quirements of the market. With respect to the great modern problems—what I call the four P's of population, pollution, peace, and poverty—it may be that articulating these is the most important part of the problem—that once these needs are formulated in the right way, the technological solutions will become obvious, or will fall into place.

The Mission-Oriented Laboratory

The characteristic institution for the conduct of applied research in the modern era is the large, multidisciplinary "mission-oriented" research organization. Although this type of organization has not replaced the small specialty company or even the independent inventor as a source of innovation, it is to an increasing degree the source of basic technology both for public purposes and for industrial projects.

What constitutes a "mission"? How is it defined, and how is it used to shape the specific research program? How is success in the performance of a mission to be measured?

The answers to these questions are complex and often subtle. A mission must be neither too vague nor too specific. It must be concrete enough to provide real guidance in the choice of tasks and priorities, and to be understandable by the key people in the organization, but it must be general enough to permit the phasing-out of old tasks and the establishment of new research goals. A mission must be like the shell of a building, within which the interior can be drastically rearranged to carry out constantly changing tasks. A mission, however, should not be simply an umbrella under which almost any high-quality scientific activity can be justified. Not every exciting discovery is convertible into an economically or socially useful product. Unfortunately, the broader the objectives of an institution are, the harder it is to determine what is really relevant to its mission. Very large diversified companies find that almost everything is relevant in principle, but they have to pick and choose, at least in the short run, in order to achieve "critical size" in the efforts they do support. In many cases it may be more important to maintain this critical size than to "cover every bet." One reason for this is that the transfer of information between organizations occurs more rapidly, except under conditions of secrecy, than does the vertical transfer from research or invention to marketable product. In the research part of an institution, it is sometimes more important that the organization be working in a general field than that it be working on a particular project. A company—or for that matter a nation—that has a broad technical capability can quickly exploit the ideas of others, and can catch up on the bets that it misses provided it has the technical sophistication to identify promising ideas at a sufficiently early stage. Just as a company or a nation cannot expect to exploit every promising scientific discovery, so every discovery that it exploits need not be its own.

In considering the "missions" of government laboratories, it is essential to distinguish a "mission" from a "task." A mission is a function assigned to an organization by higher authority or by legislation. A task is a subordinate objective that is best generated from within the research organization and pursued usually by agreement with the sponsoring agency. A research institute that does not generate most of its own tasks, but depends on external direction or "orders from headquarters," is either suffering from inadequate leadership or has a mission which is inadequately defined.

The definition of its mission is one of the most important considerations in establishing a new research organization or reorienting an old one. In evaluating the performance of such an organization in applied research, the emphasis should be on the performance of the organization as a whole rather than on its individual components. Good applied research is of little value if the mechanisms do not exist to translate research results into goods, services, or operations.

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Erratum for Drickamer Article

In the paper "Pi electron systems at high pressure" [*Science* **156**, 1183 (1967)] a mechanism is suggested for the high-pressure reactions of perylene and azulene complexes with tetracyanoethylene (Figs. 10b and 10c) which is clearly impossible as drawn. What I had meant to suggest is the reaction shown below (with Fig. 10b as an example), which is at least conceivable, if not very probable from the chemical viewpoint. A similar modification would apply to Fig. 10c.

As indicated in the paper, any serious study of the reaction requires the synthesis of enough product for more complete analysis, as well as a fairly detailed knowledge of the crystal geometry of the unreacted complex.—H. G. DRICKAMER, *Department of Chemical Engineering, University of Illinois, Urbana*