PHYSICS

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ABSTRACTS

Liquid Scintillation Technique for Radiocarbon Dating of Samples of High Organic Content.[1] JOHN L. LEPERA and DAVID E. KOLTENBAH, Department of Physics and Astronomy, and JOHN H. MEISER, Department of Chemistry, Ball State University, Muncie, Indiana 47306.——Design and construction of radiocarbon-dating apparatus at Ball State University is described. The technique first involves pyrolysis of the organic sample and the conversion of the carbon to acetylene, which is then trimerized over vanadium pentoxide to benzene. The radiocarbon content of the benzene is determined by liquid scintillation counting in a Beckman Model LS-100 Liquid Scintillation System. The method is particularly useful for dating organic materials of high carbon content and is being employed in a survey of peats and marls, principally in east central Indiana, and in dating various Indian site remains in Indiana. Details of the standardization of the counting technique and calculation of ages were given by Binnion, Meiser, and Koltenbah (see the Chemistry Division, p. 125).

An Optical Instrument for Viewing Near-flat Surfaces: The "Toposcope". WILLIAM W. DAVIS, 4124 North Pennsylvania Street, Indianapolis, Indiana 46205.——This instrument employs reflection from a flat or near-flat specimen surface as part of an optical system. All deviations from flatness (of the order of a few seconds of tilt) are made visible or dark. Resolution is excellent and fine structural detail can be seen in specimen surfaces where significant contour patterns exist. Surfaces as large as 5 inches in diameter may be examined and photographed with uniform detail and resolution.

The conditions of viewing include light field, dark field, and transition toposcopic modes and the full color mode for direct comparison. Use of the instrument to view lap polished surfaces of silicious stones has revealed much fine structural detail. Crystals deposited on true flats and surface distortions on liquids and gels have also been examined. Photographic examples were shown.

Thermodynamic Considerations in Devising an External Combustion Gas Turbine Engine Refuse Incinerator. GALE M. CRAIG and GERALD P. THOMAS, Department of Physics and Astronomy, Ball State University,

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Muncie, Indiana 47306.——Study and experiment indicate that, with existing technology, a modified open Brayton cycle can be used to burn common municipal refuse at atmospheric pressure and produce useful power while scrubbing the combustion product gases to remove pollutants. The hot combustion gases pass from a combustor through a turbine to a region below atmospheric pressure where they are scrubbed and cooled by mixing with water spray. The water spray and gas mixture is then exhausted to atmospheric pressure through a compressor. Although current compressor designs are workable in this application, a new design is needed which will have reduced water drag power loss.

Some New Solutions of Schrödinger's Equation in Spherical Coordinates. HERBERT H. SNYDER, Department of Mathematics, Southern Illinois University, Carbondale, Illinois 62901.——The solvability of the one-particle Schrödinger equation $\nabla^2\Psi + K^2(E - V)\Psi = 0$ ($K = \text{const.} > 0$) by the method of separation of variables depends not only on the coordinate system, but also on the structure of the potential, V. The problem of determining all such coordinate systems, together with the required form of the potential, was solved by Eisenhart (Phys. Rev., 74:87-89). For spherical coordinates ρ, θ, ϕ, Eisenhart's potential is $V = f(\rho) + g(\theta)/\rho^2 + h(\phi)/\rho^2\sin\theta$, where f, g, h are arbitrary functions. The author applied Eisenhart's theorem to the determination of the wave functions associated with a spherical potential well, described by a piecewise-constant potential which possesses periodic dependence on the angular coordinate ϕ, as well as the usual dependence on ρ. The equation to determine the allowed discrete energy levels now takes the form of a vanishing infinite determinant. Also shown was how the problem of the wave functions associated with the potential of a dipole field, may be similarly treated.

Holography Made Easy. CATHERINE J. BASANAVICUS, PAUL R. ERRINGTON, and JACK P. COLLINS, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306.——This summer, we set-up a holography laboratory at Ball State University. Holography works on the basis of interfering wavefronts. The equipment needed includes film, a laser, a stable base, dispersion lenses, and other accessories. The four types of holograms and the procedure used in making a hologram were discussed. Enough information was given so that others should be able to set-up their own holography laboratory.