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The Quiet Shops of Academe

Recently, through a chance combination of circumstances, I visited the instrument and machine-shop facilities of eight large universities across the country within a 3-week period. With a few exceptions, the scene was uniformly depressing. Most of the shops were spacious, well lit, and filled with serviceable machinery, but hardly a spindle was turning. A few gray-haired artisans bent to their projects, usually small ones, but the generally low-level of activity was obvious. With no work in the chucks, no partly done projects heaped on the floor waiting their turn, and few young apprentices learning the craft, an important national resource is clearly wasting away.

Two of the eight shops, indeed, were not in such a desperate state. It was easy to see the reasons for the exceptions. A large well-funded oceanographic institution was the mainstay for the busiest of the shops, and youthful machine operators were at work learning the trade. The next busiest was the smallest of the facilities I saw, and two large jobs in its relatively cramped quarters gave an exaggerated air of activity. Of the remaining six, one was moderately active, working close to half capacity, but even there I saw no evidence of young apprentices.

The difficulties of keeping large instrument shops going is no secret, of course, but each of us thinks that his own university has a special problem. The condition is not sporadic, but general. One might argue that the age of carrying out large, innovative projects within the universities is finished, as massive technological growth in all sectors of the economy outruns the university facilities. The university researcher now travels to the great national facilities or else conducts work by reading catalogs, writing specifications, and hooking things together after they are delivered. In fact, this is not the case. The growth of technology has widened enormously the selection of materials and devices that the experimenter can use. There are more possibilities for innovative work in university laboratories, not fewer, and the more creative the work, the higher the likelihood that special devices and jigs will be needed. American science has been characterized by action, by invention, by building, and by the day-to-day involvement of the experimenter with his apparatus. The present necessity of ordering finished instruments instead of engineering one's own has been forced by the financial squeeze on most areas of pure science. Engineering new systems is expensive, and the nation is not willing to pay the price.

Many of us maintain our own more specialized instrumental construction facilities, usually centered on the talents of a few skilled engineers and technicians. This traditional mode serves for many purposes but the system lacks flexibility, and we all experience the need to go outside for specialized jobs, especially for larger projects, or when the small groups have a fluctuation of too much work. This often means that new ideas are not followed up. The costs of going outside may be beyond our budgets, or the time delay unacceptably large, especially when the work must be done in an industrial shop, and we simply take another direction. The process is strongly reinforcing, and as the ability to place jobs in the university shop goes down, so does its financial base; the rates go up, and even fewer are willing or able to use it facilities.

The fundamental structure of federal research funding, as set up by Congress and as administered by the agencies, is responsible for the weakening state of technological and scientific innovation. A national resource is being allowed to waste away through national policies that show no signs of changing. Once that resource is gone, it will not be easy to rebuild. More seriously still, the conditions that foster new ideas in the laboratory will atrophy as well, with a longer time lag. That spirit of doing new things has a long history of careful nurture, and once gone it will be far more elusive to recapture.—BERNARD BURKE, *Department of Physics, Massachusetts Institute of Technology, Cambridge 02139*