as scientists and not as cold-warriors, seems to have prevented this from becoming much of an issue.

ONR London is located in an ordinary office building just off busy Oxford Street, and there are no guards on the door or security procedures which might put off foreign scientists who come in to talk shop.

Of the nine men on the current sciences division roster, four have university affiliations, three are on leave from government laboratories, one is on leave of absence from an industrial research laboratory, and one is a Navy captain from the Bureau of Medicine and Surgery, who is a psychologist.

Liaison work is always hard to evaluate, but, because of the extent and the character of the reporting its staff members do, the ONR London product is, to an unusual extent, available for scrutiny by both the scientific community and the Navy.

The best-known ONR London output is the *European Scientific Notes*, a monthly, inexpensively produced "informal publication" of 20 pages or so, of which some 7000 copies go to individuals in government agencies and research labs, to ONR contractors, and to scientists in the United States. *ESN* carries news of noteworthy developments in European research, highlights of scientific meetings, and a certain amount of parish-pump news of European scientists. It carries the caveat that material which appears in it is "not part of the scientific literature and must not be abstracted, reprinted or given further distribution."

Every 6 months another member of the London office staff takes over the editing of *ESN*, sharing the chore with the organization's librarian, Virginia Hewitson, who provides continuity. Everyone is expected to contribute to the notes; a premium is placed on conciseness and readability, and some staff members accustomed to the style and syntax of the scientific paper find it difficult to unbend.

Much more detailed information is put into ONR London's technical reports, which are sent to several hundred American scientists in addition to those on the government list. A serious attempt is made to send a particular report only to people likely to be interested in it. Other forms of ONR reporting are letters in response to inquiries from the ONR home office and other Navy and government scientists, and conference reports dealing with the main points of interest at international meetings and symposia. A small number of Europeans receive copies of the latter reports.

If it is to go on serving the scientific community, ONR London must, it is clear, continue to justify its existence to the Navy, which has the Department of Defense looking over its shoulder and Congress always there as the ultimate auditor. ONR London's fate, of course, is tied to the fate of ONR Washington. As a research-supporting agency, ONR has been dwarfed by later arrivals on the scene—AEC, NSF, NASA, and its own siblings in the Department of Defense. In part because of the activities of these agencies, pressure has been generated within the Department of Defense for emphasizing applications rather than basic research, and ONR's budget has, in the federal comptrollers' jargon, plateau-ed.

ONR London is a small operation costing about $600,000 a year—picayune in the perspective of the federal budget—but its location gives it visibility and vulnerability, particularly in view of current worries over the gold drain. It may also be pointed out that times have changed since ONR London was established. European science is thriving, and the existence of a scientific jet set shows how diminished a barrier the Atlantic has become.

Partisans of ONR London, however, have arguments to refute any suggestion that the office is lingering on like some bureaucratic anachronism left over from the Mexican War. The very vitality of European science today, they say, puts ONR London's services at a premium, since, in practical terms, it is impossible to assess scientific developments from a vantage point 3000 miles away.

As a counterargument to the balance-of-payments plaint, partisans point out that research of high quality can be contracted for much less expensively in Europe than in the United States, and so, they argue, it is worth while to have people here who really know where good work is being done and who can serve as matchmakers.

ONR London's mode of operation has changed over the years. Increasingly, a lookout is being kept for work in application of new scientific developments, and, because of this attention to "technology transfer," the applications and sciences divisions are working more closely together than they have in the past.

One further argument is that ONR London is unique. Neither the State Department science attaché program nor the military services nor the overseas representatives of other agencies, such as NSF and AEC, provide similar broad coverage. Whether other agencies really haven't tried to provide what ONR has provided or whether ONR London has simply managed better can be debated. But, as the visitors' book testifies, ONR London, which 20 years ago was a modest beachhead, has become a familiar international scientific trading post.—JOHN WALSH

Research and the Munitions List: Scientific Exchange Not Always Easy

Scientists who confine themselves to basic research may be surprised to learn that, for their brethren in more worldly pursuits, a scientific paper is an exportable "commodity" requiring a State Department license—an item on the U.S. Munitions List along with submarines, tanks, flak suits, and a host of other implements of war.

The effect of the Munitions List—which is intended to limit international traffic in arms—on the international flow of unclassified scientific and technical data came to light during the 17th International Astronautics Congress, held in Madrid last month. Among the American papers scheduled for the Congress, the major international meeting in the field of space engineering, were four that never were delivered. According to newspaper reports, these were: a survey of "Chemical rocket propulsion" by Leon Green, Chief Scientist of the U.S. Air Force; a report on "Trends in reaction control propulsions for satellites and space-

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."