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R & D at Bell Laboratories

Bell Laboratories is esteemed for its innovative excellence, creativity, and enlightened policies with respect to basic research. Other companies have been notably innovative and some have contributed to the advancement of science. But, in general, sponsorship of basic research by industry has left much to be desired. Some major research-oriented companies give freedom to a small fraction of their staff and are willing to forgo short-term benefits from them. Virtually all companies place heavy emphasis on obtaining proprietary advantages through the work of their scientists. This is, of course, expectable. But it can be carried too far. Emphasis on proprietary advantage creates an atmosphere of secrecy. Even after patents have been obtained, scientists often do not publish results of basic research. Few managements encourage publication. In this respect, Bell Laboratories is exemplary. Last year, its members published about 2300 papers, most of them in peer-reviewed journals. That seven of its scientists have received the Nobel Prize attests to the level of excellence of work at the laboratories. Research there has created new fields of science, such as radio astronomy. Its work in basic physics and related materials sciences has led research throughout the world. The discovery of the transistor led to a great expansion of solid state electronics that is the basis of modern communications and a host of consumer products as well as computers.

Bell Laboratories is the focus for research and development in the Bell System, which includes Western Electric, a manufacturing arm, and most of the major telephone companies of this country. At the beginning of 1981, Bell Laboratories employed 12,000 scientists and engineers of whom about 3000 were Ph.D.'s. As is common with companies carrying on R&D work, about 90 percent of the effort is devoted to development.

Good industrial laboratories have some advantages over academic institutions. For example, they tend to be better equipped and they are more effective in conducting interdisciplinary research. Another advantage is the ease with which results of basic research are conveyed to those who can use them in development and, conversely, the ease with which engineers can communicate their needs to scientists.

In the course of numerous visits to Bell Laboratories, I have noted many instances of good interaction between scientists and engineers. An important ingredient in channeling basic research toward useful objectives is a clearly stated mission. At Bell Laboratories everyone understands that the mission is to provide new telecommunications technology. This includes equipment designs, the engineering and planning of a telecommunications network, and the technology for its operation and maintenance. It is the function of research to support this mission. Within this framework, the latitude for individual scientists is remarkably broad. Research is for the most part concerned with the creation of new knowledge that will lead to technological development over the long term.

In the effort to attain excellence in research at Bell Laboratories, management has at least two objectives. One is the obvious wish to create an in-house capability for leadership. The second is to provide a good interface with research that is being conducted elsewhere. By very active participation in scientific meetings and by publishing, Bell scientists become well known throughout the world and are sought out for informal conversations. In addition, outside scientists exchange much information during visits to Bell Laboratories. By contrast, many companies maintain such a tight policy with respect to release of information that their employees are not particularly welcomed by other scientists.

Spokesmen for the Reagan Administration have held out the hope that with tax breaks, companies might be inclined to support more basic research. However, most companies do not seem to know how to create conditions under which research can flourish and at the same time be useful. They cannot be expected to attempt a slavish imitation of Bell Laboratories, but they could learn lessons there.—PHILIP H. ABELSON