JOURNAL NOTES

Tracks and Stars

Nuclear stars in photographic plates can only be detected by using a microscope since each prong of the star is merely a dotted line of silver grains less than one micron in diameter. With conventional bright-field illumination the numerical aperture and magnification of the microscope must be high enough so that the individual grains are resolved. The penalties for such magnification (150 to 300 times) are that the width and depth of field are small and that it is continually necessary to focus up and down through the 90-micron thick emulsion. To scan a single 1 x 3 inch plate may take several days. Ordinary dark-field illumination would help enormously except for the myriad randomly located grains comprising the fog, which masks the weaker prongs.

A rotating-azimuth, planar, dark-field illumination method has been developed which largely overcomes this difficulty by selectively revealing linear arrays of grains. By means of a slotted diaphragm beneath the condensing lens, all illuminating rays are stopped except those which are roughly parallel to a single vertical plane and make an angle of from 25 to 45 degrees with the (vertical) axis of the NA 0.17 objective. Grains of a track perpendicular to the single vertical plane now produce scattering with constructive interference in the direction of the objective; the track accordingly appears very bright. Fog grains do not produce constructive interference in this direction, and thus remain relatively dark.

In practice, the diaphragm is rotated slowly by a motor so that each track alternately gleams and disappears. The flashing tracks are so noticeable that low overall magnification (50 times) is possible, giving a 4 millimeter width of field. Effective depth of field is 25 to 100 microns, so that little focussing is required. Entire stars may be seen at a single glance, and minimum ionization plates are scanned in two to four hours. The large working distance (about one centimeter) permits plates to be scanned from the back, and might be useful in scanning two plates together, one on top of the other. W.A.S.

Detection of Tracks and Stars in Nuclear Track Plates. By E. H. Land, G. R. Bird, and W. A. Shurcliff. *J. Opt. Soc. Am., 40: 61, February, 1950.*

New Electron Microscope

This paper describes a new microscope designed for universal application in the field of electron microscopy. The direct range of magnification extends from the optical microscope limit to 100,000 times; further optical enlargement of the photographs is possible when required. The continuous coverage of this large range is made possible by the inclusion of an extra intermediate projector lens. This extra lens allows the instrument to be used as an electron micro-diffraction camera whereby an electron diffraction pattern can be immediately obtained from a small area, 10^{-6} cm^2 or less, of the specimen under observation. Micro-analysis of crystalline specimens or detection of small crystals amongst amorphous material is thus possible.

The design of the new microscope is based on experience gained with an earlier model, the object being to produce a high performance instrument at reasonable cost with a simple design which would permit future improvements to be easily incorporated. Results obtained with the experimental model, the prototype, and early production models have fulfilled expectations. The mechanical rigidity and the relative simplicity of operation enables a much greater proportion of successful micrographs to be obtained than on earlier instruments. Inclusion of an objective lens aperture, which increases image contrast, should make the instrument especially useful in biological and metallurgical applications. R.S.P.

A Three Stage Electron Microscope with Stereographic, Dark Field, and Electron Diffraction Capabilities. By M. E. Haine, R. S. Page, and R. G. Garfitt. *J. App. Phys., 21: 173, February, 1950.*

Bubble

The present paper is a more detailed account of a brief note that appeared in 1946 in the Physical Review (69: 538). It describes a spherical shell model of the nucleus which, for high excitations, has far fewer levels than the "liquid drop" or other current nuclear models.

The model takes the form of a thin, hollow, spherical shell that is positively charged like an electrically charged soap bubble. The frequencies of vibration of the shell, which may easily be calculated by the method used long ago by Lord Rayleigh for the vibration of a water drop, depend upon the mass, charge, and radius of the shell. Vibration levels for the shell model are very nearly equally spaced and each has associated with it a set of rotation levels.

Nuclear radii values calculated for this model agree fairly well with the theory of alpha ray disintegration, but are nearly double those given by the target area for fast neutrons. This may be due to the nuclei being transparent for fast neutrons. H.A.W.

The Spherical Shell Nuclear Model. By H. A. Wilson. *Phys. Rev., 77: 516, February 15, 1950.*

Faraday Effect

In 1846 Michael Faraday discovered that any transparent isotropic medium, which in itself may be optically inactive, would rotate the plane of polarization when placed in a magnetic field. The rotation is proportional to the length of the light path through the medium, to the magnetic field strength, and to the cosine of the angle of the light path and the axis of the field.

The proportionality constant, the Verdet Constant V, is multiplied by the molecular weight and divided by the density of the substance investigated, giving rise to a term called the Molecular Verdet Constant, which is nearly temperature independent, and dependent only upon any electronic shifts in molecular structure. It has been shown that simple dipole association such as solvation and hydrogen-bonding where no changes in elec-