astronomy

A dry Venus

The atmosphere of the planet Venus has come under very close scrutiny in recent years. Optical and radio observations from the earth, from spacecraft flying by and from spacecraft descending into it have been concentrated on it.

It has been well known for some time that the basic constituent of the Venus atmosphere is carbon dioxide. Researchers have lately been trying to set limits on the amounts of lesser constituents. It was expected that one of these substances would be water. Small amounts of water would be useful in contributing to a greenhouse effect, by which it is supposed temperatures as high as 750 degrees K. are maintained at the surface of the planet.

In the March 9 SCIENCE a group of radio astronomers from the University of California at Berkeley (Michael A. Janssen et al) report that they can observe no water or at least no more than 2 parts per thousand in the lower atmosphere of Venus. This is not enough water, they say to form clouds or to contribute appreciably to a greenhouse effect.

X-ray sources: Black holes or neutron stars?

Theorists suppose that the collapse of a stellar object under the influence of its own gravitation can result in either a black hole or a neutron star. The difference lies in the mass with which the object is endowed, and calculations of the critical mass range from 0.7 times the mass of the sun to 3.2 solar masses.

In December 1972 Remo Ruffini of Princeton University proposed that two of the X-ray sources now under observation by astronomers are in fact black holes (SN: 1/13/73, p. 28). This would mark the first knowing observation of black holes.

Now in the Feb. 15 ASTROPHYSICAL JOURNAL LETTERS Ruffini and Robert W. Leach present an analysis that suggests the pulsating X-ray sources have systematically lower masses than the nonpulsating ones. Ruffini and Leach propose that the pulsating sources (as are radio and optical pulsars) be considered neutron stars and the heavier nonpulsating sources be considered black holes.

How protostars keep cool

Astrophysicists generally regard the dark dusty interstellar clouds as the places where new stars are likely to form. What apparently happens is that part of a cloud begins to collapse under its own gravitation, and this collapse continues until stellar densities and temperatures are reached.

Although some of the heat generated by the gravitational collapse is retained by the protostar, much of it must be carried away or a thermodynamic condition that halts the collapse will be generated. A cooling mechanism is therefore necessary, and it must involve one of the constituents of the clouds: dust, carbon monoxide, hydroxyl or formaldehyde.

In the Feb. 15 ASTROPHYSICAL JOURNAL LETTERS P. S. Berger and M. Simon of the State University of New York at Stony Brook suggest that at the beginning of the process a certain transition of the rotation of the carbon monoxide molecule can radiate away sufficient energy. The isotope $^{12}C^{16}O$ serves as cooler for the surface of the cloud; $^{13}C^{16}O$ cools the interior. Later in the scenario of protostar collapse it appears that cooling by molecular hydrogen and dust grains becomes the dominant mechanism.

natural sciences

The remarkable eyes of trilobites

The eyes of trilobites, small, extinct arthropods of the Paleozoic era, have been found to possess sophisticated, glass-like lenses capable of producing relatively clear images over a wide depth of field.

The lenses owe their remarkable properties to their impregnation with the mineral calcite, specifically calcite with its crystal structure arranged so precisely as to produce the optical properties of glass, says Kenneth M. Towe of the paleobiology department of the Smithsonian Institution.

The calcification might have taken place after the creatures died, Towe reports in the March 9 SCIENCE, except that the crystal orientation is so accurate and consistent from specimen to specimen that it must have been due to a process of biomineralization. "The calcite lenses," he says, "must have been present during the life of the animals."

To study the optics of the lenses, Towe embedded specimens in clear epoxy, face down on glass slides, and looked at objects through them with a microscope. The result was inverted images that stayed in focus from a few millimeters to optical infinity.

A few living arthropods have calcified lenses in their eyes, but, says Towe, their poor crystal orientation would produce double vision.

Early man wipes out early game

When early man discovered America after the chilly northern wastes to which he was accustomed, a population explosion may have resulted in which an abundance of hunters tracked down many large mammals to extinction.

So theorizes Paul S. Martin of the University of Arizona in Tucson, despite the conspicuous lack of "kill sites" that have been commonly found among traces of Stone Age man in similarly temperate parts of Eurasia. The explanation, Martin reports in the March 9 SCIENCE, may be that the newcomers to comfortable North America found their prey more inexperienced and vulnerable than were the Old World's man-shy animals, and thus needed few large kills.

The relatively easy living conditions, Martin maintains, could easily have produced a population explosion in which man swept down from Canada, covering the present United States in scarcely three centuries and all of North and South America in 1,000 years. Hunters in the moving front of humanity could easily have left behind them a wake of extinction among mastodon, mammoth, camel, early horse and other species, between 10,500 and 11,500 years ago. In fact, says Martin, the only way such a population leap could have failed to play a major part in the decimation of the New World's primitive, large mammals is that "sometime before 12,000 years ago, the earliest man came over the Bering Straits—without early woman."

Ancient sheep in South Africa

Sheep bones reported to be the earliest positively identified sheep remains ever found in Sub-Saharan Africa have been unearthed by researchers from the South African Museum in Cape Town at a site about 100 miles to the east.

Radiocarbon dates from charcoal fragments found in the same digging layer give dates of 670 B.C., and 300, 350, 360 and 485 A.D., although the earliest date is in doubt because it came from a possibly unreliable area, report F. R. Schweitzer and K. J. Scott in the Feb. 23 NATURE.