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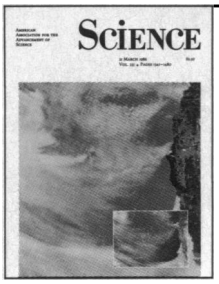

COVER Satellite images showing an extensive stratocumulus cloud system off the coast of California. The false color image is constructed from visible (0.63 μm) and near infrared (0.89 μm) radiances. The inset is constructed from 3.7 μm radiances. The streaks revealed at 3.7 μm are caused by a decrease in cloud droplet size for clouds that are contaminated by the exhausts of ships. See page 1020. [Images constructed by J. A. Coakley, Jr., and R. A. Bumpas; cover design by M. Shibao, National Center for Atmospheric Research, Boulder, CO 80307]

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Strengthening U.S. Engineering

The large U.S. deficit in trade has multiple origins. To ameliorate it will require many actions, some of which are outlined in a report just issued by the National Academy of Engineering.* The document emphasizes the need to respond to the growing quality and quantity of engineering activity abroad and to tap the new knowledge and technology being developed at foreign centers of excellence.

The report presents what it terms an illustrative rather than comprehensive list of 34 areas of engineering research in which there is comparable or superior technology abroad. The areas include artificial intelligence, robotics, systems engineering and control, optoelectronics, combustion and engine technology, high speed rail, and nuclear plant safety. As might be expected, a few countries have widespread competence. Out of the 34 items named, the following countries are listed as having comparable or superior technology to the United States: Japan, 25; Federal Republic of Germany, 22; United Kingdom, 20; France, 15; and Sweden, 12. In all, 25 countries are named, four of them behind the Iron Curtain. The list and the activities indicate that the rest of the world can progress without tapping U.S. technology. But can the United States become competitive in global technology if it attempts to follow a policy of technologic isolationism?

U.S. industrial success earlier in this century led to an attitude of superiority and a prejudice against the need to learn what the rest of the world is doing. While many of our competitors became multilingual, we basked in the comfortable assumption that for us command of English was sufficient. We have also been reluctant to recognize that the immediate post–World War II period of U.S. economic dominance has ended. The world in which U.S. engineers and technologists learn and practice is changing more rapidly than our institutions.

The report specifies four areas in which focused and improved U.S. efforts are needed in the United States: (i) promoting international cooperation in engineering research, (ii) making engineering education more responsive to world-wide progress and concerns, (iii) gathering, disseminating, and assimilating information from abroad, and (iv) supporting international organizations and standards. A key item is (iii). If we are to compete, we must be quick to learn about and apply advances being made elsewhere.

In the gathering and dissemination of information, a number of organizations have roles or needs. These include universities, government, professional organizations, small companies, and multinational companies. The multinational companies have a large variety of mechanisms for information gathering. They have facilities abroad; they participate in joint ventures, operate centers to assess competitors' products, maintain listening posts, send their experts on exchange visits abroad, and hire foreign consultants. Once the information is obtained, it is systematically disseminated to relevant personnel within the organization. Small U.S. companies, in sharp contrast, are lacking in ability to be aware of global developments. They need to improve their information flow. In comparison with other countries, the performance of the U.S. government is poor. Other nations have developed better governmental mechanisms for monitoring foreign technological developments and reporting them back to governmental agencies and domestic industries. For example, several nations—including France, the Federal Republic of Germany, Japan, and the People's Republic of China—have notably more effective science and technology attaché systems than the United States. The impression is widespread among U.S. scientists and engineers that if information is gathered, it is not vigorously disseminated.

Insofar as their resources permit, the professional societies perform very useful functions on information gathering and dissemination. Given sufficient funds, they could do more in the way of translation and could assist in exchanges of scholars. The universities, with some exceptions, have not been sufficiently active in accumulating information about engineering developments abroad. Nor have they performed some other aspects of their educational function well in an era of global engineering competition. The report emphasizes the need for more instruction in foreign languages and for more arrangements for study abroad, including postdoctoral fellowships.—PHILIP H. ABELSON

*National Academy of Engineering, *Strengthening U.S. Engineering Through International Cooperation: Some Recommendations for Action* (National Academy Press, Washington, DC, 1987).