SCIENCE

Instrumentation, Science, and Technology

INSTRUMENTATION is one of the foundation stones of modern science and technology. It is important that we realize this. Likewise, it is important that we understand its interrelationships with science and technology. Some thought should also be given to the social implications of instrumentation.

Almost invariably the history of an instrument begins with the observation that a change in some variable produces a change in another more easily measured property of the system under observation. For instance, temperature measurements began when early workers observed that the volume of the gas enclosed in a thermoscope bulb was a function of temperature. It took over a century of study by many workers before this observation resulted in the use of mercury in glass thermometers, with a scale based on easily reproduced fixed points. During this period, temperature measurement was studied for its own sake; it was not a tool to be used to obtain more exact information about the effect of temperature on other phenomena. Even now we have research on temperature measurement in progress. It is directed toward more precise definition of the temperature scale, toward extending the scale to higher and lower ranges, and toward the development of more desirable measuring instruments. But now, most areas of the science of temperature measurement are so well known that they serve as tools for other branches of science and for industry.

Today, progress in the science of instrumentation is usually much more rapid. We have the advantage of the work done by our predecessors, and we have a steadily increasing number of workers in the field. We also have an avid demand from industry and the armed forces for improved instruments of many types. We might take as an example a recently developed ultrasonic viscometer. This instrument makes use of a magnetostriction oscillator to supply pulses of ultrasonic energy to a probe. The damping of the vibration of the probe is a function of the viscosity of the medium in which it is immersed. This instrument gives a continuous indication of the viscosity of the sample, and it has the advantage that, with one probe, it can cover a wide range of viscosities. Measurements can be made over a temperature range from $-109°$ F to $+650°$ F and at pressures ranging from the lowest attainable to thousands of pounds per square inch. There are no moving parts or orifices to be blocked. Here we have an instrument based on a completely different principle from those previously employed for measuring viscosity. The result is a device with unique advantages for many applications. Products as diverse as plastics, soil conditioners, treating agents for oil-well-drilling muds, paints, inks, synthetic fibers, starch, and gelatin will benefit from this improved tool for measuring viscosity.

It is important to realize that the basic ideas for instrumentation come from research in pure science. Our technology depends on instrumentation. The demands of our technology cause instruments to become available which, although they were designed for industrial use, often make research in pure science much easier. Thus, there is a fundamental relationship among pure science, instrumentation, and technology, with each benefiting from the others. This situation results in an increasingly rapid rate of progress in all three fields.

Instrumentation makes possible better products at lower cost in human labor. It does not, however, as some fear, put people out of work. It requires better trained workers to care for plants where instruments take over many of the operations formerly carried out manually, and it requires an instrument industry to supply the necessary instruments.

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