

Astronomy

Ron Cowen reports from Washington, D.C., at an American Physical Society meeting

Helium poses interstellar puzzle

Scientists continue to analyze data from Astro, the X-ray and ultraviolet observatory that orbited Earth during a nine-day mission last December. One of the spectrographs on board, the Hopkins Ultraviolet Telescope (HUT), detected the absorption of extreme ultraviolet light by neutral helium and hydrogen gas in our galaxy. Researchers used those measurements to infer the ratio of neutral helium to neutral hydrogen in the region between Earth and the white-dwarf star named G191B2B (SN: 1/5/91, p.10). Last week, the same team announced that its calculated ratio — about 8.5 to 100 — matches the cosmic abundance predicted by the Big Bang theory.

At first glance, that finding appears straightforward. But Arthur F. Davidsen, HUT's principal investigator, says the data may prove puzzling; his team had expected a slightly higher ratio. Because it takes more energy to strip an electron from neutral helium than from neutral hydrogen, it's likely that less helium gas would undergo this ionization, says Davidsen, an astronomer at Johns Hopkins University in Baltimore. The lower ionization rate should create a relative surplus of neutral helium compared with neutral hydrogen, he explains, resulting in a higher ratio of the two gases than the ratio believed created at the birth of the universe.

Davidsen suggests several explanations for the apparent discrepancy. Astro's preliminary results indicate that the region between us and the white dwarf may be too chilly to ionize much gas. However, he adds, several earlier studies suggest that although Earth may lie inside a relatively cold, neutral gas cloud, the region closer to the white dwarf contains warmer, less dense gas where significant ionization should occur.

Alternatively, he says, local conditions might somehow conspire to ionize helium and hydrogen gas at identical rates, resulting in a ratio that would remain unchanged from the Big Bang. Says Davidsen, "I don't know the answer to this one yet."

Measuring a shocking velocity

Astronomers working with HUT have also calculated the speed of a shock wave plowing through interstellar space from the Cygnus Loop, a supernova remnant about 26,000 light-years from Earth. The supernova's shock wave proved energetic enough to strip five of eight electrons from atomic oxygen gas and induced these ionized atoms to emit the ultraviolet light detected by HUT, reports Arthur F. Davidsen of Johns Hopkins University. Equating the energy of the emitted ultraviolet light with the kinetic energy of the passing shock wave, Davidsen's team estimates that the wave was speeding along at 168 kilometers per second.

Hubble finds hydrogen cloud excess

A quasar can act like a brilliant searchlight, illuminating vast amounts of material between it and an observer. Taking advantage of this phenomenon, the Hubble Space Telescope's faint-object spectrograph trained its sights on material lit by the quasar 3C273. The absorption spectra detected by the instrument indicated an unexpectedly large number of hydrogen clouds between the quasar and Earth.

"It looks like we skewered between five and seven hydrogen clouds along the line of sight," says Richard J. Harms of Applied Research Corp. in Landover, Md., the spectrograph's principal investigator. Astronomers expected to see at most a cloud or two, he adds.

The clouds may represent budding galaxies that have not yet formed stars, he says, or gaseous halos from mature galaxies. New spectra taken along the line of sight of two other quasars may indicate whether such clouds are a common occurrence, Harms adds.

Biomedicine

Carol Ezzell reports from Atlanta at the annual meeting of the Federation of American Societies for Experimental Biology

A cognitive boost from iron or zinc

Nearly one in 10 U.S. women of reproductive age suffers from iron deficiency, and most of these women are also low on zinc. Studies have shown that a deficiency of either mineral can impair cognitive functioning.

Now, researchers report boosting the memory and reasoning capabilities of 26 iron- and zinc-deficient women with an eight-week regimen of mineral supplementation. At the University of Texas Medical Branch in Galveston, Harold H. Sandstead and a colleague gave the women 30-milligram tablets of iron or zinc, or a tablet of each, every day, along with a general vitamin supplement. For comparison, eight mineral-deficient women and 11 healthy women received only the vitamin supplement.

Women who took either the zinc or iron supplement improved their scores on the Wechsler Memory Test by up to 20 percent, with an average increase of 10 percent, Sandstead says. Those who took only the vitamins showed no change.

Interestingly, women who took the iron-zinc combo did not improve their scores. Sandstead attributes this to the two minerals' ability to cancel each other out, as demonstrated previously in laboratory tests. Iron and zinc also had differing effects on the volunteers' cognition, he says. Iron — but not zinc — improved short-term memory of verbal information, and zinc — but not iron — improved the ability to associate word pairs.

The results are "certainly remarkable," says psychologist James G. Penland, who studies the link between nutrition and cognitive functioning for the U.S. Department of Agriculture in Grand Forks, N.D. But Penland cautions that the Wechsler Memory Test is not the most sensitive cognitive test.

Anti-anxiety drug may help nix heart attacks

Alprazolam, an anti-anxiety drug sold under the trade name Xanax, may do more than just calm you. Coronary researcher John D. Folts — whose animal experiments in the mid-1970s showed that aspirin could prevent the arterial blood clots that lead to heart attacks — now reports animal results suggesting that alprazolam adds to aspirin's ability to stave off such clots.

In 1978, Folts and his co-workers at the University of Wisconsin-Madison, discovered that giving aspirin to dogs with narrowed coronary arteries did not prevent heart attacks if the dogs also had high blood levels of the hormone epinephrine. He found that epinephrine contributed to heart attack risk by promoting the aggregation of platelets, the blood cells that drive clotting.

Aspirin helps prevent blood clotting by binding to a specific receptor on the platelet surface. But it does nothing to reduce anxiety-driven heart attacks, because epinephrine — the "fight-or-flight" hormone associated with anxiety — does not act on platelets through the same receptor, Folts explains.

His team has now tested alprazolam on 10 dogs treated with aspirin for several days and then given an infusion of epinephrine. Only one dog developed clotting in the coronary arteries (coronary thrombosis), Folts reports. But when the same dogs received only aspirin before the epinephrine infusion, seven of the 10 developed the heart-threatening blood clots. Similarly, dogs given only alprazolam alone showed no reduction in coronary thrombosis.

Aspirin plus alprazolam "apparently shows complete protection" from heart-attack-causing blood clots, Folts asserts. Alprazolam's protective effect does not result solely from its mood-calming capabilities, he maintains, citing studies at the University of Texas Southwestern Medical Center in Dallas, in which aspirin combined with the sedative diazepam (Valium) did not ward off coronary thrombosis in patients recovering from heart attacks. Folts suggests that alprazolam acts by blocking platelet-activating factor, a clot-inducing protein produced by cells lining the blood vessels.