PHYSICS AND ASTRONOMY

Chairperson: Malcolm E. Hults
Department of Physics, Ball State University
Muncie, Indiana 47306

Chairperson—Elect: Vincent A. DiNoto, Jr.
Department of Physics, Indiana University Southeast
New Albany, Indiana 47150

ABSTRACTS

Problems in Experimental Studies of the Zeeman Effect. Jolanta M. Czerwinski and Malcom E. Hults, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306.——By studying the intensities of Zeeman components and hyperfine structure of forbidden lines, the presence of interference between electric-quadrupole and magnetic-dipole radiation can be determined. This effect can be obtained by observing the difference in relative intensities of the components in the Zeeman patterns when viewing parallel to the magnetic field as compared with viewing perpendicular to the magnetic field.

The purpose of this report is to illustrate how easily misleading are the data if the instruments are not properly checked and adjusted.

Laboratory Interfacing of the VIC-20 Computer through an A/D Converter. L. Dwight Farringer, Department of Physics, Manchester College, North Manchester, Indiana 46962.——Inexpensive home computers can provide low-cost laboratory computer interfacing experience for college science students. Hardward and software for doing this with the Commodore VIC-20 computer have been developed. For 8-bit digitizing of voltage measurement, an inexpensive ($5) ADC-0809 analog-to-digital converter has been used. With the use of an internal timer of the VIC-20, data logging can be done to record voltage data as a function of time over very short or very long time intervals.

The conversion time of the ADC-0809, operating at the VIC-20's clock frequency, is about 75 microseconds. By using a machine-language subroutine for rapidly storing data in memory locations and resetting the timer, voltage measurements can be recorded at intervals as small as 100 microseconds, so data points can be recorded at rates up to 10,000 per second. This method has been used for digitized recording and display of low-frequency sound waveforms. The stored data could then be used by a Fourier analysis program to compute the frequency spectrum of the waveform.

Laboratory Interfacing of the VIC-20 Computer through its Game-control Port. L. Dwight Farringer, Department of Physics, Manchester College, North Manchester, Indiana 46962.——Inexpensive home computers can provide low-cost laboratory computer interfacing experience for college science students. Hardware and software for doing this with the Commodore VIC-20 computer have been developed. At the simplest level, the control port intended for control of video games can be used. This port provides (a) five digital input/output lines which can be used for on-off signals, and (b) two inputs for variable resistances, from which the computer generates 8-bit digitized numbers proportional to the resistances. The computer also has internal timers which can be used for external time measurement.

Applications have been developed to use the digital I/O lines for such things as "stop watch" control of a millisecond timer, human reaction-time measurements, camera shutter-speed measurements, and photogate control of timing for measuring periods of pendulums or speeds on an air-track.

Applications have also been developed to use resistive transducers for measurement of such physical variables as motion, light intensity, and temperature. By use of timer subroutines, data logging can be done, e.g. measurement of temperature as a function of time, over very short or very long time intervals.

The Development of Computer Software for Use in the High School Chemistry and Physics Classrooms. ARTHUR MIDDLETON, Rensselaer High School, Rensselaer, Indiana 47978 and DAVID R. OBER, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306.——A series of computer programs in Physics and Chemistry has been developed for the microcomputer. These programs deal with the analysis of laboratory data, quizzes, simulations, and autotutorials. Programs have been developed for both the classroom and the laboratory. The topics of the various programs will be presented and some sample programs will be illustrated. These programs will be discussed in the context of software that is commercially available at this time. A report on preliminary work involving the interfacing of microcomputers to laboratory hardware will also be given.

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Photographing the Night Sky. ROGER L. SCOTT, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306.——Many people, laymen and professionals alike, associate photography of the night sky with the use of telescopes and telephoto lenses. In fact, beautiful and educational celestial photography can be accomplished with an ordinary 35 mm camera mounted on a sturdy tripod. Using exposures of only 20 to 40 seconds, modern color film will record in vivid color all the stars that you can see as well as many others too faint for the unaided eye. The discussion will include simple techniques for night sky photography, as well as several examples of what can be accomplished.