

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. □

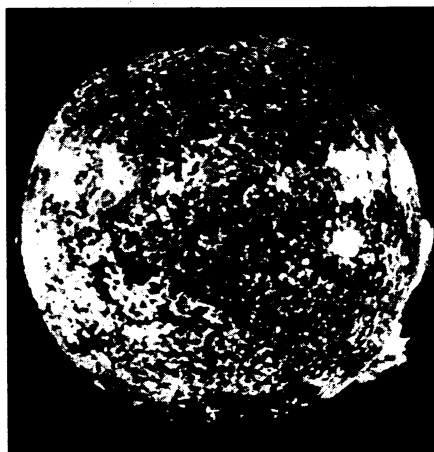
contaminated over the years with accreted material of varying composition. Their calculations indicate that the expected neutrino counting rate decreases by a factor roughly equal to the ratio of the HEA then (about 4.5 billion years ago) and now.

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

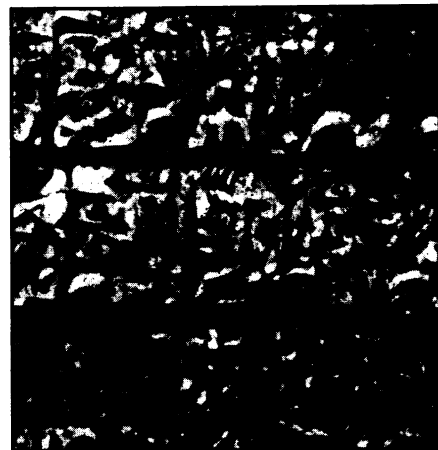
## Solar neutrinos: The inside story

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.*