

# physical sciences notes

## PHYSICAL CHEMISTRY

### Spectral lines of organic solid

The first known observation of the splitting of spectral lines of a complex organic solid under the influence of an electric field has been reported by Dr. Robin Hochstrasser of the University of Pennsylvania.

The Stark effect, as such splitting is known, was detected in simple atomic gases in 1913 by Johannes Stark, awarded the Nobel Prize for this work in 1919.

Dr. Hochstrasser is studying the way energy is transferred from molecule to molecule within solids when the molecules are excited by light. This knowledge is important to understanding such processes as photosynthesis and vision, as well as other molecular processes within a cell.

In 1965, Dr. Hochstrasser reported the first splitting of spectral lines in complex organic solids under the influence of a magnetic field. Magnetic separation of the spectral lines of atoms and simple molecules is known as the Zeeman effect, for which Peter Zeeman won the Nobel Prize in 1902.

Both developments are similar to an increase in the resolving power of a lens, since they allow studying the structure of molecules and solids in greater detail than ordinary spectroscopic analysis.

## RADIO ASTRONOMY

### Sun being used as sender in radio tests

The sun is being used as if it were a satellite in experiments studying the atmosphere's effect on the transmission of radio waves having a frequency of either 16 billion or 30 billion cycles a second.

The aim is to determine how rain or other moisture in the atmosphere affects the strength of signals at these frequencies, typical of those that may become useful for satellite communications. Since no satellite is broadcasting radio waves at these frequencies, solar transmissions are being used.

The sun tracker constructed by Bell Telephone Laboratory scientists for the test consists of a flat metal reflector, five by nine feet, that automatically follows the sun from dawn until dusk. The signals are reflected into a stationary horn antenna.

Frequencies above 12 megacycles would open previously unused parts of the radio spectrum for satellite communications and deep space probes, but such signals are severely weakened by rain. The studies so far show that periods of high attenuation due to rain last 10 minutes or less, since rain storms are patchy.

## MATHEMATICS

### Courses for physical scientists

Results of a national study of mathematics for physicists, chemists, biologists and engineers show that most courses should be a combination of 50 percent theory and 50 percent application.

In such courses as statistics and machine computation, most scientists queried in the survey recommended a greater emphasis on applications than on theory. Many scientists indicated that certain mathematics courses

should be shortened.

For instance, chemists and physicists often find no need for a full course in group theory, but would like to have a one semester course giving all of the basic concepts, theory and applications to their field of specialty.

A report on the results of the National Study of Mathematics Requirement for Scientists and Engineers is published in the May 17 *SCIENCE* by G. H. Miller of Tennessee Technological University, Cookeville.

## SOLID STATE PHYSICS

### New solid state journal

Measurements of volume as a function of pressure are among the earliest and probably the most extensive high pressure studies yet made. Results of such studies are of interest for testing both atomic and macroscopic theories of the equations of state, which define the physical condition of a given substance.

The four most common methods for these studies are piston displacement, X-ray diffraction, ultrasonic velocity and shock velocity. A summary of the advantages and disadvantages of these methods is reported by Dr. H. G. Drickamer of the University of Illinois in the first issue of *COMMENTS ON SOLID STATE PHYSICS* (April-May, 1968).

The aims and format of the new journal are the same as *COMMENTS ON NUCLEAR AND PARTICLE PHYSICS*, first issued in 1967 (SN: 2/25/67, p. 192).

## ASTRONOMY

### Gamma ray source reported detected

After many unsuccessful attempts to detect radiation from celestial sources even shorter than X-rays, scientists from Rice University report they have measured gamma rays from the Crab Nebula, using a scintillation detector carried by balloon to 38 kilometers above earth's surface (SN: 9/29/67, p. 117).

When the gamma rays they detected are combined with radio, optical and X-ray measures, the electromagnetic radiation from the Crab source has been recorded, with some gaps, over a frequency range of a million million to one.

In another balloon experiment, gamma radiation was also detected from the constellation of Cygnus, but its exact source is not known with certainty.

## ASTRONOMY

### Moon phases calculated to A.D. 2003

The phases of the moon for each month from 1960 through 2003 have been predicted by a computer at the U.S. Naval Observatory, and published as Circular No. 119.

However, Berenice L. Morrison warns that the times of the phases so computed "may occasionally differ by a minute from the times printed annually in the 'American Ephemeris and Nautical Almanac'."

For those going to Antarctica, Louise B. Wilson of the observatory has plotted the time of sunlight, moonlight and twilight during the years 1969 through 1971. Her graphs are available in Circular No. 120.

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