JOURNAL NOTES

Short-Lived Spectra

There has been growing interest in applications of spectroscopy to studies involving rather rapid reaction rates. In particular, we at the Applied Physics Laboratory have been interested in problems of combustion, in which the concentrations of radicals and molecular species change very quickly indeed. These reactions are accompanied by the emission of radiation characteristic of the molecular groups involved. It seemed entirely likely, therefore, that a spectrometer scanning a proper portion of the spectrum could be of use in ascertaining relative abundances of these molecules and radicals, as well as some data regarding their lifetimes. The new lead sulphide, lead selenide, and lead telluride photoconducting cells, far more sensitive in the near infrared to heat than the thermocouple or the bolometer, previously used, have made it possible to construct a spectrometer useful from the near ultraviolet to the infrared. Such a cell responds in about twenty to fifty microseconds, and one can therefore hope to scan such a spectrum interval in about a thousandth to a hundredth of a second and still retain sufficient resolution for many purposes.

This instrument is of the Littrow type in which a single mirror serves both to produce parallel rays, and to focus images of the slit, reflected from a prism backed by a plane mirror. The scan is obtained by oscillating the Littrow mirror. The first mirror drive covers about a third of the whole spectral range. The cell output is amplified, properly synchronized, and fed to an oscilloscope with a long persistence screen. The oscillating mirror then produces on the screen a continuing series of spectra which can be compared with one another. Photographs of as many as thirty complete spectra for one carbon monoxide-oxygen explosion have been taken at a rate of fifty per second. The time of scan for each spectrum was from three to four thousandths of a second; the remainder of the cycle is "dead time," since only part of the mirror travel can be used. It is interesting to note the great differences in relative intensity of the various carbon dioxide bands in the explosion (a nonequilibrium process) compared to these same bands as produced in an ordinary carbon monoxide-oxygen flame.

There should be fruitful application of such a spectr meter to problems in absorption spectroscopy, in both biological and chemical studies where rapid changes in composition may be expected. S.S.

Rapid Scanning Spectrometer for Oscillographic Recording. By B. W. Bullock and S. Silverman. *J. Opt. Soc. Am., January, 1949.*

Government Research

Many scientists dislike government work and seem to feel that civil service carries with it an inherent stigma. In search of ways to attract able men to government research, the author analyzes data collected from a few typical college, industrial, and government laboratories. Salaries alone do not account for the scientists' reluctance to enter civil service, for the pay is not far out of line with that offered by colleges and industry. Few scientists object to security regulations but many object to the manner in which security is enforced. The dual system of control in many laboratories, especially those controlled by the armed services, whereby a scientist is employed as an aide to a uniformed superior, divides responsibility and authority and seems predicated on the offensive assumption that scientists cannot be trusted. Most annoyances are petty and might be avoided by putting managerial and administrative positions on a competitive basis in government laboratories. Management should be able to cut through the red tape, set rules fitted to the needs of scientists, and offer employees the same kind of intangible compensations afforded them by colleges and universities. E.A.W.

The Scientist and Government Research. By Eric A. Walker. *Am. J. Phys. 17: 30, January, 1949.*

Shadow Casting

The technique of shadow casting, in which a beam of atoms is sprayed obliquely across an electron microscope specimen and allowed to condense, results in enormously increased contrast and in a pronounced three-dimensional effect in the image. It has increased about fivefold the ultimate perceptive power of the electron microscope for small biological objects.

To achieve this increased power practically, one must use an extremely smooth base, or substrate surface, and a nongranular metallic film for shadowing. Extensive investigation has been made of the structure of substrate surfaces and of metallic films. It is found that the surfaces of organic substrate films (such as collodion) are rough, and apparently cannot be rendered sufficiently smooth. Freshly polished glass is smooth within a few Angstrom units, and can be used as a substrate for metallic shadowing by a replica transfer process. It is found that uranium is superior for general shadow casting, while platinum is the best for use with glass substrates, from which it can be readily stripped in forming a replica.

The improved technique should enable microscopists to photograph more easily the larger protein molecules of biological importance. R.C.W.

The Electron-Micrographic Structure of Shadow-Cast Films and Surfaces. By Robley C. Williams and Robert C. Backus. *J. App. Phys., 20: 98, January, 1949.*

Phosphors

Most fluorescent substances emit light of a wavelength longer than that of the light used to cause the fluorescence. There are a few substances, however, that emit visible light when exposed to infrared light. These substances are really phosphorescent. A fluorescent substance is luminous only while exposed to radiation. But these phosphors, after exposure to ultraviolet light, release