

rather than the content that constitutes scientific truth. Rather than banded individuals, scientists have become an organized priesthood, and their system has become the major orthodoxy of modern society; it is the system of ideas that everybody—including myself—believes, whether or not one knows anything about it. The popular feeling about it contains both superstitious reverence and superstitious fear, and the current mass education in science, we shall see, does not allay these.

The shift of emphasis from an open dialogue of morose or bumbling men with surprising Nature to an elite service to a progressive self-correcting system of knowledge has been accompanied by immense changes in the social organization of science, the role of the scientist, and the personal engagement of the man in the role. There is now less use for individual genius and hunch or for a personal ethical choice of a field of search as peculiarly fascinating, congenial, or “good.” The issue is not, let me make clear, whether the field is benevolent or useful, for it has often been the hallmark of scientific genius to research the senseless, the apparently trivial, the pathological. But I doubt that an older-style scientist paid attention to what *he* considered indifferent. His work was suffused with himself—and it is my Wordsworthian bias that scientists and artists, formed by their disinterested conversation with meaning, are usually good people. When a study is pursued as indifferently scientific, however, it is likely that extrinsic purposes will dictate the direction that is taken. Inevitably there is pressure for pay-off results rather than the wandering dialogue with surprise. A scientist becomes personnel, pursuing the goals of the organization.

More fatefully, as a great successful institution, the system of knowledge has become interlocked with the other great institutions of

society, and the dominant style takes over. But this style was not devised for open dialogue with surprise; it was devised for cash accounting, tax collection, military discipline, logistics, and mass manufacture. Yet bureaucratic methods must somehow be appropriate to science too. Committees *must* be able to evaluate “projects.” There *must* be profiles of gifted persons to support, and there *must* be university courses relevant to training others. Scientific thinking must be able to be parceled out for efficient division of labor, and discoveries must occur on schedule: basic research, application, development, shaping up for production. With enough capital, one can mount a crash program and break through. To be serviceable, excellent scientists become administrators. Grant-getters who are clever about the forms become scientists. Corporations become impresarios for scientists. Scientific brains from other countries are brought up to work in the American style on American problems, seriously impoverishing their own people and precluding the development of various schools of thought. In the end, unless an hypothesis involves big cash, its author cannot afford to pursue it, though he used to love it.

The rationalization is ready to hand. Modern science *requires* big capital and big organization: take cyclotrons, moon shots, statistical surveys, universal information-retrieval. These are now science *par excellence*. There has been a redefinition. Bypassing the experience of nearly four hundred years, which located science in hypothesis, deduction, and crucial experiment, we have amazingly come back full circle to the bureaucratic system of Bacon’s *Novum Organum*.

It is hard to know whether the corporate style of research is really the best one, for it tends to be self-proving. If brainy people agree to operate in this manner, they are not operat-