physical sciences

The clouds at the center of the galaxy

To find out something of the shape and distribution of the gas clouds at the center of our galaxy, N. Z. Scoville of the Owens Valley Radio Observatory, P. M. Solomon of the Institute for Advanced Study and K. B. Jefferts of Bell Telephone Laboratories did a survey using the radio emanations of carbon monoxide.

Their conclusions, reported in the Jan. 15 ASTROPHYSICAL JOURNAL LETTERS, are: The molecular gas is present throughout the nuclear region of the galaxy though its density falls sharply beyond 300 parsecs from the center. The distribution of the gas is that of a nuclear disk with expanding arms or else a spiral pattern. The total mass of the gas within 600 parsecs of the center is upwards of 100 million times the mass of the sun. The dust grains that contribute the far infrared emanations from the center are located in the gas region.

Looking for extragalactic radio bursts

The explosions of supernovas and various other events should, in principle, produce transient bursts of radio waves. Interest in searching for these bursts is heightened by the supposition that if extragalactic ones are found they will yield information about the space between galaxies (whether there is anything in it) and by the recent discovery of gamma-ray and X-ray bursts of unknown origin.

Unfortunately the latest reported search for such radio bursts records a negative result. It was done by G. R. Huguenin of the University of Massachusetts at Amherst and E. L. Moore of Mount Holyoke College. They used equipment at the Five College Radio Observatory for a series of observations and then added an antenna at the National Radio Astronomy Observatory at Green Bank, W. Va., to make simultaneous searches for bursts arriving coincidentally at both places. They report in the Jan. 15 ASTROPHYSICAL JOURNAL LETTERS that they find nothing they can confidently say is what they were looking for.

California group finds no gravity waves

Gravitational waves, are a prediction of the theory of general relativity. There is one claim that they have been discovered, but it is not yet uncontestedly accepted. An ever-widening search continues.

To those contemplating such a search, the pulsars seem a highly plausible source of gravitational waves. Pulsars are apparently very massive, extremely dense bodies undergoing very swift rotations, and this is the sort of thing that theory would expect to be sources of the radiation.

As gravitational waves pass through a massive body, they should cause tidelike fluctuations of its surface. These fluctuations would be tiny but measurable, and several antennas consisting of large metal masses have been designed. The earth itself is a possible antenna: One might hope to measure its gravity-wave-induced fluctuations with a vertical seismometer. Such an experiment has been set up by a group from the Lawrence Berkeley Laboratory, Terry S. Mast, Jerry E. Nelson and John Sarloos. Taking data at two seismically quiet locations in California, they searched for signals pulsating at the period and the half period of 81 pulsars. Though they could detect earth motions as small as 10^{-11} to 10^{-14} meters, depending on frequency, they report in the Jan. 15 ASTROPHYSICAL JOURNAL LETTERS that they see no evidence for gravity-wave signals from pulsars.

earth sciences

When Greenland rebounded

The Greenland Ice Sheet retreated more than 125 kilometers in the last 9,000 years in the Søndre Strømfjord region of West Greenland. This glacial unloading results in what is called postglacial isostatic rebound—the gradual uplift of a portion of a continent as its heavy load of ice disappears. In that region of Greenland, the process is recorded by emerged marine sediments and visible former shorelines as much as 125 meters above sea level.

Norman W. Ten Brink of the Institute of Polar Studies of Ohio State University has completed detailed studies of the region that provide new data on this uplift process.

He reports that postglacial uplift of the outer Søndre Strømfjord area was extremely rapid initially—about 105 meters per 1,000 years. "This is the highest rate of uplift reported from Greenland thus far, and appears to be one of the highest rates known from any area," Ten Brink says in the February GEOLOGICAL SOCIETY OF AMERICA BULLETIN. After that the rate of uplift decreased exponentially.

Uplift was apparently essentially complete by 5,000 to 4,000 years ago. Ten Brink calculates the half-life of such isostatic recovery—the time required for one-half of the remaining uplift to occur—to be about 960 years.

Another conclusion of his studies is that the crust of the earth is very flexible laterally.

Another blow to the SST

The Concorde supersonic transport program, suffering from severe economic difficulties, is now confronted with another scientific report on the dangers SST's might pose by changing the composition of the upper atmosphere.

Four Harvard University scientists present an analysis in the January JOURNAL OF THE ATMOSPHERIC SCIENCES confirming conclusions drawn earlier by Harold S. Johnston and P. J. Crutzen regarding the possible impact of large numbers of supersonic transports.

"A fleet of 320 Concordes operating for seven hours a day at 17 kilometers is predicted to lead to a decrease of one percent in the column density of ozone, and similar conclusions presumably apply to the Soviet TU144," report Michael B. McElroy, Steven C. Wofsy, Joyce E. Penner and John C. McConnell.

Based on other studies of the biological consequences of an increase in the amount of ultraviolet radiation reaching the surface of the earth as a result of a reduction in ozone, they urge continuing caution in the development and operation of SST's. "Stratospheric aircraft, injecting major quantities of nitrogen oxide into the atmosphere, represent a potentially important environmental hazard."

Detection of underwater waves

With the aid of images taken by NASA's first Earth Resources Satellite (ERTS-1), two scientists working at the Atlantic Oceanographic and Meteorological Laboratories in Miami detected long underwater oscillations called "internal waves." Moving very slowly in packets or groups of striations, usually six to eight miles apart, the waves typically take 10 to 30 minutes to complete one oscillation. The activity is most pronounced at 60 to 600 feet below the surface.

The scientists attribute the wave action to the deep-water side of the continental shelf. They estimate that about every 12½ hours, when the incoming tidal current encounters the sharp change in depth at the shelf's edge, the right conditions are set up for the launching of an internal wave packet.