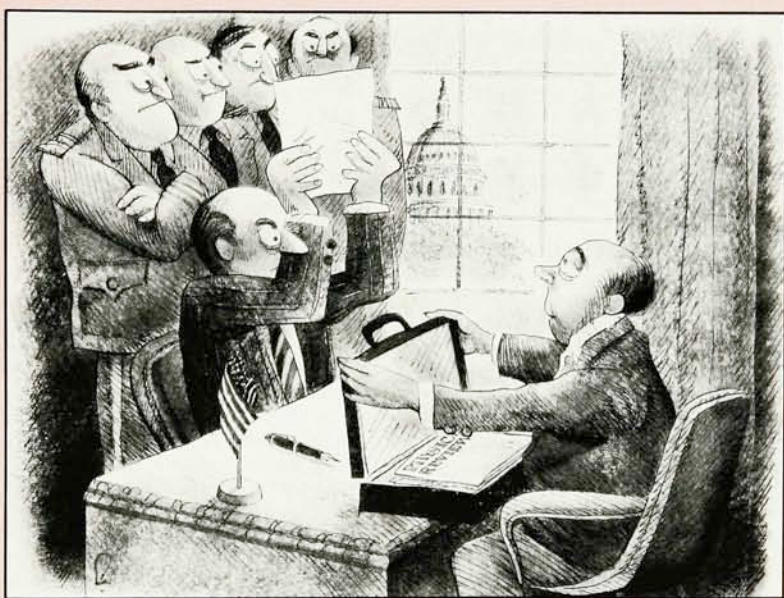


Stifling scientific communications to protect US technology

The episode was characteristic of the complicated, confusing, often contradictory ways the government goes about restricting scientific and technical information it believes can threaten the nation's military and economic strengths. It began last summer when the Optical Society of America and the Institute of Electrical and Electronics Engineers lined up three experts in military applications of optical fibers to deliver unclassified papers at a joint meeting in New Orleans on 28 February. "We knew we were waving a red flag at the Pentagon," recalls Jarus W. Quinn, the Optical Society's executive director. "We considered our chances of gaining approval to be vanishingly small after the 'San Diego incident' only a month earlier."

At San Diego, the Society of Photo-Optical Instrumentation Engineers had organized a conference on laser communications and infrared optics. The night before the meeting was to begin last August, officers of the society received a telegram from the Commerce Department warning that some of the presentations might violate existing technology export regulations. Next morning, several Department of Defense representatives summoned individual participants to a hotel room, in a scene worthy of a Kafka novel, to ask two questions: "Was your work sponsored by a DOD agency?" and "Have you secured clearance for your paper?" The tactic achieved the desired effect. "They never actually asked me to withdraw my presentations," said an engineer from an industrial laboratory, "but when I thought about the penalties for violating the export control laws, I was scared enough to pull them." In all, the participants withdrew more than 150 of the 626 papers submitted to the SPIE meeting.

In the case of the OSA-IEEE meeting, a paper describing Army applications of fiber optics for missiles was sent to the Army Materiel Development and Readiness Command (Darcom) for clearance some four months before the session. When Darcom labelled the subject "sensitive" and subject to export control, the author, a



ROCCO LOTITO

civilian Army scientist, decided to withdraw it. After the other participants did the same, the session was scrubbed. Even so, in the conference exhibit hall, throughout the meeting, Hughes Aircraft Co. displayed its wire-guided optical fibers system, which is potentially applicable to the Army-Hughes BGM-71A TOW antitank missile, and Darcom never complained. "The situation was ironic," observes OSA's Quinn. "There wasn't even a hint of the state of the art in the technical session, though everyone was able to see the latest development in a nearby hall."

The government's increasing vigilance over the outflow of technical data to the Soviet Union and its Warsaw Pact neighbors has aroused emotions ranging from anxiety to anger among scientists and businessmen ever since Commerce demanded an export license for the American Vacuum Society's 1980 conference on magnetic bubble memories (PHYSICS TODAY, April 1980, page 81). At times the actions of government officials in applying laws, directives, and regulations against

scientific communications and technological exports have seemed arbitrary and, in the event, "overzealous" or "heavy-handed." Sometimes, it seems, there are "turf battles" about what department, agency, or group should exercise jurisdiction in controlling militarily sensitive technologies. This is not surprising because right now there are 44 separate activities in some 10 different departments and agencies either studying export controls or executing current policies.

Within the Pentagon, DOD officials often argue over what to classify, precisely because there are virtually no absolute guidelines. At Commerce and the State Department, those responsible for controlling the outflow of militarily-related technology to Eastern Europe also lack clear guidance, though their actions have not exposed the substantial differences between the policy and research people that prevails at DOD. Not surprisingly, some government officials have voiced their frustration with the handling of scientific communications. After the SPIE fiasco, for instance, George Keyworth,

President Reagan's science adviser, was quoted as saying: "I think the incident was both unfortunate and ill-timed. . . . Still, there obviously has to be some reconciliation between a legitimate concern for technology transfer and an unfettered pursuit of research, particularly in the international community." So far, the attempts to reconcile the differences have led to more uncertainty.

DOD activities. Last 21 September, Richard D. DeLauer, undersecretary of Defense for research and engineering, sent a memorandum to the services aimed at plugging the leaks from DOD-sponsored basic research (6.1 budget items). It called for all new and renewed contracts and grants to require the researcher to submit a prepublication copy of any paper to DOD. "It is important that you realize," DeLauer wrote, "that review of research papers is for comment and not for approval."

On 29 December, in his last official act as deputy Defense secretary, Frank C. Carlucci signed interim directive 2040xx, establishing a DOD international technology transfer panel, known as IT². Chaired by Richard N. Perle, assistant secretary for international security policy, IT² is charged with identifying export control issues and policies as well as resolving interagency disputes on such matters. When IT² is completely organized, a subpanel led by Stephen B. Bryen, deputy assistant secretary for international economic, trade, and security policy, will handle technology-transfer cases, including the resolution of disputes arising from DOD reviews of scientific and technical papers. "It finally gives all the voices here, particularly those in the military, an opportunity they didn't always have—to support their position in the decision process," explains a DOD veteran. To support IT², DOD has allocated about \$2 million for FY 1983 and \$10 million for FY 1984.

Bryen's group will consist of representatives of the services, Defense Intelligence Agency, National Security Agency, and DOD's public affairs and general counsel's offices. The group will try to determine the sensitivity level of technology-transfer issues covered in papers and publications that may violate Export Administration Regulations (EAR) and International Traffic in Arms Regulations (ITAR). After months of indecision, the group is now setting guidelines for reviewing research papers. The key reference for this activity is the Militarily Critical Technologies List, a classified 700-page glossary of subjects DOD, Commerce, and State regard as the "crown jewels" of US military prowess. Though DOD has twice revised and updated this list, it is now preparing a new declassified version that can be used by the academic and business communities.

Future defenses:

Some of the Defense Department's highly sensitive technology

Alternate methods for electromagnetic radiation and propagation	Kilojoule advanced research laser
Artificial intelligence: cryptographic analysis, aircraft command and control, target planning, photo interpretation	Ocean acoustic tomography
Charged-particle beams	Ocean laser communications
Computer-aided design of circuits	Processing of spacecraft imagery
Decentralized command, control, communications, and intelligence (C ³ I)	Radiation-hardened submicron vacuum integrated circuits
Detectors for low-power millimeter waves	Rapid-solidification technology
Electrooptic countermeasures	Self-contained munitions
Energetic-material synthesis and behavior	Self-reinforced polymers
Energy efficient aircraft	Solid dielectrics and electrolytes
Free-electron laser	Spacecraft structures and materials
High-power microwaves	Spacecraft survivability research
Indium-phosphide integrated circuits	Supercomputers, computer survivability
Infrared fibers	Three-dimensional multilayer integrated circuits
	Ultra-submicron electronics research

Actually, it is Commerce that implements EAR and State that administers ITAR. About two years ago, ITAR and EAR were brought to bear on the transfer of scientific ideas as well as high-technology hardware. Since then the number of incidents involving scientific exchanges has increased, leading some scientists to argue that the government sees them as security risks. This view has been strengthened by DOD requirements that some papers need to bear special notices. At a recent Washington Conference on Rapid Solidification Processing, sponsored by the National Bureau of Standards Center for Materials Science, a summary of the proceedings said: "This document contains information which is subject to special export controls. It should not be transferred to foreign nationals in the US or abroad without a validated export license. (Reference Export Administration Regulations, Section 287.1, Oct. 1, 1980, and Federal Register, Oct. 1, 1980, Vol. 45, No. 192, page 65014)."

Sometimes DOD stamps a notice on papers describing critical technologies. Headed "Subject to Export Control Laws," the notice reads:

This document contains information for manufacturing or using munitions of war. Export of the information contained herein, or release to foreign nationals within the United States, without first obtaining an export license, is a violation of the International Traffic-in-Arms Regulations. Such violation is subject to a penalty of up to 2 years imprisonment and a fine of \$100,000 under 22 USC 2778.

The purpose of such notices is to "sensitize" scientists to the acute anxiety in Washington that the nation is losing its industrial and technological leadership to other countries.

DOD began using notices after lawyers questioned whether the Pentagon's restrictions on scientific communications violated a First Amendment right of free speech. Richard Meserve, a Washington lawyer and physicist, claims Pentagon actions against scientific papers have revised the old academic axiom to "Publish and perish." The Justice Department and DOD have examined the constitutional issues raised by EAR and ITAR, but no legal actions have been taken against the regulations so far on such grounds.

In its report, *Scientific Communication and National Security*, an advisory panel of the National Academy of Sciences and National Academy of Engineering, chaired by Cornell University president emeritus Dale R. Corson, declared last October that neither EAR nor ITAR are effective or appropriate means for restricting university research because the vast majority of such work, both basic and applied, should be exempt from restrictions (PHYSICS TODAY, November 1982, page 70). What's more, the panel found, the Militarily Critical Technologies List is imprecise and in need of "drastic streamlining." DOD is now attempting to do that (see box).

Chilling effects. How the regulations and lists are used is a major sticking point for corporate executives and university administrators as well as for scientists. Stringent enforcement, such as preventing foreign scholars from attending meetings, limiting access to research, and refusing export licenses for goods, can have a "chilling effect" on scientific exchanges and trade relations.

In March 1982, DOD set up the DOD-University Forum as a way of reconciling the military and academic viewpoints—or, as a Defense lawyer has put it ungraciously, “calming the restless natives.” The forum consists of eight university presidents, three association executives, and ten DOD representatives, with its cochairmen being Stanford University president Donald Kennedy and Defense’s DeLauer. Since then, the forum has met twice, most recently on 20 April, when it approved the report of a working group on export controls. The report calls for providing the scientific community with “clear and stable guidelines” for the international transfer of information, though it recognizes that a coherent technology transfer policy does not yet exist throughout the government. It recommends that DOD policy regarding academic science be based on the principles of the Corson Report, especially for the so-called “gray areas” of sensitive technologies, and that controls on DOD-funded research be specified in contracts. The contract, says the report, “is seen as a mechanism to convey information about the need to delay the transfer of technology. The whole structure stands on the foundation of presumed willingness on the part of the research performer to make an earnest effort to inhibit the flow of truly sensitive information. If that presumption is not true, then the foundation is gone.”

Moreover, some forum members are wary of rigid enforcement of EAR and ITAR on academics. “Attempting to impose tight controls over a broad spectrum of research activities would be divisive, inhibiting, and counterproductive,” said the working group paper the forum has endorsed.

Anticipating such criticism, the President’s national security adviser, William P. Clark, decided to organize an interagency study involving seven departments, the Central Intelligence Agency, NASA, General Services Administration, and NSF. Headed by Ronald B. Frankum, deputy director of the White House Office of Science and Technology Policy, a working party was named to clarify government policy on export controls of scientific research. The issues were phrased in questions listed in National Security Study Directive 14-82, signed by President Reagan last 23 December:

► How can the government improve the manner in which it determines what unclassified, nonproprietary scientific research information should be subject to control so as to focus its efforts efficiently and to avoid raising fears of intrusion within the scientific research community?

► What changes, if any, are required to ensure that implementation of export

control regulations does not interfere with the legitimate communication of scientific research information and to ensure that the burden of compliance on the scientific community is reasonable and acceptable?

► What should be the government’s policy with regard to information presented at open scientific meetings, and what procedures should be developed to ensure consistent implementation of that policy?

The interagency group first met in January in hope of meeting its report deadline of 1 March. After meeting up to three times a week, often for seven or eight hours at a stretch, and writing seven drafts, none of which won full agreement, the panel was disbanded in late February. On 25 February, Clark produced a classified study directive 5-83, signed by Reagan. The new study is widened considerably to include non-government scientific research as well as government sponsored work in universities, foundations, and national laboratories with military implications. It was unveiled publicly on 18 April by Louis T. Montulli, OSTP senior policy analyst for national security and space, at a special session of the American Physical Society meeting in Baltimore. As Montulli explained it, the study seeks to answer the questions: Is there too much militarily sensitive information being released by

the US in classified form, and, if so, where is the most cause for concern? Once the source of leakage is identified, what types and levels of controls would be needed to stop the leaks?

The senior steering group this time is headed by an official of the National Security Council. Under it are three working parties to review government organization structures concerned with technology transfer, to evaluate US policy on technology export controls in the light of foreign, economic and military objectives and to assess the problems and policies associated with unclassified, militarily sensitive scientific communications. This summer and fall, according to Montulli, the scientific community will be asked to appear before the working groups, answer lengthy questionnaires and review draft reports. By the end of the year the steering group is required to send the President a policy statement for action—presumably through an executive order or legislation.

“I’ll be surprised if university science that is not funded by government is part of our problem,” Montulli told APS. “But I consider the problem we face as extremely serious. If the solutions proposed are worse than the problem, I am assured this administration won’t impose them. We are going to try to produce a practical system.” —IG

Physics does well in NASA budget

The President’s budget request of \$7.106 billion for NASA in FY 1984 represents an increase of \$267 million or 3.75% over FY 1983 appropriations. Physics and astronomy programs fare rather well within this request, up \$73.6 million or 17% over FY 1983. Unlike last year, the FY 1984 request includes four new starts—a Shuttle-tethered satellite, a Numerical Aerodynamic Simulation capability project, an Advanced Communication Technology Satellite, and the Venus Radar Mapper. The planetary exploration budget, which was cut 25% last year, is up in the FY 1984 request from \$186.4 million appropriated in FY 1983 to \$205.4 million (or just a little less than the FY 1982 appropriation).

Funds for research and analysis programs, which support teams at universities, are down once again in the FY 1984 request; for example, funds for planetary R&A are cut from \$50.3 million appropriated in FY 1983 to \$45.5 million. Last year Congress restored funds for R&A programs. This year funds for R&A were increased in action in both Houses, but the final budget has yet to be decided. A more urgent question, however, is the final

budget for the Space Telescope.

Space Telescope. The President’s request includes \$120.6 million for the telescope, originally scheduled for a 1983 Shuttle launch and postponed to 1985. NASA spokesmen told us that management problems at Perkin-Elmer Corporation, the main contractor for the telescope, will cause significant cost overruns and yet another delay in the launch. An investigation, scheduled to be completed by June, is now in progress at NASA. New people, including some with space experience, have been shifted into management positions at Perkin-Elmer, said Frank McDonald, chief scientist at NASA. The present problems have already caused the launch of the telescope to be delayed until 1986, but NASA spokesmen said that not all the technical problems have been dealt with, and it would be reasonable to expect some further delay.

And where will the money come from to pay for these overruns? “While the telescope is the highest-priority mission in space science, it would be short-sighted to finance overruns on the Space Telescope from other scientific programs. This would set us on a