physical sciences

A limit on neutron-star mass

A neutron star is supposed to be the result of the compression of all or part of the mass of an ordinary star until the density is equivalent to that of atomic nuclei and it is made up mostly of neutrons.

Within a neutron star are various layers in which the matter possesses different energies and therefore different physical characteristics (SN: 2/27/71, p. 151). In the innermost of these levels, the core of the neutron star, are conditions that lead to an upper limit on possible neutron star masses, write Y. C. Leung of Southeastern Massachusetts University and G. C. Wang of Massachusetts Institute of Technology in the Oct. 4 NATURE PHYSICAL SCIENCE.

The core of a neutron star is a superdense gas of highly excited particles of the class called hadrons. Calculations show that for massive neutron stars the hadron gas is too soft to resist gravitational collapse. Therefore a stable structure can form only if the star's mass is too small for this soft-gas calculation to apply, say Leung and Wang. They conclude that it is unlikely that neutron stars can be more massive than half the sun's mass.

Interstellar thioformaldehyde

The compound thioformaldehyde (H_2CS) has been discovered in the radio source Sagittarius B2 according to a report from Australia in International Astronomical Union circular 2362 dated Oct. 8.

M. W. Sinclair, J.-C. Ribes and N. Fourikis of the Commonwealth Scientific and Industrial Research Organization Division of Radiophysics and R. D. Brown and P. D. Godfrey of Monash University used the 64-meter radio telescope at Parkes for the observation.

Thioformaldehyde is the sulfur analogue of formaldehyde (H_2CO). The observers find a thioformaldehyde/formaldehyde abundance ratio of 1:15. The ratio of sulfur to oxygen is 1:40. The difference appears to be another piece of evidence to show that the abundances of interstellar compounds do not depend simply on the abundances of their constituent elements, but rather that some kinds of selective chemical processes are going on there.

No natural superheavy elements

Nuclear physicists have theoretical reasons to believe that superheavy nuclei (with atomic numbers around 114) may be able to exist with a relative stability that gives them lifetimes of millions of years.

If that is so, it is possible that some such atoms might be present in old mineral samples. However, the results of a two-year search conducted by the Lawrence Berkeley Laboratory leads to a highly pessimistic judgment on the likelihood of finding any.

In a tunnel belonging to the Bay Area Rapid Transit District, located 850 feet under the summit of the Berkeley hills, LBL scientists examined more than 40 samples of ores from the earth and the moon. The work was done underground to protect the samples from interference of cosmic rays. No superheavies were found. "The negative results of this experiment have made us much more pessimistic about finding superheavy elements in nature," says Stanley Thompson, one of the nuclear chemists who did the study.

environment

Phosphates often unnecessary

Federal agencies last month warned housewives that substitutes for phosphates in detergents are more harmful than the phosphates. The implication read into the Federal action—especially by detergent companies—was that housewives should therefore continue to use the phosphate-containing detergents.

A study by CONSUMER REPORTS, described in its October issue, indicates that detergents containing neither phosphates nor substitutes work fine for households with water hardness comparable to the average for the nation.

Test families were given detergents not labeled as to brand or phosphate-content, and were warned not to use ammonia, bluing or other additives that could throw off the test results. The detergents contained no phosphates. Test families used them for 30 to 60 days in water of 130 parts per million hardness minerals.

Says the report: "Our test results suggest that no-phosphate detergents can be used in the typical laundry without any noticeable change in the consumer's satisfaction with the wash. The no-phosphate detergents we tested did the wash every bit as well as the best-selling high-phosphate detergents."

Hot water is prime factor

The temperature of the washing water, not the kind of cleansing agent used, is the key factor in killing pathogens on clothing, reports the Southern Research Institute in Birmingham, Ala.

Working under an Agricultural Research Service grant, SRI scientists placed poliovirus on swatches of fabric, either by direct contact or in aerosol sprays. The swatches were then washed in standard top-loading washing machines and put through wash, rinse and spin cycles. Swatches were of common clothing materials such as wool shirting, cotton terry cloth, wool blanketing, nylon shirting and Dacron-cotton shirting.

Samples of all fabrics were washed in warm water (100-109° F.) and cold water (70-80° F.); samples of all the fabrics except wool were laundered in hot water (120-140° F.).

Very little detectable virus remained after hot water washing. Cold water and warm water reduced virus levels, but still left significant amounts in the still wet fabrics. Warm water left somewhat fewer viruses than cold water. Once the swatches were dried, virus levels on all of them declined further.

Toxin formed in manufacture

A contaminant associated with various pesticides made from chlorophenols is produced in the manufacture of the pesticides rather than in nature, says biochemist Philip C. Kearney of the Agricultural Research Service.

The highly toxic material, TCDD (2,4,7,8-tetra-chlorodibenzo-p-dioxin) has been implicated in teratogenic effects of the use of the herbicide 2,4,5-T. In addition, it causes the skin eruptions called chloracne.

"We are certain TCDD is not produced biosynthetically from 2,4,5-T in soils, nor in any other manner except in the manufacturing process," says Kearney. Quality control in manufacturing can thus prevent contamination, he adds.