

## BIOLOGY

**Cave Creature Governed By Daily Metabolic Cycle**

► THE CAVE CRAYFISH is a stranger to daylight. He lives deep underground in an environment free from light and temperature changes. Nevertheless, he is probably subject to the same daily metabolic rhythms known to affect the activity of plants and animals living in a normal day-and-night environment on the earth's surface.

This discovery, says Dr. Frank A. Brown, Jr., adds "strong additional support" to the theory that all organisms respond to the universal influence of a 24-hour cycle, timed by the earth's rotation, no matter where they live.

Dr. Brown, a zoologist at Northwestern University, Evanston, Ill., found "a statistically significant 24-hour rhythm of activity," previously unnoticed, while studying records kept on cave crayfish left in constant darkness after their capture.

The eyeless, pigmentless creatures were taken from the River Styx inside Mammoth Cave, Kentucky. Since the cave may have been formed as long as four million years ago, the crayfish have been in darkness for countless generations. Temperature measurements of the river at various times of the year have shown no significant variations.

Energy-producing chemical changes reached their daily peak in the crayfish at about 7 p.m. Minimum metabolic activity occurred at about 9 a.m. Activity from 8 a.m. to 10 a.m. in the morning was less than half that from 6 p.m. to 8 p.m. in the evening, Dr. Brown reports in *Nature*, 191:929, 1961.

This daily rhythm in metabolism, Dr. Brown states, closely resembles that of the incubating chick egg, and is almost identical to that of the fiddler crab, the potato plant and numerous other organisms investigated so far.

• *Science News Letter*, 80:192 September 16, 1961

## BIOCHEMISTRY

**Poliovirus Toughens to Survive Large Drug Dose**

► THE POLIOVIRUS can become so tough that it can survive a drug dosage 10,000 times that required to stop its ancestors.

The wild Mahoney poliovirus can develop such resistance, Drs. Joseph L. Melnick, Derek Crowther and Julio Barrera-Oro of Baylor University College of Medicine in Houston, Texas, reports. So can the attenuated LSc strain, "the very virus used in the oral polio vaccine."

Both of these strains have built up resistance to guanidine hydrochloride, a potent inhibitor of poliovirus multiplication, in the test tube, and the Mahoney strain has become resistant while living in monkeys.

Whether inside the monkey or out, the resistance builds up when the virus has to

grow in the presence of the drug. Each generation becomes a little tougher than the last.

No one knows just how the viruses do it, but the process of developing resistance probably is similar to the build up of resistance in bacteria. This resistance creates a possible difficulty in developing an efficient drug to combat the virus, the researchers report in *Science*, 134:557, 1961.

The findings should not alarm persons who have had poliovirus vaccine. The Salk shots contain only killed virus, and the poliovirus in Sabin oral vaccine is in no danger of becoming resistant to guanidine hydrochloride. This drug is too toxic to be given to humans.

• *Science News Letter*, 80:192 September 16, 1961

## TECHNOLOGY

**Solar Heating Proves Costly in New England**

► SOLAR HEATING EQUIPMENT costs more than can be justified by fuel savings in a suburban home in New England.

Massachusetts Institute of Technology engineers have reached this and other conclusions from detailed records of three years' experience with their fourth solar house. Their findings were reported by Prof. Alfred G. H. Dietz at the United Nations Conference on New (non-nuclear) Energy Sources, in Rome.

Sunshine hitting the roof of this particular three-bedroom suburban house provided two-thirds of the energy required to heat it and gave an adequate hot water supply. Claremont D. Engebretson, a mechanical engineer, and his family occupied the home throughout the last three years. It will now be converted into a conventional home and sold.

"In countries where conventional fuels are abundant," Prof. Dietz told the United Nations Conference, "the use of solar energy for heating is economically attractive only where there is an unusually high yield of sunshine per square foot."

The energy collector of this particular solar house, in Lexington, Mass., was 16 by 40 feet and consisted of two layers of glass over a thin aluminum sheet painted black. It was set at an angle of 60 degrees and served as one wall of the house.

Water pumped through copper tubes attached to the aluminum sheet was heated by the trapped solar energy and stored in a 1,500-gallon tank in the basement. Hot water was pumped through a heat exchanger to transfer heat from the water to air, and the warm air was forced into the living rooms through ducts.

The experience gained in constructing and operating this unit, Prof. Dietz believes, will some day be valuable. It would be feasible, he said, to heat a house solely by a solar system even in the random weather of New England, but more storage space would be required than could conveniently be provided in a small house.

M.I.T. researchers now expect to concentrate on problems that can be explored without a full-scale house.

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**IN SCIENCE**

## CHEMISTRY

**Ethane Found Useful In Tritium Measurements**

► A NEW METHOD of measuring the radioactivity of tritium, a hydrogen isotope, with ethane, a gaseous hydrocarbon, is being used at the University of California's tritium laboratory at La Jolla.

Three researchers in the University's chemistry department point out that much larger amounts of hydrogen, the only gas used to date for counting gas-phase tritium, can be put into a counter when the hydrogen is first converted to a hydrocarbon. The need for enrichment with tritium is lessened and the resulting measurements are more accurate, they state.

Drs. A. E. Bainbridge, Paula Sandoval and H. E. Suess report in *Science*, 134:552, 1961, that ethane, synthesized by mixing hydrogen with acetylene over a colloidal palladium catalyst, has "ideal" counting characteristics for low-level tritium activity.

The amount of radioactivity of tritium is used to date the age of recent air and water samples.

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## METEOROLOGY

**Women's Names Win out As Hurricane Designation**

► WITH HURRICANES Betsy and Carla kicking up a fuss, U. S. weathermen have again been working their way through the list of women's names to dub hurricanes.

Following in the footsteps of Hurricane Anna, future hurricanes this year will carry names ranging from Debbie and Esther all the way to Tanya, Virgy and Wenda if the need should arise. Girl's names have been used since 1953 to identify tropical storms in the Atlantic Ocean, Caribbean Sea and Gulf of Mexico.

Experience has shown that using girl's names produces less errors while broadcasting or transmitting hurricane news than the older, more cumbersome method of latitude and longitude position. The system is also shorter and quicker.

Last year the U. S. Weather Bureau adopted a system of using the same set of names every four years. If a major hurricane sweeps through the United States causing extensive damage and loss of life, the name assigned to it is put in mothballs for 10 years. Hurricane Donna last year thus far is the only unhappy holder of this distinction.

Some persons have suggested that hurricanes be designated by numbers (1-2-3), animals (antelope-bear-coyote), or by boy's names (Arthur-Ben-Christopher), but the female sex has won the male weathermen over.

• *Science News Letter*, 80:192 September 16, 1961

# E FIELDS

## BACTERIOLOGY

### Germs That Enjoy Heat Threaten Food Spoilage

► HEAT-LOVING bacteria that threaten potential food spoilage trouble in connection with the present increase of the automated dispensing of hot-prepared foods are being studied in various parts of the world, it was learned at the Tenth Pacific Science Congress in Honolulu.

The thermophilic bacteria can cause food loss even in canned food that has been improperly cooled after processing. The microorganisms can grow rapidly at unusually high temperatures.

Dr. Hilmer A. Frank of the University of Hawaii's department of food processing and utilization discussed basic work on the methods of spoilage and the enzyme systems, the factors affecting spore formation and growth, and other phases of the development of heat-loving bacteria.

Several antibiotics alone and in conjunction with heat may be the practical solution of combating the food spoilage microorganisms. These and other possibilities are being explored.

Heat usually kills germs but in some cases the particular kinds that actually enjoy high temperatures have been found growing merrily in natural hot springs of relatively high temperature.

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## OCEANOGRAPHY

### Huge Fault in Ocean Floor Moves 720 Miles

► A HUGE SCAR in the ocean floor has moved 720 miles. However, it took 100,000,000 years to do it.

Magnetic surveys conducted by United States ships off the California coast have shown that rocks along the Mendocino fault have moved eastward at a speed of approximately one-half an inch per year. The movement stopped many millions of years ago.

Ships cutting through the ocean waters measured changes of the earth's magnetism caused by the rocks in the ocean floor. By matching the magnetic "grain" of the rocks north and south of the fault, the direction and extent of movement can be measured.

A sister fault, roughly paralleling the Mendocino scar, has moved about 150 miles, making a total displacement of 870 miles. The faults probably once extended right into California, but years of erosion have wiped out all evidence.

The large displacements along the faults strongly agree with data supporting the continental drift theory. Many scientists believe the continents of the world have been drifting apart for many millions of years.

The geomagnetic surveys were first con-

ducted by Scripps Institution of Oceanography aboard the U. S. Coast and Geodetic Survey ship, Pioneer, and later extended by Scripps ships, Drs. Victor Vacquier, Arthur D. Raff and Robert E. Warren report in Geological Society of America Bulletin, 72:1251, 1961.

Except for the rumblings along these east-west faults, the northeastern Pacific Ocean floor "has been relatively quiet since some time in the Paleozoic era," which ended about 230,000,000 years ago, the scientists report.

Large movements along faults have also been recorded on land. Movement along the San Andreas fault in California, cause of many earthquakes that shock the state, has been about 350 miles in the last 130,000,000 years.

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## BIOCHEMISTRY

### Enzyme Action Puzzle May Soon Be Solved

► THE MYSTERY of how enzymes speed up chemical reactions in living things is on the verge of discovery according to Prof. Frank H. Westheimer, chairman, chemistry department, Harvard University.

Enzymes are giant proteins within the cells composed of thousands of atoms. At body temperatures they catalyze chemical reactions that scientists in laboratories can duplicate only at very high temperatures and with the assistance of strong acids, alkalies and other chemicals.

The complexity of enzymes makes experimenting directly with them extremely difficult. Prof. Westheimer and others have devised "chemical models," simple chemical compounds that in essential ways mimic the reactions of certain enzymes, with which to study the actions of enzymes.

Prof. Westheimer told the Fifth International Congress on Biochemistry in Moscow that two enzymes are particularly important. They are ribonuclease which catalyzes the break up of ribonucleic acid (RNA), and alcohol dehydrogenase, which transfers hydrogen atoms from sugar, starch and other substances to coenzymes, or special carrier molecules.

Ribonuclease is the first enzyme whose number and precise arrangement of amino acid building blocks is known, and a three-dimensional model of this molecule has been constructed. However, there is much yet to be solved about the workings of this enzyme.

Every region in an enzyme is not active in catalysis. The "active sites" of ribonuclease are under study, as are the significance of the coiling and folding of the long molecule.

Although much is known about how alcohol dehydrogenase works, the arrangement of its amino acids is still a puzzle.

As progress in the field continues, Prof. Westheimer noted, the theory of enzyme action will become secure and chemists may be able to create synthetic catalysts like enzymes in the laboratory.

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## CHEMISTRY

### Crystal Growth Method For Improving Masers

► SCIENTISTS have developed a crystal-growing technique that will improve the already amazing performance of masers and optical masers, the devices that can amplify a pinpoint frequency of sound or a narrow band of light hundreds of times.

The currently used method of growing artificial crystals yield crystals that are under considerable strain, with the internal structure distorted, and the two beginning materials are not evenly distributed.

Such imperfections are tolerable when the crystals are used as jewel bearings or as phonograph needles. But masers need a crystal of better quality.

The new technique, developed by E. A. D. White of the General Electric Co., Ltd., Wembley, England, produces "good-quality" crystals of pure corundum or ruby (corundum and chromium) by dissolving the materials in lead fluoride. The whole process is carried out in a platinum crucible heated in a laboratory furnace. As the solution cools slowly, it crystallizes.

In some cases, Dr. White reports in Nature, 191:901, 1961, lead fluoride gets inside the crystal. But most of the crystals are clear and free of strain.

"The incorporation of high concentrations of paramagnetic ions," a highly desirable feature for crystals used in masers, is easily achieved with the new method.

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## PUBLIC HEALTH

### Process Removes 98% of Strontium-90 From Milk

► SHOULD the United States be hit by a nuclear attack, the milk supply, at least, could be made safe. The Agricultural Research Service, the Atomic Energy Commission and the U. S. Public Health Service have developed a process that removes 98% of the strontium-90 from milk.

The technique used is a complicated version of the water softening process: Citric acid is added to cold raw milk to ionize all the strontium. (Without the acid, only 60% of the strontium would be in ionized form.) The milk-acid mixture is then poured through tall columns containing an ion-exchange resin that essentially snatches the strontium ions out of the milk as it flows by.

The remaining steps are merely clean-up chemistry: The milk is treated with potassium hydroxide (an alkali) to neutralize the acid, then pasteurized and homogenized. Water added with the acid and alkali is removed by flash heating the milk in a vacuum chamber.

The process is now being tested on a pilot-plant basis at the U. S. Department of Agriculture's research center in Beltsville, Md., the developers report in Agricultural Research, 10:14, 1961.

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