physical sciences

Binding clusters of galaxies

Galaxies tend to come in clusters. The clusters appear to be bound together, and that makes a problem for cosmologists because the mutual gravitational attraction of the masses visible in the clusters is not enough to bind them. Observations also indicate that invisible intergalactic gas would not do the job.

In the Aug. 13 NATURE PHYSICAL SCIENCE Joseph Silk of the University of California at Berkeley and Alan Solinger of Massachusetts Institute of Technology propose a means of binding that includes formation and destruction of dwarf galaxies.

According to the Silk-Solinger scenario, which takes the cluster in Coma Berenices for an example, the large galaxies condensed out of clouds of primordial gas. Clouds not massive enough to condense spontaneously would have remained. These leftover clouds would, at some later time, be compressed by shocks caused by outbursts in the central active galaxies of the cluster. The compression could initiate collapse of these clouds into dwarf galaxies. The pressure of the interstellar gas would quickly strip the new galaxies of any residual gas or of gas produced by young stars. Therefore the dwarf galaxies would contain only old stars.

The average time between galactic collisions in the core of the cluster is about a billion years so there has been ample time for the dwarf galaxies to undergo collisions and be disrupted. This leaves a residue of intergalactic stars which help bind the cluster.

Searching for superheavy elements

For several years physicists and chemists have been actively searching for superheavy elements, substances with atomic weights and numbers greater than the 105 now known.

Results of two searches are reported in the Aug. 17 NATURE. F. H. Geisler, P. R. Phillips and R. M. Walker of Washington University in St. Louis looked for evidence of superheavies trapped in natural material. They set up detectors in a salt mine to look for fission products of superheavy nuclei in the surrounding matter. None were found.

Material irradiated by protons was the subject of a search in England by a group of six scientists from the Rutherford Laboratory, the University of Manchester and the Universities Research Reactor. The idea behind the experiment was the hope that some of the bombarding protons would cause some nuclei in the sample material to recoil and collide and fuse with other nuclei producing superheavies. In 1971 this group had presented hotly controverted evidence for the appearance of eka-mercury (element 112) in such a proton-irradiated sample. The present experiment attempted to repeat the earlier one. This time no evidence for eka-mercury or any other superheavy was found. The group concludes that future searches will have to involve direct fusion of heavy nuclei by driving one against another in heavy-ion accelerators.

Interstellar lithium discovered

To the growing list of elements and compounds found in the interstellar clouds now add lithium 7. It was found by its absorptions from the light of the star zeta Ophiuchi by W. A. Traub and N. P. Carleton of the Smithsonian Astrophysical Observatory and Harvard University. The abundance of lithium in the zeta Ophiuchi cloud, they report in the Aug. 15 ASTROPHYSICAL JOURNAL LETTERS, is about one-sixth that in the solar system.

chemistry

From our reporter at the meeting of the American Chemical Society in Chicago

Cutting cholesterol in beef

Heart researchers generally agree that cholesterol is implicated in heart disease. So in 1970, a committee of nutrition scientists suggested that more attention be directed to reducing the saturated fat content of foods. Saturated fat is a major source of cholesterol. Joel Bitman and his coworkers at the U.S. Department of Agriculture in Beltsville, Md., set out to do so.

They have devised a way to reduce saturated fat in beef, cheese, veal and milk. They feed droplets of unsaturated fat encapsulated in protein to cattle. The microcapsules prevent bacteria in the rumen from converting the unsaturated fat to saturated fat. As a result, the unsaturated fat passes into the lower intestinal tract of the cow or steer and is digested as unsaturated fat.

Using this process, they have reduced the saturated fat content of milk by 33 percent, of beef by 18 percent and of veal by 14 percent. Taste tests show no differences between normal beef, veal and cheese and saturated fat lowered beef, veal and cheese. But chemicals must be added to the saturated fat-lowered milk to mask a taste alteration.

Muscle protein sequenced

For the first time the sequence of amino acids in a muscle protein—actin—has been determined. The achievement was reported by Marshall Elzinga and John H. Collins of the Boston Biomedical Research Institute. The protein has 374 amino acids.

The Boston chemists are now able to identify amino acids that have key roles in the function of actin. They can also compare actin from muscles that do not function properly with normal actin, and see whether the muscle malfunction is due to errors in actin's structure.

They are now attempting to sequence myosin, another major muscle protein.

Luminescent white blood cell

In plant photosynthesis or in animal vision, electrons are excited by light. When organisms luminesce (glow), electron excitation is created by chemical reactions, and energy is lost as light.

Luminescence is known to exist in lower organisms, such as sponges, jellyfish, clams, shrimp, fireflies and glow worms. Now it has been demonstrated in mammals as well by Robert C. Allen, Richard Steele and Rune Stjernholm of Tulane University.

They have found that the human white blood cell luminesces when it makes a chemical to destroy bacteria. The electronically excited microbicidal agent then engages in bacterial destruction—perhaps by oxidizing target bacteria (removing electrons from them).

Better than a lawn mower

A compound that inhibits the growth of grass has been developed by chemists at the 3M Co. in St. Paul, Minn. Toxicology tests suggest that the compound will not harm people or the environment. The compound, trifluoromethylsulfonamido acetanilide, goes under the name of SUSTAR plant growth regulator. It has applications where mowing is difficult or costly, such as highway medians and rights-of-way, golf courses and cemeteries.