

about 2.26 billion electron-volts. It was found by a collaboration of physicists from Columbia University, Fermilab, the University of Hawaii and the University of Illinois. The experiment is of a type called photoproduction, in which high-energy photons (gamma rays) are struck against a metal target. The interaction between the photons and the atomic nuclei in the target causes the photon's energy to materialize itself into any and all kinds of particles. Among them are 50 events

that have the characteristics of the new antibaryon, and the phenomenon is so sharply defined the experimenters are sure it's a particle and not some amorphous bump in the data.

In principle such an antibaryon should be produced as part of a pair that includes its counterpart, a charmed baryon. Presumably these are also being made, although for technical reasons the experiment is unable to record them. Most likely they will be looked for soon. □

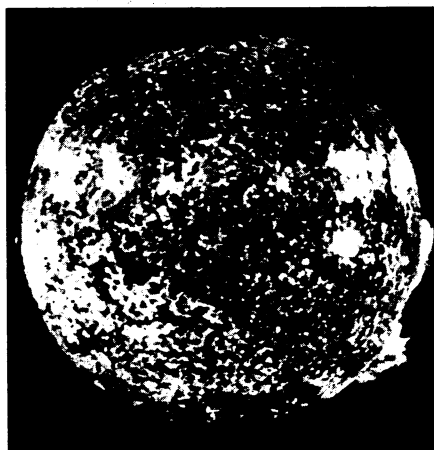
contaminated over the years with accreted material of varying composition. Their calculations indicate that the expected neutrino counting rate decreases by a factor roughly equal to the ratio of the HEA then (about 4.5 billion years ago) and now.

If, as mentioned, one assumes that the HEA have doubled, one predicts a neutrino rate of about 2.6 solar neutrino units (SNU). (Standard theory predicts a production rate of about 6 SNU.)

Six years ago, Raymond Davis Jr. of Brookhaven National Laboratory began looking for neutrinos emitted by the sun using a 105,000-gallon tank of perchloroethylene buried under the Black Hills in South Dakota. An average of all the accumulated data indicates an observed neutrino production rate of only $1.4 \pm .4$ SNU. If one regards this not as a definite measurement but as a constraint, as Davis prefers to do, the experimental statistics yield an upper limit on the rate of 1.8 SNU. Although the new prediction is still in excess of that actually observed, it certainly is a step in the right direction. □

Mammoth quakes jostle the sun

Oscillations of the sun have once again been observed (SN: 8/2/75, p. 68), but this time with a new twist. Using NASA's Orbiting Solar Observatory 8, a team of French scientists have measured monstrous oscillations of the sun's atmosphere occurring every 14 minutes. The high-resolution ultraviolet sensors aboard the spacecraft detected pulses with amplitudes of 1,300 kilometers. This is in stark contrast to previous measurements, by Henry A. Hill of the University of Arizona, which have recorded solar oscillations with amplitudes one ten-thousandth as great. "This is definitely a new phenomenon," says Hill, and probably represents a pulsation characteristic of the solar corona (the outermost aura of the sun). The corona is millions of degrees hot and is that portion whose visible light remains during a total eclipse. Sound travels at a speed that increases as the square root of the temperature. Acoustic waves, which are most likely responsible for the observed pulsations, therefore travel through the sun with ease. Thus far theories for generally explaining the solar corona have not been successfully formulated. As such, this new phenomenon, which seems to involve that portion of the sun, is completely unexpected and cur-



The sun (this photo taken by the Skylab ultraviolet spectroheliograph) has been seen to oscillate, changing its effective radius by 2 arc-seconds every 14 minutes.

rently lacks an adequate explanation. The principal investigator responsible for the French instrument on board OSO-8 is Roger Bonnet of Centre National de la Recherche Scientifique in Paris. The OSO-8 craft was launched last year equipped with instruments to study the sun and cosmic X-rays from the background radiation. □

Cuneiform tablets tell of ancient empire

King Naram-Sin of Akkad, the great Mesopotamian state, conquered Ebla in 2550 B.C., looted the palace and set it afire. Little has been heard of Ebla since, but excavations made by Italian archaeologists in Syria last year are now revealing that Ebla may have been a vast and civilized empire, rivaling Mesopotamia and Egypt in the history of civilization. The most important evidence for this comes in the form of 15,000 clay tablets covered in cuneiform script. David Noel Freedman of the University of Michigan worked with the Italian team. He says of the find: "It is as if we had ignored that Rome existed and suddenly find out about it and the Roman empire."

The language of the tablets, unknown until now, has been named Eblite by the researchers. It is related to the Biblical

Solar neutrinos: The inside story

Yet another hypothesis attempting to explain the absence of expected solar neutrinos has been added to the growing stockpile. It depends on the accretion of interstellar material onto the surface of the sun via gravitational attraction. This mechanism (which is not new) has the net effect, the authors argue, of enhancing the heavy element abundances (HEA) of the sun's surface compared with its interior. Since all the known relevant observations measure only the surface qualities, inferences made about the interior HEA may well be overestimates. Previous calculations by John N. Bahcall of the Institute for Advanced Study and others indicate that decreasing the solar interior's HEA would cause it (via a lengthy progression of interactions) to cool by a fraction of a million degrees. The neutrino production mechanism is highly sensitive to

temperature, so this cooling would cause a suppression of the sun's neutrino output.

Based on these calculations and their reasoning, Michael J. Newman of the California Institute of Technology and Raymond J. Talbot Jr. of Rice University conclude that much of the theoretical discrepancy with observation may be due to misguided extrapolations of observed surface abundances to the interior.

Reporting in the Aug. 12 NATURE, the researchers discuss the evolution of HEA in the interstellar medium due simply to the ongoing process of nucleosynthesis. Theoretical solar models, they claim, predict that over the lifetime of the sun, the HEA may have as much as doubled (by mass). In that case, they continue, qualities of the solar interior, which reflect the conditions at birth, will differ markedly from those of the surface, which has been



Cuneiform script tells of Eblan empire.

Hebrew that was used about one thousand years later. One of the most important tablets is one containing a vocabulary of Ebalite and Sumeric words. The Sumerians, developers of cuneiform script, thrived in Mesopotamia about 3000 B.C.

The tablets, found in the ruins of the ancient palace, are now being translated. They tell of commercial transactions, international treaties, military reports, religious rites and sacrifices and the story of creation and the great flood. This suggests that Ebla was an important commercial and political power in the area around the Red Sea north to Turkey and east to Mesopotamia. In addition, says linguist Giovanni Pettinato, the tablets shed light on the history of the Jewish people and may contribute to an understanding of some controversial parts of the Bible. □

Fish attracted to electric schools

One otherwise nondescript group of African fishes called "mormyrids" possess a stimulating anatomical feature—an electrical system. An electric organ in the tail generates weak currents, and specialized tissues in the brain in turn detect them. This system helps mormyrids find food and dodge predators in the murky rivers and lake bottoms of tropical Africa and helps them as well, a new study shows, to stay in protective schools.

Mormyrids such as the *Marcusenius cyprinoides* (or "parrot mormyrids") that live in tributaries near Lake Chad form schools at night and migrate along the river bottoms in search of worms and larvae. Although vision is probably the major sensory cue in the schooling behavior of most fishes, ichthyologists agree, visual cues are obviously reduced for nocturnal bottom-dwellers.

Animal behaviorist Peter Moller of Hunter College and the American Museum of Natural History in New York decided to study the schooling behavior of these electric fish. He made field measurements, then conducted laboratory experiments at Daga Weir on the El Beid River in Chad.

He first caught young specimens of *M. cyprinoides* (schooling occurs mainly among young fish) then observed three groups of them for several days in a concrete holding tank. He was able to identify five types of group behavior: pursuit, physical contact, slow group movement, parallel lineup and single-file swimming.

Moller then "disconnected" the electrical system in each member of one observation group by surgically severing the spinal cord and its neurons just above the electrical organ in the tail. This operation, Moller writes in the Aug. 20 *SCIENCE*, does not interfere with the animal's locomotion since the muscle nerves are connected to the spinal cord in front of the

surgical lesion.

The fish in the now "electrically silent" group, Moller found, showed less pursuit of and contact with the current-emitting fishes, and seldom participated in slow group movement. Most striking was the total absence of parallel lineup and single-file swimming—quite characteristic of schooling fishes—among the "turned off" mormyrids.

The data, Moller says, suggest that

electric organ discharges provide the basis for schooling behavior by reducing the number of aggressive physical encounters and keeping the fish spaced within minimum and maximum distances. Since schooling is considered, in large part, a visual process in other fish, this study represents another schooling mechanism that is adapted to aid group cohesion and thus survival in dark, murky waters, Moller says. □

Diet scrutinized for drug metabolism

Due to the ever-increasing number of drugs on the market and the propensity of Americans to take them for every ailment, major or otherwise, scientists are scrutinizing factors that might influence the way drugs behave in the human body. First they found that the drug-metabolizing enzymes a person inherits are crucial for an effective and safe passage of drugs through his body (SN: 6/26/71, p. 438). Then they found that if two or more drugs are taken at the same time, unexpected toxic reactions can result (SN: 5/29/71, p. 365). Now they have found for the first time that diet can influence the speed at which drugs pass through the human body, confirming similar animal results.

Alvito P. Alvares, Karl E. Anderson and Attallah Kappas of Rockefeller University and Allan H. Conney of Hoffmann-LaRoche, Inc. studied three young men over an eight-week period. During the first two weeks of the study, the subjects ate their usual home diet. The average American diet is 15 percent protein, 50 percent sugar and 35 percent fat. During the second two weeks, they were kept on a low-sugar, high-protein diet. The composition of this diet was 44 percent protein, 35 percent sugar and 21 percent fat. During the third two-week period, the subjects were put on a high-sugar, low-protein diet. The composition was 10 percent protein, 70 percent sugar and 20 percent fat. The final two weeks the subjects returned to their usual diets.

During each of the test periods the subjects received a drug called antipyrine on day 10 and a drug called theophylline on day 14. The amounts of the drugs in the subjects' bloodstreams were measured up to a few hours after drug administration. Results in all three subjects, reported in the August *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*, showed that the two drugs were broken down considerably faster when the subjects were on a high-protein rather than a high-sugar diet. Specifically: The half-life for the drugs during the high-protein diet was 9.2 hours, versus 17.5 hours during the high-sugar diet.

The implications? A high-sugar diet would probably predispose people to greater drug toxicity than a high-protein diet, since drugs would linger longer in the body. In fact, animal studies have

shown that protein deficiency increases the toxicity of certain drugs (SN: 7/1/75, p. 43). However, this might not necessarily be the case. A high-protein diet is known to prime the liver enzymes needed to break down drugs in the body, but sometimes these enzymes metabolize drugs and other foreign compounds to a more toxic rather than to a less toxic state. A lot more must be learned about diet and drug metabolism before scientists can recommend what kind of food people should eat to obtain optimal drug metabolism.

For instance, researchers need to know whether the protein and sugar content of the diet also influences the metabolism of other drugs in people. They need to learn whether the fat, vitamin and trace element content of the diet influences human drug metabolism. Unsaturated fats and some vitamins and minerals appear to keep animals' liver enzymes primed for action (SN: 7/19/75, p. 43). Finally, they need to better understand precisely how different dietary components influence drug metabolism. □

NAS panel member forced to resign

For the first time in its history, the National Academy of Sciences has requested and obtained the resignation of a member of one of its committees for inappropriate conduct and conflict of interest. Pathologist Paul Gross was asked to leave the NAS Subcommittee on Particulate Contaminants, of the Committee on Drinking Water Standards, after documents obtained incidentally in a court case revealed he had leaked committee recommendations to a mining company involved in relevant litigation. Gross, 74, lives in Naples, Fla., and holds a research post at the University of South Carolina.

At issue is the question of whether asbestos fibers can be dumped safely into lakes and rivers from which drinking water is to be drawn. Gross has served as a consultant for the Reserve Mining Co., which dumps iron ore wastes containing asbestoslike fibers into Lake Superior. He once testified on the company's behalf in a lawsuit brought by the Environmental Protection Agency to stop the