physical sciences

ASTROPHYSICS

Interstellar abundance of carbon

The ratio of two isotopes of carbon, C-12 and C-13, in interstellar space, has been measured by Drs. Victor J. Bortolot and Patrick Thaddeus of the Goddard Institute for Space Studies in New York. They find the ratio to be 82 C-12's to one C-13. The upper limit is 137 to one and a lower limit of 67 to one. On earth the ratio is also 82.

Because the observed interstellar value agrees with the terrestrial one, they conclude that carbon-rich stars contribute very little to the interstellar medium. In such stars, the ratio is known to be four. The agreement, it is reported in the February PHYSICS TODAY, suggests that the composition of interstellar space has been extremely stable for at least as long as the earth has been around, now estimated as about five billion years.

Drs. Bortolot and Thaddeus base their measurements on 25 high quality spectra taken with the Lick Observatory's 120-inch telescope.

RADIO ASTRONOMY

Radio observations of Scorpio X-ray source

The X-ray source Scorpio X-1, known to be variable in both visible and X-ray wavelengths, has now been found to fluctuate in the radio range.

The Australian radio astronomer Dr. J. G. Ables of Adelaide reports that it is too early to determine the exact period of the variations. However, their time scale of the order of hours seems very like the slower optical fluctuations. Changes detected so far in the X-ray emission from Scorpio X-1, the strongest X-ray star, seem to have a short time scale and be of the flare type.

Dr. Ables made a total of 164 scans across the X-ray star at a wavelength of six centimeters with the 210-foot radio telescope at Parkes, the Australian National Radio Observatory. He found the intensity varied by a factor of 20 in the radio range, corresponding to more than three stellar magnitudes, while the largest optical variations are only 1.1 magnitudes. The radio variations cannot be attributed to ionospheric scintillation, he reports in the March 8 NATURE.

PHYSICAL OCEANOGRAPHY

Waves 1,000 miles long being mapped

Just as the atmosphere has planetary waves that play an important part in governing weather changes, so do the oceans have planetary waves. What function they serve, however, is not known.

In an effort to find out, an extensive investigation is being made in the Pacific Ocean for these waves, which are thought to be about 1,000 miles in length and take two weeks to a month to complete one cycle. The waves will be recorded by 15 tide gages on islands of the Caroline and Marshall groups on an east-west line stretching 2,500 miles across the Pacific about 500 miles north of the equator.

The oceanic planetary waves are believed caused by the gravitational attraction of the sun and moon on the earth and are, therefore, a special form of tide. Once initiated, however, they are apparently largely governed by the depth of the water and by earth's rotational effects.

The investigation is being made by Drs. Henry M. Stommel and Carl I. Wunsch of MIT and Steacy Hicks of ESSA in Rockville, Md. Data will be gathered for four years, then subjected to analysis.

SOLAR PHYSICS

Outstanding solar burst in millimeter range

Although the sun has been studied extensively over a wide range of wavelengths in the radio region for more than 20 years, there have been very few observations at wavelengths of less than three centimeters and even fewer in the millimeter band.

Drs. D. L. Croom and R. J. Powell of the Radio and Space Research Station in Buckinghamshire, England, report in the March 8 NATURE that they have detected a major radio burst from the sun at both 4.2 and 16 millimeters, or 71 and 19 gigaherz respectively.

The burst occurred on July 6, 1968 and may be the largest ever recorded at millimeter wavelengths. It also ranks as among the largest observed at any wavelength.

HIGH-ENERGY PHYSICS

Planning CERN experiments

The Intersecting Storage Rings are now about half completed at the CERN installation in Geneva. When they go into operation in 1971 they will add more information in the first millisecond of experimental time than have 20 years of conventional cosmic ray research.

This prediction in no way detracts from the value of cosmic ray research, past, present or future, Dr. Gerard K. O'Neill of Princeton University stresses in the March 8 NATURE. Although the proton beams are not expected to collide for another two years, high energy physicists are already arguing about the suitability of different experiments to ISR conditions.

The interaction energy of the two 28 GeV proton beams in the laboratory frame of reference is about 1,600 GeV, or some 60 times as great as produced by the CERN proton synchrotron or nearly 10 times as great as from the Russian accelerator at Serpukhov.

Such high energies open the way to investigation of two of the most challenging problems now facing nuclear physicists—the existence of the hypothetical quark (SN: 2/17/68, p. 158), and the existence of a possible intermediate boson particle that would take part in weak nuclear interactions (SN: 11/16, p. 500).

GEOPHYSICS

Nitric acid detected in atmosphere

A balloon-borne spectrometer scanning in the infrared region has found nitric acid in earth's atmosphere at heights from 20 to 30 kilometers on four different flights.

The observations by Dr. David G. Murcray and his co-workers at the University of Denver were made by using the sun as a source and measuring the change in the infrared energy received before and during sunset.