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Cooperation in R & D: Whose Responsibility?

Spurred by competitive and financial pressures, U.S. research laboratories in universities, industry, and government are searching for collaborative agreements to improve their performance. Many successful arrangements are being expanded and new ideas put forward. The National Bureau of Standards (NBS) has had considerable experience in cooperative research arrangements, and some thoughts based on our experience may be useful to others.

While some U.S. institutions are finding it possible to agree on long-term and comprehensive multimillion-dollar research ventures, we have found that cooperative efforts need not be long-term nor restricted to "big ticket" items. The big national research facilities must be shared, as we share our research reactor, synchrotron radiation source, and other facilities, but these need not be the models for all cooperative ventures. Our Research Associate Program has fostered a variety of useful cooperative research programs, many of which require little in the way of unique facilities and are narrow in scope. Each agreement has been tailored to fit the work at hand and the capabilities and goals of the participant.

Over the past decade, NBS initiated a series of research projects to improve our knowledge of the properties of liquefied natural gas (LNG) mixtures, containment materials, and measuring techniques. About half the work was funded by relatively small-scale cooperative programs with industry, particularly under the aegis of the American Gas Association. At one point we put together a 19-member consortium of natural gas users, importers, and utilities for a single project to develop a good equation of state for LNG. One of the most successful projects, backed by NBS, the American Gas Association, the Maritime Administration, and the American Bureau of Shipping, was simply to produce a well-documented, easy-to-use handbook of data for LNG users. Typically, it took 9 to 18 months to make the arrangements for a project in the LNG program. Likewise, we recently announced a major cooperative program with the American Society for Metals to collect evaluated alloy phase diagram data and make the data available through a computerized information system.

These are only two examples of the variety of our joint research ventures. About 100 industrial research associates and 40 postdoctoral fellows are working today at NBS. More than 325 professors and students are stationed in NBS laboratories each year under various guest worker arrangements. We have education agreements with 100 universities and colleges and joint research programs with the Electric Power Research Institute, the Gas Research Institute, the American Dental Association, the American Society for Testing and Materials, and others.

In carrying out cooperative research programs, one must be persistent, attentive to detail, and involve both the technical staff and managers in the initial detailed formulations and the later critiques of progress. In all our agreements there has been no substitute for the involvement of bench scientists and engineers. Laboratories wishing to collaborate in research should seek the advice of all potential participants, whether they are in industry, universities, or government. At NBS all research managers are encouraged and expected to make such interaction a way of life. That concern is manifested by daily contact with university and industry peers and users and by a variety of formal evaluation panels involving scientists and engineers selected by the National Academy of Sciences and the National Academy of Engineering. This kind of regular interaction fosters an environment that is receptive to cooperative research.

The pluralistic nature of American society presents a real variety of opportunities for cooperation, and these opportunities should be imaginatively explored. It is up to managers and researchers to be ambitious and innovative in their planning for cooperative research and to have the will to work out seemingly small but nevertheless crucial details of mutual understanding.—ERNEST AMBLER, *Director, National Bureau of Standards, Washington, D.C. 20234*