craft" by T. B. Carvey, Jr., W. R. Jones, and O. J. McCaughey of Hughes Aircraft Company; a report on "Effects of chemical non-equilibrium flow models on the shock layer properties about pointed and blunt re-entry vehicles during planetary re-entry" by G. Gravalos, I. H. Edelfelt, and C. J. Studerus of General Electric; and a paper on "Evaluation of candidate heat shield materials for high performance ballistic re-entry vehicles" by E. A. Reinikka, also of General Electric.

According to a State Department spokesman, the first of these papers never reached the Congress but was embargoed by the Air Force itself. In the case of the GE papers, the authors apparently submitted them to the State Department for review, as regulations require, but proceeded to Madrid before the necessary license, signifying approval, had been obtained. While they were in Madrid, word reached the authors that the State Department had vetoed the presentations. As for the details of the Hughes case, the company refuses to comment.

The incident in Spain differed from routine interventions by the State Department only in that bad timing on someone's part (it's not quite certain whose) produced a public flap. The State Department's reviewing function is based on a section of the 1954 Mutual Security Act, authorizing it to maintain controls over international shipments of a variety of arms, ammunition, and technical data relating to them. "Technical data" is defined in the regulations as "any model, design, photographic print or negative, plan, specification, or drawing, engineering performance characteristics data, or similar information which could enable the recipient to use, produce, operate, maintain, repair, or overhaul the article to which these data relate." The controls are applicable "regardless of whether the transmission of such information is accomplished by oral, visual, or documentary means. This includes, but is not limited to, transmission by mail, by hand, through foreign visits by American technical personnel, release to foreign nationals in the United States, or through participating in symposia."

Most of the research in the area scrutinized by the State Department is performed by the major defense and aerospace contractors—companies and individuals already so heavily involved in security controls that State Department monitoring of technical papers is apt to seem just one more item on the checklist. Most companies maintain security offices that themselves perform the initial review of work that staff scientists wish to send abroad; papers are also studied by the contracting agencies—usually NASA or the Pentagon—which provide technical assessment. At some point the papers must go to the State Department for a policy decision on their exportability. University-based researchers working on defense or aerospace contracts are subject to the same procedures. Bypassing the system and exporting materials or documents without a license exposes the offender to a $25,000 fine or 2-year imprisonment, or both.

Because the State Department's responsibility is officially limited to articles and reports of a military nature —work that is financed almost wholly by the government—independent researchers are almost never affected. Yet the Munitions List deals with unclassified areas and gets into matters—particularly in the field of space technology—that have both peaceful and military applications. The List also expands and contracts from time to time, and it is not uncommon for areas in which the primary thrust of research and development is nonmilitary—as in certain categories of navigation and transportation equipment—to be placed within its restrictions.

In such instances, the desire of researchers to participate in normal international exchanges may be frustrated by the fact that their research is capable of dual use. It may be frustrated by other factors as well, including, for example, a policy decision by the State Department to reduce access by even friendly countries to data that might help them acquire a technological capacity we would prefer them to lack. Thus, while the State Department gave no specific reasons for curtailing the presentations in Spain, observers speculated that the action may have been directed as much against the French space program as against that of the Soviet bloc.

Whether the information is in fact not available to those who seek it is another question. There are domestic controls on the dissemination of unclassified technological data, instituted either in the commercial interest of a particular company or at the insistence of a government agency. But a great deal of material does find its way into open literature, leaving foreign nationals free to burrow into it and leaving the United States with little but a reputation for obstructionism.

Among defense and aerospace executives, concern about these arrangements seems to be, to say the least, muted. There appears to be a vague feeling that in recent months "things have been tightening up," that it is harder to discuss technology beyond the confines of the United States. There is also a kind of constant press between industry, which for commercial reasons pushes for expansion of free transmission of data and shipment of goods, and the State Department, which may have policy—or perhaps simply bureaucratic—reasons for being conservative. But by and large there is little apparent discord over the Munitions List, and feeling is general that the State Department performs its duties reasonably and without causing undue restrictions.

As for the researchers themselves, if they are dissatisfied with these arrangements their dissatisfaction is buried in the depths of their job security and their commitment to interests other than international communication. Questioned about expressed opposition by researchers to what could appear as censorship of their work, an aerospace-industry executive commented, "There's relatively little. Scientists are difficult sometimes but they're not conscript labor. Nobody's forcing them to work on these problems. If they don't like the restrictions they can pack up and leave, but the fact is that few do. They've got good jobs here."

—ELINOR LANGER

Announcements

The National Academy of Sciences has announced plans for a 700-seat auditorium, to be built at the Academy's Washington headquarters as a **memorial to Hugh L. Dryden.** Dryden, who was deputy administrator of NASA when he died last December, had been home secretary of NAS for 10 years. Money for the auditorium and for an honorary award to be established in his name will be raised through a Hugh L. Dryden Memorial Fund (2101 Constitution Avenue, Washington, D.C. 20418).

Erratum: The magnification of the cover photograph of *Devonian brachiopod* (7 Oct.) was incorrect; it should have read "about × 17,000."