

interests of management and the interests of science does not imply less organization, but rather a more appropriate and hence more effective form of organization. Organization of an area of effort does not necessarily mean that individual initiative and freedom will be done away with. Indeed, there is a good argument to the effect that both order and freedom (or individual initiative) are inherent in any effective form of organization, and that one cannot really have freedom without some form of order, law, or in other words, organization. Freedom without some effective form of order--that is, coordinating authority and rules for operation, becomes anarchy, in which no one's interests and rights are effectively protected. Certainly, even in the most highly structured organizations, the orderly pursuit of organizational goals cannot be maintained without the exercise of a certain degree of individual initiative and judgment in the face of day-to-day exigencies, as we know in the case of soldiers in combat situations, for example.⁶

Thus, the problem of organizing science is not basically a problem of administrative considerations versus scientific research considerations; it is rather a problem of determining the form of administration that is most suited to the particular blend of order and independence required in scientific endeavors.

Social Processes

In order to understand better the blend of order and independence that is required in effective scientific pursuits, it is important to recognize that both science and its cousin, technology, are social products. Like our ancestors who were sometimes overawed by the mystery and charisma that surrounded the activities of priests, we are sometimes prone to think of scientists as being somehow set apart and different from other men--as being "geniuses" with rare gifts of discernment that enables them to give birth to new scientific insights without outside assistance. Scientists and inventors usually view themselves with more modesty, as the statement of one outstanding man to the effect that "he had stood on the shoulders of giants" indicates. Although we recognize that scientists are frequently men of high intellectual endowment and academic attainment, we must also recognize that scientific "breakthroughs" often come at more or less predictable times in history after a number of scientists have been working simultaneously on the same problems and have been in communication with each other.⁷ Also we note that scientists, like other men,
