

ASTRONOMY

Stars and Satellites

When astronomers meet nowadays, they discuss a new "heavenly body," the earth satellite. The age of the youngest known stellar group was reported.

► THE YOUNGEST KNOWN stellar group, only 300,000 years old, has been found in the great nebula in Orion, whose place is marked by the middle star of the three in line in Orion's sword.

Dr. Kaj Aa. Strand, director of Northwestern University's Dearborn Observatory, reported his studies of the star cluster consisting of several hundred stars imbedded in the great nebula in Orion at the American Astronomical Society meeting in Urbana, Ill. The study was based on photographic plates taken with the largest lens telescope in the world, the 40-inch refractor at Yerkes Observatory, Williams Bay, Wis.

By comparing plates of the star cluster taken 50 years apart, the first being taken in 1901, he discovered the stars had grown farther apart in that time by a fraction of one in 6,000. This indicates the stars were all together 300,000 years ago, which is then the actual age of the cluster.

In contrast, the solar system is believed to have formed about five billion years ago.

Compared to other young star clusters, for which ages have been estimated at a few million years, the Orion cluster is thus much younger. The age is indicated not only by the expansion, Dr. Strand reported, but also by the fact that, with the exception of the most massive stars in the cluster, most of the stars are still in the stage of gravitational contraction.

According to present theory, a star still contracting because of gravitation is one in a very early stage of evolution. (See SNL, Aug. 24, p. 123.)

Visible Satellites

► EVERYONE would see the earth satellites with the naked eye if the new method for brightening the spheres is adopted.

Key to the increased visibility is to cover the satellite's surface with at least several hundred tiny reflecting metal mirrors, each of which would flash the sun's image earthward. The advantages of doing this were outlined independently by two scientists at the Astronomical Society meeting.

The arrangement would also show how fast the satellite was rotating, Armand Spitz, Spitz Laboratories, Inc., Yorklyn, Del., and Dr. Raymond H. Wilson Jr., Naval Research Laboratory, Washington, D. C., reported.

The satellites could still be seen only at twilight and dawn. But instead of being just barely visible to the naked eye, they would shine with the brightness of Polaris, the North Star, or better.

The method would work for both the 20-inch sphere, expected to be thrown spaceward next spring, and the "baby" earth

satellite, 6.4 inches in diameter, scheduled to be flung into at least a short earth-circling orbit this fall.

As sea and air travelers both know, a flat mirror will flash a bright image of the sun for hundreds of miles. A flat facet, one-half-inch square, would reflect more than 100 times as much light as a 20-inch sphere, Mr. Spitz has calculated.

By sprinkling the satellite's surface with tiny mirrors, the satellite would appear as a moving point of light always at least just visible to the naked eye. Added to this would be flashes of brightness, which might range in frequency from several a minute to several a second.

Some such arrangement is necessary for observations during the expected 99% of the satellite's lifetime after its radio power has been exhausted, Dr. Wilson reported.

The satellites are being launched as part of the International Geophysical Year, a

world-wide scientific assault on the secrets of the earth as a planet. Mr. Spitz is in charge of Operation Moonwatch, code name for the visual observing program for the satellites. The Naval Research Laboratory, under the name of Project Vanguard, has over-all responsibility for the satellite launching.

Composition of Cosmos

► THE COMPOSITION of the cosmos—does it contain the same amount of material nearby as at the remote edges of the observable universe—is being hotly argued by astronomers.

Two teams of astronomers from opposite sides of the world have surveyed the heavens for faint radio sources and come up with results that are poles apart. Their conflicting results were discussed at the meeting.

Dr. J. L. Pawsey of the Commonwealth Scientific and Industrial Research Organization, Sydney, Australia, said the Australian observations show faint radio sources are probably evenly distributed throughout observable space. Dr. A. Hewish of the Cavendish Laboratory, Cambridge, England, disagreed. He said the most recent English observations show the faint radio sources are more numerous at extreme distances.

The problem is extremely complicated because of the faintness of the signals and



GREAT NEBULA IN ORION—This enormous cloud of glowing gases in the constellation Orion is the brightest of the diffuse nebulae. Its place, marked by the middle star of the three in line in Orion's sword, can be seen with the unaided eye, although it appears to be a blurred star until telescope is used. These nebulae are truly faint and not well-defined—not faint because of their great distance as a star may be. Seen close at hand they would still be difficult to distinguish.

the difficulties of separating sources near each other in the sky. The new observations reported at the meeting extended the disagreement, first realized two years ago.

More observations are needed before the contradicted can be solved, Dr. R. Minkowski of Mount Wilson and Palomar Observatories, Pasadena, Calif., and Dr. G. C. McVittie, University of Illinois Observatory, Urbana, each reported. Dr. Minkowski said only 10% to 20% of the sources in distant space that emit detectable signals were intense emitters.

Dr. McVittie pointed out that both visual and radio observations show a spherical distribution around the Milky Way galaxy. He suggested mathematical formulas for two possible arrangements of the radio sources.

Venus's Cloud Cover

➤ THE CLOUDS that cover Venus, the earth's twin sister planet, are not composed of water droplets as are earth clouds, but of particles of carbon-suboxide.

Dr. Gerard P. Kuiper of Yerkes Observatory, Williams Bay, Wis., reported this discovery to the Astronomical Society. He said polarization studies showed the carbon-suboxide, which is a polymerized mixture of carbon and oxygen having the chemical formula C_3O_2 . A polymer is a substance in which a molecule has been linked with identical molecules to form a substance having a higher molecular weight and different physical properties.

Dr. Kuiper also reported he has confirmed the discovery of carbon dioxide in the atmosphere of Mars, first reported in 1947. Carbon dioxide on earth is produced largely by the breathing processes of man and animals, and is consumed by green plants.

His new observations were made of the enhanced carbon dioxide bands at a wavelength of about two microns, or about two 25-thousandths of an inch.

From studies of the four moons of Jupiter first seen by Galileo, Dr. Kuiper has found that two of them are covered with snow. The snow on one of these satellites, which appears darker than the other in visual light, is probably contaminated with silicate dust.

The rate of snow evaporation, even when exposed to vacuum, is not "excessive" at Jupiter's distance from the sun, Dr. Kuiper has calculated.

Good records of Saturn's rings, he reported, confirm earlier results that they are composed of snow. They were once believed to be rock fragments.

Dr. Kuiper's report is based on observations with a device developed by him 11 years ago. Called the infra-red spectrometer, the instrument uses a dime-sized vacuum tube that is ultrasensitive to invisible infra-red light rays.

Very little infra-red light was reflected from Saturn's rings. They appear very dark on the spectrometer. This shows, Dr. Kuiper said, that the rings are made of small snow crystals deposited at very low temperatures.

The infra-red technique also revealed new features about Uranus, showing that its atmosphere is not composed of methane, as

was thought, but of a molecule, HCO, similar to the disinfectant formaldehyde.

New Observatory

➤ OF THE FIVE sites studied for the new national astronomical observatory, Kitt Peak in Arizona has shown "particularly excellent seeing," the American Astronomical Society meeting learned.

Dr. Helmut A. Abt of Yerkes Observatory, Williams Bay, Wis., gave this report for Dr. A. B. Meinel, a member of the National Science Foundation's advisory panel for the planned observatory.

Kitt Peak rises 6,875 feet as an isolated mountain mass on the Papago Indian Reservation 40 miles southwest of Tucson, Ariz. Only a primitive bulldozer trail, with grades as high as 78%, leads to the summit.

Dr. Meinel's report revealed that cloud cover records for Kitt Peak show that cloudiness, especially in summer, is less than at Tucson.

Evolution of "Freak" Star

➤ A "FREAK" star system, of which there are only about 100 in the entire Milky Way's two hundred billion stars, is believed to be in the last stages of evolution, Dr. Otto Struve of the University of California's Leuschner Observatory has reported.

In the annual Henry Norris Russell lecture of the American Astronomical Society, Dr. Struve said that many millions of dollars have been spent in the last 150 years to solve the riddle of beta Lyrae.

This is a naked-eye star, about the same brightness as stars in the Big Dipper, a little south of the brilliant summer object, Vega in Lyra, the lyre, which can be seen now directly overhead. Although beta Lyrae was known to the ancient Chinese, the fact that its brightness is periodically dimmed every 12.9 days was not discovered until 1784.

Since then, hundreds of astronomers have observed it. The object is actually two very close, neighboring stars that revolve around each other, and the changes in brightness of beta Lyrae result from successive eclipses.

There is only one star like it in a volume of space about ten billion cubic light years, Dr. Struve has calculated, whereas ordinary stars like the sun occur at the rate of about one in every 50 cubic light years. A light year is the distance light, traveling at 186,000 miles a second, covers in a year, or about six million million miles.

Dr. Struve explained that stars like beta Lyrae are rare because they lose mass into space only for an extremely short period of time, probably about 10,000 years, compared to the estimated five billion years since the formation of the solar system.

Both stars of beta Lyrae are giant ones, one about 50 times the size of the sun, the other about 30 times. Their surfaces are nearly in contact, some six million miles, compared to the 93,000,000 separating the earth and sun. Because of their large masses, the tidal forces between them are enormous.

Gaseous streams erupt from the surface of both. These streams produce a thin atmospheric envelope revolving around both

stars that is ultimately driven off into space by radiation pressure.

Dr. Struve estimated the amount of matter thus lost by the system is three million billion tons a year. Since at this rate the entire mass of beta Lyrae would be exhausted in about 30,000 years, the loss of mass can last only a short time.

The optical data upon which Dr. Struve's conclusions are based were obtained by him in collaboration with Dr. J. Sahada, of the University of California's Observatory, with a spectrograph at the 100-inch telescope of Mount Wilson Observatory. Dr. S. S. Huang, another University of California Observatory astronomer, also collaborated.

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