of 32-bit superminis and the increasing power of the microcomputers. The 16-bit microcomputers have an important feature known as real-time, multitasking. This capability enables the computer to work on several jobs "simultaneously" and to respond to requests from instruments for data acquisition services immediately as needed. So, the makings of work stations in future local area networks are at hand.

For the record, IBM's 9000, which is based on a Motorola 68000 microprocessor, starts at $5700 but a usable system with disk drives and keyboard is about $8500. Perkin-Elmer's 7500, also based on the Motorola 68000, offers a color video display, and starts from $10,800. The Labtech 70 differs substantially from the other two microcomputers. It is built around Intel's 8088 microprocessor and 8087 coprocessor. The 8087 is an integrated circuit specially designed to make floating-point arithmetic operations very rapidly, and it gives the Labtech 70 a substantial number-crunching capability. The lowest priced version of the Labtech 70 is also a bit more expensive, starting at $13,800. Digital Equipment's new Labstation 23, which is a microcomputer version of the company's PDP 11/23 minicomputer, starts at $7695. At present, Labstation 23 is intended to link instrumentation to Digital Equipment's VAX superminicomputers. Finally, Spectrogram's Labmate V incorporates both a 16-bit (Intel 8088) and an 8-bit (Intel 8085) microprocessor so that older programs written for the smaller machines remain usable. Prices of the basic Labmate V start at $5900.

—**Arthur L. Robinson**

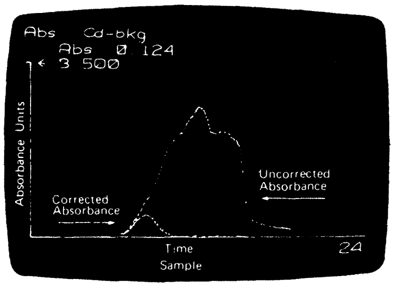
A New Way to Correct Background in AA

Correction for background absorption has always been a problem in atomic absorption (AA) spectroscopy. Because the conventional hollow cathode source emits light only at precise wavelengths, it is not possible to use it to scan the spectrum to provide background correction. It is thus necessary to use a second light source, typically a deuterium arc, to provide this scan. This dual lamp system, in turn, requires very precise alignment of the light sources and the use of a beam splitter, which reduces light throughput. The system also does not work as well in the visible region as it does in the ultraviolet.

One way around these problems is to use the Zeeman effect (*Science*, 7 Oct. 1977, p. 39). This involves enveloping either the furnace or the light source—but normally the furnace—in a strong magnetic field. When the furnace is in the field, atomic absorption occurs only in a polarization normal to the magnetic field, while absorption by the background occurs in polarizations both normal and perpendicular to the field. With an appropriate polarizing filter, it is then relatively easy to correct for the background. The primary drawback is that the magnet system is expensive, so that Zeeman effect spectrometers cost substantially more than conventional deuterium arc instruments. In certain cases, furthermore, calibration curves are double-valued, so that a given reading can represent two different concentrations.

A new and surprisingly easy way to correct background has been developed by Stanley B. Smith, director of research and development at Instrumentation Laboratory Inc. (IL), and Gary M. Hieftje of Indiana University. "We had been working together for a long time trying to find a better way to eliminate interference, but without a lot of luck," says Hieftje. "Then, one day 4 years ago, we were walking around Cambridge, England, after a spectroscopy colloquium when we both looked at each other and realized we had the answer." It has taken since then to work out the bugs and to incorporate the system into a commercial instrument, the IL Video 22.

The answer involved making use of a property of hollow cathode lamps that had previously been viewed as a liability. When a small amount of current is passed through a hollow cathode lamp, it excites an inert gas which, in turn, excites atoms of the element of interest, causing them to emit light at precise, narrow wavelengths. At higher currents, however, the emission lines are broadened significantly, which has the effect of reducing the sensitivity of the instrument. At still higher currents, nonexcited atoms of the source element are vaporized and absorb most or all of the light at the desired wavelengths; the net effect is that the source emits light at wavelengths other than those absorbed by the element of interest. This phenomenon is known as self-reversal, and was a condition to be avoided until Smith and Hieftje recognized that what the source was emitting was light that would be absorbed only by the background. "I look at what they have done," says a scientist from a competing company, "and I kick myself and say 'Why didn't I think of that?' "



Cadmium analysis

IL Video 22 AA screen during the determination of cadmium in 2 percent sodium chloride. Background absorption is 2.8 absorbance units (99.8 percent).

In operation, the Smith-Hieftje (pronounced Heef′-yah) background correction system operates by cycling the hollow cathode lamp through periods of low and high current. It is run at a low current for several milliseconds to determine the spectrum, then at high current for about 300 microseconds to measure the background. The actual times are precisely controlled so that the same number of photons reach the detector during each phase of the cycle. Recovery of the source when the current is reduced occurs in milliseconds. The electronics package then subtracts the background readings to produce the corrected spectrum. The system is particularly good, Smith says, for correcting structured background in which particles or unionized molecules in the sample chamber interfere with normal measurement of the analyte.

Because the Smith-Hieftje system is so simple, the new Video 22 is less expensive than a conventional deuterium arc spectrometer and significantly less expensive than a Zeeman effect instrument. The only important modification of the source that is required is additional insulation to prevent arcing when it is run at high currents. The company stresses that running at high current does not damage the source, and the sources are, in fact, guaranteed for the same amount of use as those in a conventional spectrometer. Because major changes in the electronics are required, however, it is not possible to retrofit the Smith-Hieftje system onto an existing AA spectrometer.—**Thomas H. Maugh II**