

PHYSICS AND ASTRONOMY

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ABSTRACTS

A Valveless Drain-Down Solar Collector System. L. DWIGHT FARRINGER, Department of Physics, Manchester College, North Manchester, Indiana 46962.—To avoid cold-weather nighttime freezing of water-filled solar heat collectors in a domestic hot water system, it is common to use either a closed-loop heat exchanger system with antifreeze liquid in the collector loop or an open-loop system with temperature controlled valves to isolate the collectors from the domestic water system and drain them when freezing conditions prevail. An alternative form of open-loop system has been devised, in which the collectors automatically drain whenever the circulation pump stops. From tests of a small model, it appears that this system may have cost, efficiency, and reliability advantages. Some unanswered questions will be discussed, and plans for a full-scale test system will be described.

Design and Construction of a Dye Laser. J. W. KAELLNER and D. R. OBER, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306.—An organic dye laser has been designed and is currently under construction. The dye laser consists of a mirror-lens combination and a jet stream of dye. The jet stream is excited transversely by a 5-watt argon laser. The open laser cavity design makes the device particularly useful as an instructional and demonstration tool. Preliminary studies will be discussed in which Rhodamine 6G is the lasing medium.

Some Problems Involved in Obtaining Accurate Oscillator Strengths for Use in Astrophysics. RONALD E. PITTS, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306.—During the last decade, there have been great improvements in computers, in astronomical telescopes, and in telescope instrumentation. As a result, more realistic theoretical stellar models have become possible, and interest has been generated in the fields of stellar evolution, cosmogony, and cosmology. With these new investigations has come the need for more accurate abundance determinations of the elements present in both the sun and in other stars.

Abundance determinations are based on atomic oscillator strengths or f -values. Traditionally there have been difficulties in all methods of obtaining experimentally determined f -values. These difficulties range from procuring data free from systematic errors to being unable to apply an accurate technique to a particular line or lines for which f -values are needed. The introduction of lasers into atomic spectroscopy offers some new hope for circumventing some of these difficulties. The f -values obtained with these new laser techniques should be of sufficient accuracy to assist in new improved abundance determinations.

IUE Observations of the Peculiar Object BL Lacertae. ROGER L. SCOTT, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306,

KAREN R. HACKNEY and RICHARD L. HACKNEY, Department of Physics and Astronomy, Western Kentucky University, Bowling Green, Kentucky 42101.—Recent observations of the ultraviolet spectral energy distribution of the extragalactic object BL Lacertae have been obtained using the International Ultraviolet Explorer (IUE) satellite. Low resolution ($\bar{6}\text{\AA}$) IUE spectrographic images were obtained with the LWR camera (3200-1900 Å) and the SWP camera (1900-1300 Å) on 1979 August 20 and 21 respectively. The discussion will compare the ultraviolet data with ground based optical-wavelength observations made at an earlier epoch. The observations were made at Goddard Space Flight Center with the assistance of the IUE Observatory staff, and supported by NASA under grant NSG 5238.

Active Solar Heating Systems for Residential Application in Indiana: A Comparative Optimization Study. R. TAYLOR and R. COSBY, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306.—The FCHART method was used to size and study the performance of residential solar space and water heating systems for four Indiana locations. Local manufacturers or distributors supplied necessary data for the flat-plate collector systems selected for study. Applied to a new "average" Indiana house, the effects of catastrophic fuel increases and tax credits on system design and economics were investigated.

A Tube-Type Photographic Sensitometer. ROBERT L. TONKEL and ROGER L. SCOTT, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306.—The authors have constructed and tested a "tube-type" sensitometer for determining the relative light sensitivity of various photographic emulsions. The instrument is designed after one in use at the University of Florida, and the prototype model built by D. W. Latham of the Smithsonian Astrophysical Observatory (Latham 1969). The discussion will include descriptions of the design and function of the sensitometer and its use in a program for developing and testing various "hypersensitization" techniques which are used to increase the sensitivity of photographic emulsions.

Reference: Latham, D. W., "A Harvard-Smithsonian Tube Sensitometer," American Astronomical Society Photo-Bulletin, No. 1, p. 3, 1969.