

physical sciences notes

SOLID STATE PHYSICS

Continuous laser beam tuned

A way to tune the frequency of a continuous laser beam, as radio waves can be changed to different frequencies, is reported by Bell Telephone Laboratory scientists. Previously, the only known variable parametric oscillators were operated with pulsed lasers.

The new oscillator was made possible using crystals of barium sodium niobate ($\text{Ba}_2\text{NaNb}_5\text{O}_{15}$). Two are used in the system; one converts infrared laser light into green radiation that, after passing through a focusing lens, pumps the second crystal, which operates as the oscillator.

Tuning of the light from one wavelength to another is possible because the exact frequencies of the exiting light beams are matched in phase by controlling the temperature of the oscillator crystal.

In the initial experiments by Dr. R. G. Smith and his co-workers at Bell, the oscillator output was tuned from 9,800 Angstroms to 11,600 Angstroms, equivalent to a bandwidth of 45 million million cycles.

CELESTIAL MECHANICS

Lunar positions found in error

Preliminary numerical calculations on the moon's motion indicate that the lunar positions now in use are in error by several hundred meters at certain times.

These errors are large enough "to affect adversely analyses of data from spacecraft as well as determination of ephemeris time," report Drs. J. Deral Mulholland and Charles J. Devine of the Jet Propulsion Laboratory, Pasadena. Tracking of space probes on or near the moon confirms the computed errors, Drs. C. N. Cary and W. L. Sjogren, also of the laboratory, state in a companion report in the May 24 *SCIENCE*.

Radar waves reflected from the moon also show discrepancies from ephemeris positions, Dr. Gordon H. Pettengill of the Massachusetts Institute of Technology, Cambridge, and three co-workers report.

ASTRONOMY

High resolution orbiting telescope

Launching an orbiting optical telescope 25 times the diameter of Palomar's in the form of a composite mirror made of 200 individual segments is proposed in the May 24 *SCIENCE*.

Dr. Gerard K. O'Neill, physics professor at Princeton University, calculates that such a telescope "would resolve detail of about 300 meters on the inner planets at closest approach or of a few kilometers on Jupiter."

Rockets capable of putting a 120-ton payload in low orbit are expected to be available by 1970. Dr. O'Neill suggests that 40 tons of such a payload be 200 mirrors, each one meter in diameter and 10 centimeters thick. Assembled, they would form a lace-like pattern and intercept about one percent of the light falling on the total 5,000-inch diameter.

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BIOCHEMISTRY

Five prostaglandins synthesized

Synthesis of five hormones in the family of prostaglandins that play a fundamental role in the metabolism of living cells is reported by seven chemists at Harvard University in the May 22 *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*.

Although prostaglandins have been known since 1930, research on their effects has been hampered by the extremely small amount of these hormones that can be extracted from their natural source in animal tissues. The ability to synthesize five of the 15 or so hormones comprising the prostaglandins from readily available chemicals will speed acquisition of basic facts about their effects on the body.

Adaptations of the methods of making the five should make the others easily obtainable in the laboratory, report Dr. Elias J. Corey and the six post-doctoral fellows who worked with him.

Prostaglandins, now that they can be synthesized, are expected to be of value in treating high blood pressure and other circulatory ailments, obesity and stress.

INORGANIC CHEMISTRY

Perbromate synthesis clears inconsistency

An inconsistency in the reactions of members of the halogen family that has plagued inorganic chemists since the middle of the 19th century has been cleared up by the creation of compounds in which bromine has a valence equal to that of seven hydrogen atoms.

Chlorine, bromine, iodine and fluorine belong to the chemical family called halogens, which have many properties in common. Chlorine, which is one of the lighter elements, and iodine, having a much higher atomic weight than chlorine, both form heptavalent compounds.

Scientists at Argonne National Laboratory now find the first heptavalent compounds of bromine, which lies between chlorine and iodine in the halogens. Perbromic acid has been synthesized by Dr. Evan H. Appelman, and its identity confirmed by Dr. Martin H. Studier.

Success of the experiments is attributed to radiochemical techniques allowing detection of very small amounts of perbromate produced in the first experiments. A new oxidizing agent, xenon difluoride, has made it possible to produce relatively large amounts of perbromate in later experiments.

METEORITICS

Denver stone; a new fall

The first freshly fallen meteorite to be recovered in the United States since Sept. 9, 1961, was discovered in the roof of a Denver warehouse on July 17, 1967, where it had evidently landed during the preceding week.

Its composition and structure are those of an olivine-hypersthene chondrite, Drs. Brian Mason and Eugene Jarosewich of the U.S. National Museum report in the May 24 *SCIENCE*.