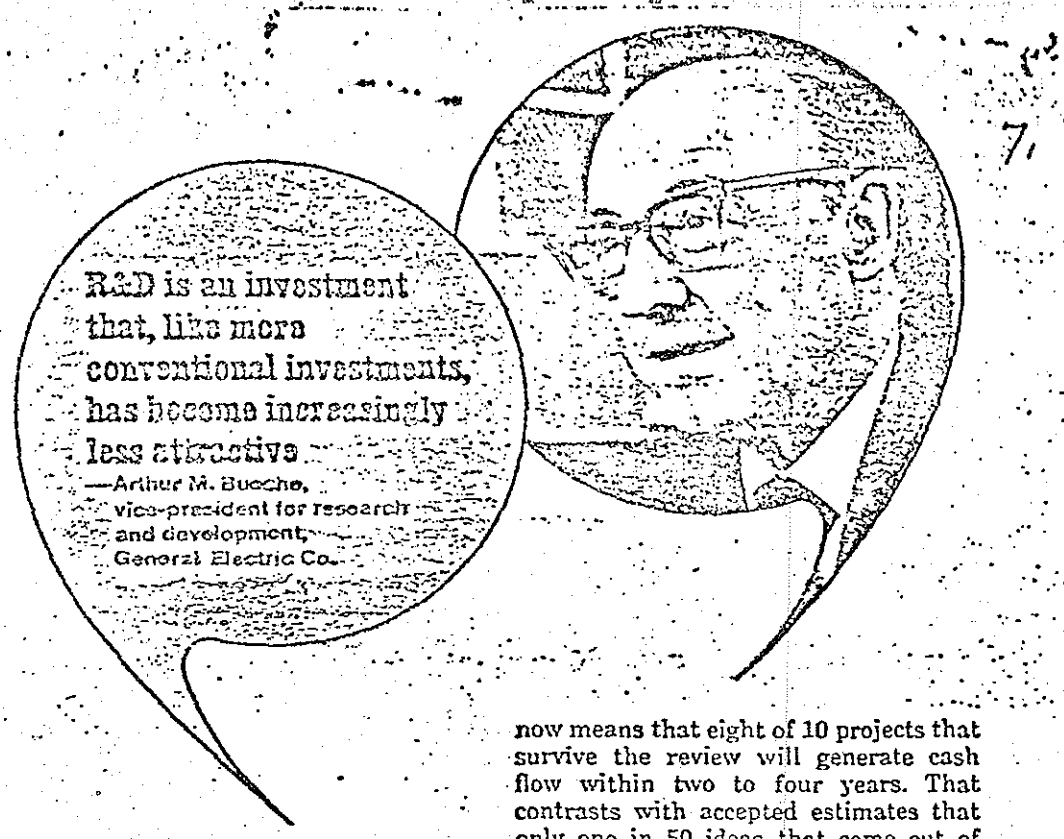
According to the Defense Dept.'s Davis, both Defense and NASA "have faded" in this role, the result of the Vietnam war and concerns over the military-industrial complex. "The consumer marketplace and other government agencies have not been able to pick up where DOD and NASA left off," she says. "The Department of Energy should be able to help with this, but it hasn't yet. And the Department of Transportation just never blossomed in this role." An unreleased IPL study for the Energy Dept. summed up industry's views. The company officers interviewed said government could spur industry's energy R&D only by creating a national energy policy, increasing its managerial competence, and offering financial incentives rather than massive contracts.

On the other hand, there have been some recent, notable government efforts to spur the innovation process. "We've talked to the leading semiconductor companies about our hopes for their innovation," says Davis. She says that the Defense Dept. expects to program $100 million over the next five years for industrial innovation in optical lithography, fabrication techniques involving

electron-beam technology, better chip designing and testing to meet military specifications, and system architecture and software implementation.

At the Transportation Dept., chief scientist John J. Fearnsides wants to involve the private sector much earlier in the government's R&D process, thereby allowing industrial contractors to develop technology alternatives instead of having to cope with rigid specifications at the outset. Such a policy, some believe, might have resulted in major savings for the Bay Area Rapid Transit system, for instance. "It is more expensive to fund a wider range of choices, but only at first," says Fearnsides.

The NSF also has announced a new industry-university grant program for cooperative exploration of "fundamental scientific questions." The aim is to make "a long-term contribution toward product and/or process innovation."



The failures of business

While agreeing on the need for federal policies that bolster innovation, those knowledgeable about industrial research think that the companies themselves share some of the blame for stagnation and must be willing to examine their practices critically. Alfred Rappaport, a professor of accounting and information systems at Northwestern University's graduate school of management, believes that one reason the U. S. lags in R&D is that the incentive compensation systems that corporate executives live under tend to deter intelligent risk-taking. "Incentive programs are almost invariably accounting-numbers oriented and based on short-term earnings results," he says. "That puts management emphasis on short-term business considerations." Another criticism has been of the haphazard way in which companies have launched new R&D programs. In essence, industry should try to learn how to weed out bad ideas early on, say the detractors. To that end, Dexter Corp. has instituted an eight-factor "innovation index" approach to research management that weighs questions such as effectiveness of communications, competitive factors, and timing, and comes up with an "innovation potential" for new ideas. At Continental Group Inc., D. Bruce Merrifield, vice-president of technology, says that "constraint analysis" of new ideas now means that eight of 10 projects that survive the review will generate cash flow within two to four years. That contrasts with accepted estimates that only one in 50 ideas that come out of research labs ever generates cash flow, and not for seven to 10 years.

Large companies often fail to exploit their own resources effectively. In the 1950s and 1960s, some companies set up centralized research facilities, but many of these did not yield the hoped-for synergism—in many cases, apparently, because the different parts of the company were in businesses too unrelated to one another.

On the other hand, Raytheon Co. was highly successful in transferring its microwave expertise to its newly acquired Amana appliance subsidiary in 1967, resulting in the counter-top microwave oven. That was done through a new-products business group set up specifically for such purposes. And more recently, this group, headed by Vice-President Palmer Derby, brought the company's microwave talent to bear on its Caloric subsidiary's product line, resulting in a new, combination microwave-electric range.

In such ways, industry can maximize its potential for innovation in the most adverse environment. But the future health of the nation's economy, many experts believe, requires a much more benign environment for industrial R&D than has existed over the past decade. And Jordan Baruch, the enthusiastic leader of the multi-agency federal study, believes that such an environment is likely to emerge as a result of the Administration's concern.

"We may have bitten off more than we can chew," notes Frank Press, "and it may be that we can't get much done in a year. But even if it takes three or five or 10 years, I think it is historically very important." ■

Turning to Japan for venture capital

The recent drag in U. S. venture-capital commitments has opened opportunities for foreign companies to appropriate American ideas. A case in point is the experience of System Industries Inc., a Sunnyvale (Calif.) manufacturer of minicomputer peripherals.

In 1969, System Industries went to work on a new ink-jet printing process, forming a subsidiary, Silonics Inc., to develop and market it. By 1973, the research phase was over, and a cash-short System Industries went looking for venture capital to tool up for production. Unfortunately, none was there. With a depressed stock market, and recent increases in the maximum tax on capital gains that cut the expected return on such investments in half, the usual capital sources "couldn't justify taking the same risks they used to," says Edwin V. W. Zschau, the company's chairman and chief executive officer.

Keeping only 51%. Next, he explains, "we were thinking about government funding. But we were discouraged from even making a proposal when we learned the government would get data rights and be able to license it to other people. We didn't see why we should give away those rights just to get a little money." What Zschau finally did give up was 49% of Silonics to Konishiroku Photo Industry Co., the Tokyo-based maker of Konica cameras.

In return, the Japanese company has spent $5.5 million on Silonics, which is enough to bring the new printer to market at the National Computer Conference in Anaheim, Calif., in mid-June. "We have one of the most promising imaging technologies for the 1980s," Zschau now complains. "But we only own 51% of it."

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Michael Novak

A day for Enterprise

The last thing this country needs is another holiday. Nevertheless, I would like to propose one: Enterprise Day, to be celebrated on the Monday after the first day of spring. Enterprise Day would be a counterpart to Labor Day. Its purpose would be to honor our most endangered, heavily burdened and most fragile resource: the spirit of enterprise.

The system under which Americans live is not very old. Although it may not survive much longer, in its brief passage through the gloom of history it has cast a lovely light. Most of the progress of science, and the vast part of the world's betterment in the conditions of all people, have occurred during the short tenure of this system. A relatively few of the world's citizens discovered a method for unleashing tremendous energies of initiative and imagination. Such energy has always been available. But no society before had learned how to release it.

The word "enterprise" captured the spirit of adventure that characterized pilgrims and pioneers, founding fathers and builders of industry, sponsors of invention, artists and creative thinkers of every sort. The method was simple: Permit individuals to take risks with their own lives, careers and resources. Stand out of their way and let them go directly to the public. Permit them to reap rewards for offering the public the goods and services the public decided, by its own choices, to accept or to reject.

Such an idea was at first deemed both implausible and faintly immoral. Could individuals be trusted? Did not some officer of Reason need to guide their choices? Were not citizens so corrupt that they would choose badly, squander their resources, and be attracted to lowest common denominators? "The public is a beast," some said. "Only philosopher kings can bring about Utopia," others said.

Nonetheless, enterprise took root in a few small parcels of the world's territories. The power and beauty that broke from them were so astonishing that many other nations wished to imitate their achievements. Some did not wish to trust enterprise. Some tried to reach the same goals through servitude. And Planning. Planned servitude.

Enterprise is a resource more precious to the world than oil. For oil, there are substitutes. For enterprise, there is no equivalent form either of energy or of intelligence. The most complex computer is not as sensitive as the free choices of enterprising individuals. Such individuals are an unending source of invention. They are, alas, easily suppressed. Most societies repress them.

We have reached a decisive turn in Western societies. For several decades, statist politicians could claim to provide more goods and services than enterprise alone. There was truth in this claim. But now the cost of government is high, and the productivity of enterprise is falling. Now it is clear that statism clearly means less of everything. Taxes and inflation, by statist action, climb together. Individuals must settle for lower standards of living.

For the first time in a long time, those who oppose the statists — those who nourish enterprise — are in a position to offer ordinary citizens "more." As enterprise goes up, standards of living go up. As statism rises, so do taxes and inflation, bringing standards of living down.

There is now a huge vested interest in statism. One out of every five voters works for the government. It is time to celebrate the idea of enterprise while it still lives. Labor Day has its importance. It is enterprise that invents the projects on which to labor. Enterprise imagines, labor fulfills. Labor Day needs Enterprise Day as autumn requires spring.

And what would truly make the day distinctive is that it should not be celebrated by taking off from work. There is a far better way: It should be celebrated as a day without taxes. On one day a year, sales taxes should not apply. And all earned income from that day's labors should be exempted from income taxes.

This idea, of course, is playful. But a society lives, more than pragmatists think, by celebrations. If we do not celebrate our distinctive social secrets, we may not immediately lose them, but we are certain to undervalue them.

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SUNDAY, SEPTEMBER 3, 1978 C1

Something's Happened to Yankee Ingenuity

By Bradley Graham
Washington Post Staff Writer

It's been 89 years since Angus Campbell put the first automatic cotton picker to work, 70 years since Henry Ford gassed up his first Model T, 39 years since Du Pont introduced a super fiber called nylon and 30 years since Edwin H. Land marketed the first instant-picture camera.

All of which helps recall a time America's inventive spirit seemed unbounded and unceasing. Ideas flowed to the marketplace as fast and furious as mountain rapids flow downhill.

But what was once thought to be an endless stream of U.S. inventions has of late been trickling out less startling and less competitive products. Meantime, adding pain to the drain, the inventive powers of foreign nations have been in ascendance. The question, once raised in a whisper, is now asked in loud and urgent tones: Has American enterprise lost its innovative touch?

Consider these facts:

- The number of U.S. patents issued per year to U.S. inventors reached a peak in 1971 and has declined steadily since. But the number granted to foreign inventors has increased steadily since 1963. In 1977, foreigners claimed 35 percent of all patents issued in the U.S. across a broad range of fields.
- The U.S. balance of trade has worsened, due not only to increased oil imports, but also to more imports of foreign manufactured goods.
- Productivity, which is partly a function of technological innovation, has slumped severely. In the past decade, the rate of growth in U.S. productivity has averaged only half of what it was the previous 20 years. In contrast, productivity growth rates in Europe and Japan have been on the rise.
- From 1953 to 1966, U.S. investment in research grew at an impressive rate of 10 percent annually in inflation-adjusted dollars. However, investment in research by all sectors in the U.S. over the past 10 years has shown essentially no growth in constant dollars. Further, a number of major U.S. corporations have announced recently they intend to spend even less on long-term basic research and more on development of short-term, quick-profit products.

In a world where power and progress are often measured in terms of technological breakthroughs and scientific prowess, such trends are indeed disturbing.

For a nation that has always prided itself on its tinkerers—on those lone souls who brought forth from their garages and basement labs such revolutionary devices as power steering, the office copier and the zipper—they are downright depressing.

From boardroom to research lab, there is a deepening sense that something has happened to the once unchallengeable Yankee ingenuity. Just what, though, no one quite knows.

There is today a pervasive perception that the dynamic vitality of the U.S. economy is faltering. This perception appears to be founded on two concerns: first, that America is not as productive as it used to be; and second, that we are somehow not as inventive either. This is the first of two articles this month which will examine these concerns.

Some insist it is in rapid decline, choked by an unfavorable economic climate, government regulation and, perhaps, by the lethargy and shortsightedness of big business. Others say it has simply taken new forms, becoming more subtle and incremental in nature than grand and revolutionary. Either way, the country's genius for invention does not appear, at least, to be what it once was.

Alarm bells are going off all over. First, Michael Boretsky, a senior policy analyst in the Commerce Department: "All the indicators imply that the rate of U.S. innovation is measurably down. It's very disconcerting."

Next, Dr. Alden Bean, director of research for the National Science Foundation: "There's no solid evidence to suggest that the U.S. is going to hell in a handbasket in science and technology. But there is serious cause for concern about some trends we've seen."

After several years of arm-waiving and shouting about waning U.S. innovation, the nation's research establishment finally caught the ear of the White House. Several months ago, the Carter administration launched a major policy review of things to be done to foster innovation in private industry. The study is being coordinated by the Commerce Department and involves more than 15 agencies. A final report, including recommendations for the president, is expected by April.

But many experts say another study is hardly necessary. The worrisome state of innovation in America has been assessed and reported on many times since the first major policy review conducted by Commerce in 1967. In the interim, the problems only have become more obvious.

For one, the economic climate for innovation is poor. The financial incentives that in the past encouraged the rich and the bold to risk their money on slim-chance projects no longer exist, thanks to increases in the capital gains tax and tighter rules on stock options. Inflation, too, has put the squeeze on capital investment by existing corporations.

Also, with the winding down of space and defense programs, government support of industrially performed research has diminished. Throughout the 1950s, the government annually supported more than one-third of industrial research activity. This level of support reached almost 40 percent in 1962, but has been falling consistently and is 25 percent today.

Increased government regulation, too, has increased operating costs and shrunk the share of profits formerly available for research. So has the higher cost of energy.

Together, these developments have forced a shift in industrial research activities from the offensive to the defensive. "Major effort is being diverted into defensive research," said Howard Nason, president of the Industrial Research Institute in St. Louis. "Much more emphasis is being placed on short-term cost reductions than on long-term product and process improvements."

But as important as such external economic factors may be in explaining the innovation slump, there are certain features about the internal structure of corporate America today which some say have had a debilitating effect on innovation.

Writing in the July-August issue of the Harvard Business Review, Alfred Rappaport, professor of business at

See INNOVATE, C2, Col. 1

Something's Happened to Yankee Ingenuity

INNOVATE, From G1

Northwestern University, blames the research lag on the increasing emphasis American business places on short-term results. Rappoport asserts that management incentive programs are biased toward quick profits at the expense of perhaps smarter long-term investment.

"American business would do well to re-examine its own self-administered incentive systems," Rappoport concludes.

Industrial research today is dominated by a small number of very large corporations. The top 10 percent of those firms doing R&D in 1976 performed almost 75 percent of the total U.S. R&D effort. Ten firms accounted for more than 30 percent of all expenditures that year. This concentration may itself work against innovation.

"A large part of the blame for the lack of innovation lies with the oligopoly nature of American industry," said Mark Green, director of Ralph Nader's Congress Watch. "Big companies get hot situated to their products and there is a reluctance to break through. If you already dominate an industry, where is the incentive to take a chance on a new and costly approach?"

But the history of innovation in America is ambiguous on this point. Studies done on whether big business or little business is more inventive have gone to no conclusive end as a whole.

Certainly, many major innovations have come from outside an established industry. The ballpoint pen, for instance, was invented by a sculptor, the dial telephone by an undertaker. It took an electrical engineer employed by a shipbuilding firm in the 1930s to develop the automatic transmission, called by some the last major innovation of the auto industry. IBM's disk memory unit, the heart of today's computer, was not the logical outcome of a decision made by IBM management—rather, it was developed in one of its labs as a hobby project, over the stern warning from management that the project had to be dropped because of budget difficulties.

At the same time, certain large firms in the fields of electronics, pharmaceuticals, telecommunications and computers have been highly innovative.

In their seminal study in 1953 on the sources of invention, Harvard professor John Jewkes and his colleagues said they could not conclude that inventions flow primarily from any one source. When the study was revised in 1969, the authors stated only the obvious: that inventions can come from firms of varying size.

Business leaders, of course, refute the charge that they are less innovative today than in the past. "There's no lack on the part of big business to be innovative," said General Motors Corp. Chairman Thomas Murphy in a phone interview. "It's a big country, so we have to be big. We couldn't do all of the things we do if we weren't as large as we are."

To the public, a car may still look like a car. But auto officials say the changes which have taken place inside during the past five years have been as revolutionary as anything which has come before.

"There's a perception problem," said Thomas J. Feaheny, the man in charge of car engineering for Ford Motor Co., where "better bleat" were once not only a management dictum but a successful ad slogan. "We've never been as innovative as we are now. But the things we're doing aren't as glamorous and aren't noticed much by the consumer."

Critics note, however, that what the auto industry heralds as advances in development (the catalytic converter, on-board use of minicomputers to govern fuel efficiency and control pollution, greater use of aluminum and other lightweight durable materials) are, in fact, only more logical applications of off-the-shelf technologies rather than breakthroughs in the state of the art.

Of even greater concern, though, than what has or hasn't happened is the prospect for the future. Many major corporations have tailored research budgets to yield more practicable and immediate results. In 1968, industry allocated as much as 38 percent of its R&D dollar to the "R" part. By last year, this had dropped to 25 percent.

Corporations say the reasons for this shift from research into development have nothing to do with being too big or too comfortable. The reasons, basically, are greater pressures from government regulators to meet health, safety and environmental standards as soon as possible, and greater uncertainty about the likely profitability of longer-term, riskier ventures.

"It used to be much easier to bring new products to market," said Du Pont Chairman Irving Shapiro in an interview. "If you hit something, you'd have more time to develop it. Now it's more difficult.

"Also, the pot of gold at the end of the rainbow just isn't there. The economic environment has changed. Our thinking has had to change, too. It's become more short range."

Added Richard Heckert, Du Pont's senior vice president for R&D: "We're not exploring wholly new areas. We're concentrating instead on opportunities for research in established areas . . . . We are less able to take risks. We have to concentrate on surer projects."

The degree of such thinking does vary from company to company and industry to industry. Certain high-technology fields (instrumentation, computers and electronics) remain rooted in innovation and continue to churn out impressive new products. In other industries, though—particularly those most apt to be subject to regulation and high energy costs (steel, chemicals, paper, packaged goods and autos)—product innovation has leveled.

Part of the difficulty in deciding what to do about the innovation lag is figuring out how to define it. To begin with, innovation defies measurement.

"There are no indicators which you can look at to measure the advancement of knowledge," said NSF's Dr. Bean. "Some people count patents, but that's unreliable in part because some firms don't like to patent things and would rather rely on trade secrets rather than disclose important discoveries. Others count citations in the research literature, but that's unreliable, too."

But even without sure data, many have not hesitated to push the panic button. "You can't use statistics to say there's a problem," said Jordan J. Baruch, the assistant Secretary of Commerce who is directing the government's innovation policy review. "But you'd have to be blind not to see it."

Urgency about the problem is all the greater because America seems uniquely stricken. Western Europe and Japan grow more inventive, or so it appears, while U.S. firms age. Examples abound of foreign firms taking the lead in both new and traditional product areas. The Japanese, for instance, totally eclipsed the American communications industry in the development of video tape recorders. The Germans and Swiss now set the pace in textiles. Inventiveness in the steel industry has centered in Belgium and Austria. Some U.S. cities are even going abroad to scout for new ways to handle old problems. (The Council for International Urban Liaison here publishes a monthly newsletter called Urban Innovations Abroad that goes to 5,000 city officials in the U.S.)

Moreover, U.S. productivity rates have been in a rut for a decade—and that has serious consequences for everyone's real income and for the nation's overall standard of living. Of course, technological change by itself does not make or break productivity. There are other contributing factors, most important among them being capital investment and improved labor skills. But technology is an important ingredient in the mix.

With industry's current bent toward the here and now, there is concern that the U.S. may be cutting its innovative bridges. Some economists, notably Charles P. Kindleburger at MIT, have drawn disturbing parallels between the way U.S. firms are responding to America's battered competitive leads and the responses of British firms in the twilight of the English empire. British firms, just as American firms now, became defensive—that is, rather than redoubling efforts to generate innovations, they curtailed investment and demanded government protection against imports.

Does the current emphasis on small, incremental kinds of advances rather than on big breakthroughs threaten the dominant position the U.S. still holds?

No one is sure. Despite all the studies of innovation and productivity, no one can say whether there is an optimum rate of invention a society should adhere to, or how much innovation is enough.

There does seem to be general agreement, though, on this: The rapid technological growth which the U.S. experienced during the first two decades after World War II was unusual and is not likely to be repeated.

"We made an enormous investment in the war, made some great technological advances during it, and came out of it with a great belief in the power of technological progress," said J. Herbert Hollomon, director for the Center of Policy Alternatives at MIT. "We also were handed an accidental lead, in having survived the war better than anyone else. But one of the things that is increasingly going to be the case is that new technological innovations are going to happen outside the U.S."

Hollomon said that American business has in the past displayed an NIH (not-invented-here) complex, meaning that U.S. managers have been arrogant toward anything not thought up first in America and slow to embrace it. This is one of the things that he said will have to change if American firms hope to continue to compete in world markets. American businesses must learn to be quick to adapt, to exploit foreign inventions as well as their own, he warned.

"The problem is not with basic science," Hollomon said. "The problem really is how effective we can be in adjusting and adapting."

Some have argued that U.S. multinationals may themselves have hastened this competitive bind on America by transferring their best technologies to foreign markets in recent years. Those who say this also urge legislation that would restrict further transfers of technology.

But most who have studied the innovation problem say the solution lies in fostering innovation at home—through a more liberal tax policy, a relaxed regulatory policy, less aggressive antitrust practices and, in general, a more cooperative spirit between business and government such as exists in Japan and the leading Western European countries.

And above all, they argue for greater certainty in government policy. "I think that more than an increase in government support of R&D or a reduction in regulation, what private industry people are interested in is a reduction in uncertainty about government action," said Dr. Bean. "Look, there's enough economic uncertainty in the R&D process without the government."

Backing Off Basics

Many Concerns Stress Product Development And Reduce Research

Vexed by Sharp Competition And Federal Regulation, Firms Seek Fast Payoffs

Will U.S. Exports Be Hurt?

By Mitchell C. Lynch
Staff Reporter of The Wall Street Journal

BOSTON — The "R" is slipping from R&D, and many scientists, economists and foreign-trade specialists figure that spells trouble.

They discern an ominous change in the nation's scientific posture: Industry is curbing slow-payoff, basic research aimed at finding new products and instead is favoring hard-nosed, quick-payoff development of existing technology.

If this trend continues, some experts fret, the U.S. eventually could lose its standing as both the world's most innovative country and the biggest exporter of high-technology goods. Others worry that scientists aren't getting the elbowroom to, say, come up with synthetic fuels to replace petroleum. The problem has spread even to universities, long considered the birthplace of basic research.

"I don't hear many of my industrial contemporaries talking about exciting new major discoveries that they think will shake the world," sighs N. B. Hannay, head of research at Bell Laboratories, an arm of American Telephone & Telegraph Co. Thomas A. Vanderslice, who oversees research at General Electric Co., also is concerned. "There are trends that, unless corrected, could lead to a rapidly maturing crisis," he says.

Real Outlays Stagnant

The switch in R&D emphasis has taken place at a time when the total of such spending in the U.S. has turned essentially stagnant. American companies are spending more money on R&D, of course; one private study found that industry expenditures on R&D last year rose more than 11% from 1975 to $16.2 billion. However, the higher outlays have barely kept pace with inflation. "Strip away the higher costs, and you don't have much of an increase in the real amount of R&D being done today," says Michael Boretsky, senior policy analyst at the Commerce Department. And Otto Eckstein, who heads an economic research firm near Boston, says spending is lagging behind the pace that would be expected during a rebound from the 1974-75 recession.

Perhaps even more ominously, R&D spending in the U.S. is beginning to slacken in comparison with the rest of the world. [illegible] study estimates that the Raytheon Co. is blunt about it. "Very definitely we have gotten away from long-term general research," a spokesman for the big, diversified company says. "All the research we now are doing is applied research with well-defined goals, better focus on business objectives, and a promise of payback within a reasonable period of time."

Reasons for Switch

Executives and economists alike attribute the new, quick-payoff approach to R&D to the still-high rate of inflation, the shortage of capital funds during the current slump in the stock market, sharp competition here and abroad for existing high-technology markets, and uncertainty about government regulations and policies.

"During periods of uncertainty, companies aren't in any mood for high risks," says Alan Greenspan, a former chairman of the President's Council of Economic Advisers. "Uncertainty is plaguing the investment community, and it is far more pervasive than it was a decade ago." Under these circumstances, for example, "it is no wonder this country hasn't done much research into synthetic fuels," Mr. Greenspan says. "The payoff is too far down the road."

Richard E. Heckert, senior vice president who oversees R&D at Du Pont Co., specifically cites the impact that federal policies are having on coal-gasification proposals. "Who the hell is going to develop expensive coal processing when natural gas is selling at half its real market price?" he asks. With gas prices held down by federal regulations, Mr. Heckert says, industry is concerned about "whether it could even get a buyer for any higher-priced synthetic fuels." And George Gols, chief economist at Arthur D. Little Inc., a research and consulting firm, suggests that there is a deeper problem, "that industry, in the long run, doesn't really believe that fuel is going to be much more expensive or scarce."

Du Pont itself, whose $353 million R&D budget last year puts it among the biggest in industry, has realigned its program drastically. In recent years, the big chemical company has dropped about 22 of what it considers "new adventures" in R&D and is working on only two or three. Indeed, only 22% of Du Pont's R&D budget went to basic and new-venture research last year, compared with 38% in 1972. In the same four years, spending for what Du Pont calls "improvements for existing businesses" climbed to 78% from 62%.

This new policy means "much lower risks and much higher rewards," Mr. Heckert says. In a way, he adds, the company has given up "looking for another nylon or Dacron," two synthetic fibers that were developed by Du Pont researchers and marked major breakthroughs. Du Pont isn't searching for more extensions of plastics and synthetics because "there aren't any simple combinations left," Mr. Heckert says. "There are only so many ways you can mix around the basic molecules."

In the long run, companies like Du Pont might prefer to license technology developed by other companies, Mr. Heckert indicates.

Indeed, many companies clearly are irked because foreign manufacturers have proven adept at picking up U.S. technology through licensing agreements, improving it and then exporting high-technology products

Prof. Davidson adds that he wouldn't be surprised to see foreign manufacturers make big inroads in the U.S. markets for office copiers, electric typewriters, outboard motors and electric organs. (Using a Hammond Organ Co. license, Yamaha of Japan already has begun exporting a competitive electric organ, the professor says.)

Zenith's Layoffs

U.S. companies often lose their technological lead because, Prof. Davidson says, they are so preoccupied with keeping their share of the current-technology product market. Other observers say much research work merely involves a hunt for ways to make current products more cheaply or an attempt to accumulate so many patents in a given field as to hamper potential competitors.

A few days after Prof. Davidson was interviewed, Zenith Radio Corp.—almost as though on cue—announced that it is laying off 25% of its work force, including a large number of researchers. The reason: competition from Japanese TV-set makers. The Research Department is being brought into the Product Development Department, a Zenith spokesman said. Research projects that "aren't directly related to the immediate product line (color-television sets) are being eliminated," the spokesman added. "We're dropping some research projects where the payoff was 20 years from now. They weren't making a contribution to our needs now."

Many corporate executives, economists and academics also complain that government regulation and red tape are strangling basic research in the U.S. Foreign governments, in contrast, nurture industrial research, U.S. businessmen say.

These governments have less-stringent antitrust laws and, in fact, often urge domestic companies to share technology and production operations. For example, under pressure from Paris, the Peugeot S.A. auto maker last year acquired control of Citroen S.A., another French auto maker, which was in deep financial trouble. Peugeot's job was to bring Citroen under its wing and create one streamlined auto-making operation. The U.S. Justice Department's Antitrust Division, on the other hand, prohibits American auto makers from even exchanging information or knowhow, much less combining production operations.

Drug Regulations

Foreign governments also impose fewer regulations that slow the introduction of new products. This difference is most apparent in the pharmaceuticals field.

Du Pont's Mr. Heckert says that in this country the average corporate cost of bringing a new drug from the laboratory to the pharmacy is $10 million. "Think about introducing 50 of them," he says sardonically. To get Food and Drug Administration clearance for a muscle relaxant called Dantrium in 1972, the Norwick-Eaton Pharmaceuticals division of Morton-Norwich Products Inc. submitted to the agency 456 volumes of technical material, with each volume two inches thick—literally a ton of documents.

An FDA spokesman says the average new-drug application today takes up about 70 volumes of technical material. And the processing of such applications can take years. One reason is a bureaucratic problem: An FDA employe risks little by delaying an application, but he can get into trouble by clearing a drug that later is im-

Walter E. Goldblith, provost of the Massachusetts Institute of Technology, puts part of the blame on what he calls "a nightmare" federal funding system. Compared with the looser block grants of bygone years, money now is doled out only for tightly controlled projects, Mr. Goldblith says. By insisting on multifarious reports and other forms of accountability on basic-research projects, Washington has "fragmented the study of nature until it has become meaningless," he complains. "Scientists? Our people have had to become more like accountants," Mr. Goldblith snorts.

It is difficult to determine the extent to which this basic-research lag is hurting the nation's trade figures. However, technology clearly is important to U.S exports. The Commerce Department says that while the U.S. was incurring a $5.88 billion deficit in merchandise trade last year, its exports of technology-intensive manufactured goods were outrunning such imports by $26 billion.

"What alarms me is the trend we're seeing now and what effect it may have on our trade picture later," says Edward M. Graham, a professor at MIT's Sloan School of Business. "Right now it's a problem not quite a crisis."

"Unfair" Comparisons

But not everyone is alarmed. Some economists, including Mr. Gols of Arthur D. Little, say research comparisons with, say, the late 1960s are "unfair" because the government and corporations then were spending huge amounts of money on research related to defense and the space program.

Frank Press, President Carter's science adviser, agrees. "A certain amount of deterioration is inevitable," Mr. Press says. "The first thing we have to realize is that the boom years of the 1960s have passed." Furthermore, he warns that the statistics are "still too imprecise; we need to break down the figures sector by sector to find out where the problems really are."

To Mr. Press, the answer isn't a flood of federal funds into basic research. "We have to be careful," he says. "We don't want to overload the system."

Review of industrial innovation urged

Unusual joint Senate-House hearings held at AAAS meeting explore how lagging R&D investment by industry is affecting U.S. economy

Within the next two weeks the Office of Science & Technology Policy will recommend to President Carter that the Administration undertake a comprehensive domestic policy review of industrial innovation. OSTP chief Frank Press explains that such a review is necessary because "it is evident today that the health of our economy is being adversely affected by a lag in our productivity and a decline in our industrial innovation."

Press made his announcement at hearings held earlier this month by the Senate Subcommittee on Science, Technology & Space, chaired by Sen. Adlai E. Stevenson (D.-Ill.). Just a few days later the subject of industrial innovation was further explored at a most unusual set of Congressional hearings.

The Senate Subcommittee on Science, Technology & Space and the House Subcommittee on Science Research & Technology broke long-standing Congressional precedent by holding a day of joint hearings. The site of the hearings was even more unusual. They were held at the American Association for the Advancement of Science annual meeting in Washington, D.C. And for what may be the first time in Congressional history, people in the audience were allowed to comment on testimony and ask questions.

At the first set of hearings, Stevenson agreed with Press that "there is persuasive evidence that the U.S. trade lag and the growing competition the U.S. is facing from other countries is due to a lack of industrial R&D investment." He was disturbed by the possibility that policy review might be rejected by Carter.

But Press says that no matter what the decision is on the domestic policy review mechanism for the study, the study will go forward. He explains that he already has had numerous discussions with industrial research leaders on the issue and a number of conditions that need correction already have been identified. These include, according to Press, that:

• "There is insufficient incentive on the part of industry to innovate boldly. Industry leaders tell us that it is safer to market incremental improvements in tried and true products than to undertake greatly innovative R&D.

Press: decline in innovation

• "Industry investment is too low on exploratory research, particularly that from which results would be more advantageous to society as a whole rather than one firm or industry in particular.

• "Industrial managers . . . are having to put a larger share of their income into so-called 'defensive' measures to meet new environmental and consumer safety standards. As desirable as these standards may be (and I think most of them are), we must recognize that they require resources that might otherwise be used for innovative work more.

• "Equipment and facilities are aging and not being replaced as rapidly as necessary to keep U.S. industries productive and competitive."

It is obvious, Press says, that in some areas the U.S. has been living off past research results and a "reversal of this situation is essential not only for the domestic effect but also to improve our competitive position in world markets." Thus, the idea of a domestic policy review to identify problem areas and possible solutions, to be conducted jointly by OSTP and the Department of Commerce.

At the AAAS section of the hearings, Dr. N. Bruce Hannay, vice president of research and patents for Bell Laboratories, suggested that one place such a study might start looking for problems and remedies would be in the government's own backyard. He believes that "it is a matter of national necessity to strengthen U.S. innovative capacity, [but] unfortunately national actions and policies remain a major part of the problem." And he suggests some areas where changing federal policies would have a beneficial effect on innovation.

For example, Hannay believes that antitrust threats inhibit certain activities that might promote innovation. Cooperative research between companies is effectively barred by such threats. But, he says, antitrust relief could encourage firms too small to sustain separate fundamental research efforts to undertake cooperative basic studies or it could foster cooperation between companies with complementary talents.

In another area, he points out that federal contracts for R&D generally require that any patents that flow from the work be available to all. The idea is that since publicly funded R&D led to the patent everyone should be able to use it. "The trouble," he says, "is that what belongs to everybody is usually of interest to nobody, because the much larger investments necessary to manufacture and develop the market for a new product are unlikely to be rewarded by a satisfactory return on the investment, in the absence of an exclusive license."

One positive action the government could take, Hannay suggests, would be to use government procurement, a potentially powerful lever, to stimulate private investment. Experimental tests of this concept, he says, look very promising, explaining that "mechanisms like procurement are attractive because they focus on what the government can do with reasonable efficiency, that is, specify the results wanted. They do not depend on what the government cannot do as well, which is to determine the method for getting the result." He also believes that selective federal support for R&D for civilian technologies can be justified in certain instances.

Another participant at the AAAS hearing, Dr. Bela Gold, professor of industrial economics at Case Western Reserve University, also had a number of suggestions on how the government might go about stimulating industrial innovation, most of them economic. They include substantially more favorable tax treatment of the capital gains or delayed profits derived from desired long-term projects, special allowances for losses attributable to such efforts; cost-sharing grants for especially urgent or risky projects; accelerated depreciation for capital projects providing needed modern additions to capacity, but involving long construction periods; and establishment of an array of major government-financed research centers to conduct basic research

on the scientific foundations of various industries.

Which, if any, of these recommendations might be made following the OSTP-Commerce study won't be known for at least a year. But Press says one of the study's objectives will be development of Presidential-level options that address ways the government can assist industry in strengthening its research efforts. □

EPA schedules 29 free TSCA seminars

The following is a complete list of free day-long training seminars the Environmental Protection Agency will be holding during the next three weeks (C&EN, Feb. 20, page 8). The seminars are designed to help chemical manufacturers and importers comply with inventory reporting requirements of the Toxic Substances Control Act. Reports describing chemicals that are manufactured or imported in the U.S. and, in some cases, what quantities and where, are due on May 1.

Persons wishing to preregister for a seminar can do so by calling the number listed for the area in which that meeting will be held. The seminars begin at 9:30 AM.

In addition, the American Chemical Society's Chemistry & Public Affairs Department has arranged for EPA to present a training seminar at the upcoming ACS national meeting in Anaheim, Calif. The seminar will be held on Tuesday, March 14, in Room Magnolia C of the Disneyland Hotel following the 3:30 PM business meeting of the Division of Chemical Information.

Northeastern area: 212-557-9898

- Feb. 28, Boston—Boston-Waltham Holiday Inn, 455 Totten Pond Rd., off Rte. 128, exit 48E
- March 1, New York—New York-Coliseum Holiday Inn, 440 West 57th St., mid-Manhattan between Ninth and 10th Ave.
- March 2, Albany—Albany-Airport-Latham Holiday Inn, U.S. 9, exit 24 from New York State Throughway
- March 3, Rochester—Rochester-Airport Holiday Inn, 911 Brooks Ave., off I-490, exit 47.
- March 7–8, Newark—Newark-International Airport Holiday Inn, 160 Holiday Plaza, exit 14 from New Jersey Tpke.
- March 9, Philadelphia—Philadelphia-City Line Holiday Inn, Rte. 1 and I-76 City Ave. exit or north from Amtrak 30th St. station.
- March 10, Harrisburg—Holiday Inn Town, Second and Chestnut St., Second St. exit from I-83.

North Central area: 312-986-4830

- March 14, Pittsburgh—Pittsburgh-Allegheny Valley Holiday Inn, 180 Gamma Dr. at R.I.D.C. Park, Allegheny Expwy. off I-80 and I-76.
- March 15, Cleveland—Cleveland-Independence Holiday Inn, 6001 West Rockside Rd., exit off I-77.
- March 16, Cincinnati—Cincinnati-Riverfront Holiday Inn, 600 West Third St., Covington, on I-75 at Fifth St. exit.
- March 17, Indianapolis—Ind.-Speedway-N.W. Holiday Inn, 6330 Debonair La., Jct. I-294, I-74, and U.S. 136.
- Feb. 28–March 1, Chicago—Chicago-O'Hare Airport Holiday Inn, 3801 North Mannheim Rd., Jct. I-294, U.S. 45, and Rte. 19.
- March 2, Detroit—Detroit-Farmington Hills Holiday Inn, 38123 West 10 Mile Rd. at I-96 and Grand River Ave., off I-275.
- March 3, Minneapolis—St. Paul-State Capitol Holiday Inn, 161 St. Anthony St. opposite State Capitol, Marion St. exit from I-94.

South Central area: 214-387-0404

- March 2, Dallas—Dallas-Fort Worth Airport-North Highrise Holiday Inn, Rte. 114 at Esters Rd., north entrance to D/FW Airport off I-635.
- March 7, Kansas City—Kansas City-City Center Holiday Inn, 1301 Wyandotte St., Jct. I-70, U.S. 71, and Alt. 69.
- March 8, St. Louis—St. Louis-North Holiday Inn, 4545 North Lindbergh Blvd., on U.S. 140 at I-70, 3 miles east of I-270.
- March 9–10, Houston—Houston-NASA Holiday Inn, 1300 NASA Blvd., on Rte. 528 off I-45 (NASA exit) or Rte. 146.
- March 11, Baton Rouge—Baton Rouge-South Holiday Inn, 9940 Airline St., Jct. U.S. 61 and I-12.

Southeastern area: 404-393-0140

- March 3, Orlando—Orlando-Altamonte Springs Holiday Inn, I-4 and Rte. 436.
- March 14, Atlanta—Atlanta-Airport Holiday Inn, 1380 Virginia Ave., off I-85 S.
- March 15, Nashville—Nashville-Vanderbilt Holiday Inn, 3613 West End Ave., on U.S. 70S, off I-40 at Broadway (No. 49) exit.
- March 16, Winston-Salem—Winston-Salem Coliseum (North) Holiday Inn, North Cherry-Marshal Expressway.

Western area: 408-275-8110

- Feb. 28–March 1, Los Angeles—Buena Park (Disneyland) Holiday Inn, 7000 Beach Blvd., Beach Blvd. exit from Santa Ana or Riverside Frwy.
- March 7, Los Angeles—Laguna Hills Holiday Inn, 25205 La Paz Rd., Jct. I-5 and I-405 south of Orange County airport.
- March 8, San Jose—San Jose-Park Center Plaza Holiday Inn, 282 Almaden Blvd. at West San Carlos Ave.
- March 9, Oakland—Marriott Motor Inn-Berkeley, on Rte. 17 and I-80 at University Ave. exit.
- March 10, Portland—Cosmopolitan Airtel., 6221 N.E. 82nd Ave., off Columbia Blvd. and 80th Ave. □

Federal Alert—*new regulations*

This listing covers noteworthy regulations appearing in the Federal Register *from Jan. 9 to Feb. 15. Page numbers refer to those issues.*

PROPOSED

Environmental Protection Agency—Proposes rules change for handling Freedom of Information Act requests for business information acquired under Toxic Substances Control Act and Resource Conservation & Recovery Act; comments by March 20 (Jan. 18, page 2637).

Proposes testing requirements for four chemicals and six chemical categories recommended by Interagency Testing Committee on Oct. 5, 1977; comments by April 3 (Jan. 31, page 4073).

Proposes strict controls on halocarbon organics in drinking water; comments by May 31 (Feb. 9, page 5755).

Food & Drug Administration—Proposes further restrictions on use of chlortetracycline and oxytetracycline in livestock feeds; comments by April 20 (Jan. 20, page 3032).

Occupational Safety & Health Administration—Establishes emergency temporary workplace standard (effective Jan. 17, 1978) for acrylonitrile at 2 ppm as an eight-hour, time-weighted average; proposes permanent standard at same level; hearing in Washington, D.C., on March 21 (Jan. 17, pages 2586 and 2608).

FINAL

Environmental Protection Agency—Issues effluent limits, new source standards and pretreatment standards for carbon black manufacturing; effective Jan. 9 (Jan. 9, page 1343).

Establishes rules for restricted use pesticides and sets deadline for data and label submissions; effective Feb. 9 (Feb. 9, page 5782).

Occupational Safety & Health Administration—Issues permanent standard for occupational exposure to benzene; effective March 13 (Feb. 10, page 5918).

NOTICES

Consumer Product Safety Commission—Joins with EPA, FDA, and OSHA to form Interagency Regulatory Liaison Group to draft uniform testing standards for chemicals (Jan. 10, page 1523).

Environmental Protection Agency—Sets up data security task force to study security measures needed to protect confidential business information gathered under Toxic Substances Control Act (Jan. 12, page 1836).

Announces availability of second addendum to TSCA candidate list of 2800 additional chemicals (Feb. 7, page 5051).

Food & Drug Administration—Announces availability of draft forms for registration of drug makers and listing of drugs in commercial distribution; comments by April 10 (Feb. 7, page 5059).