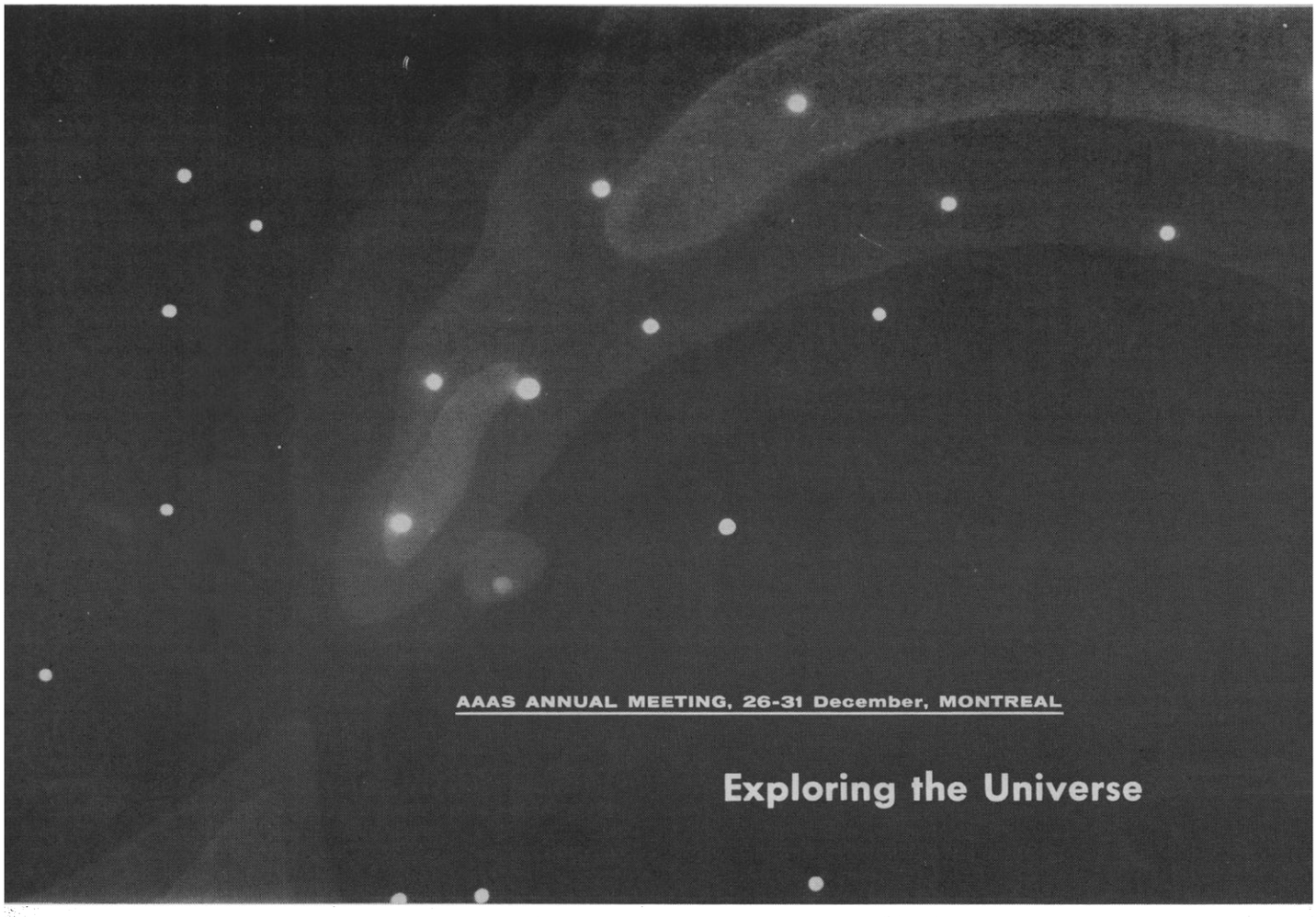
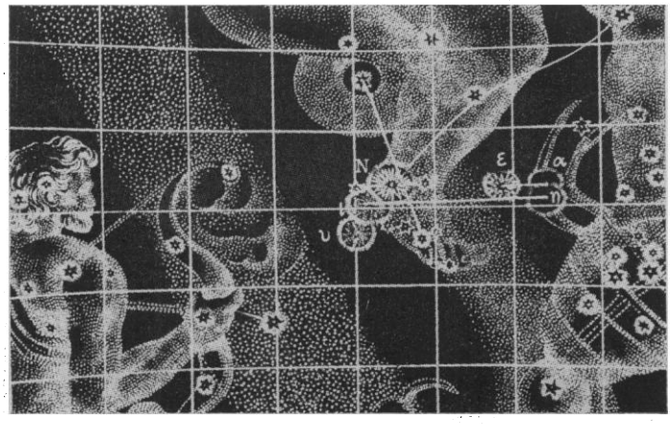


If radio frequencies were visible and light frequencies invisible, the sky would look like this radio map by John Kraus, radio observatory, Ohio State.

Standing on a small planet, our curious species has been able to look out toward a celestial horizon 10 billion light-years away and discern some 100 billion other galaxies as neighbors in an expanding universe. This has been done with the aid of only two bands of the electromagnetic spectrum: the optical and radio frequencies that pierce the semiopaque atmospheric curtain.

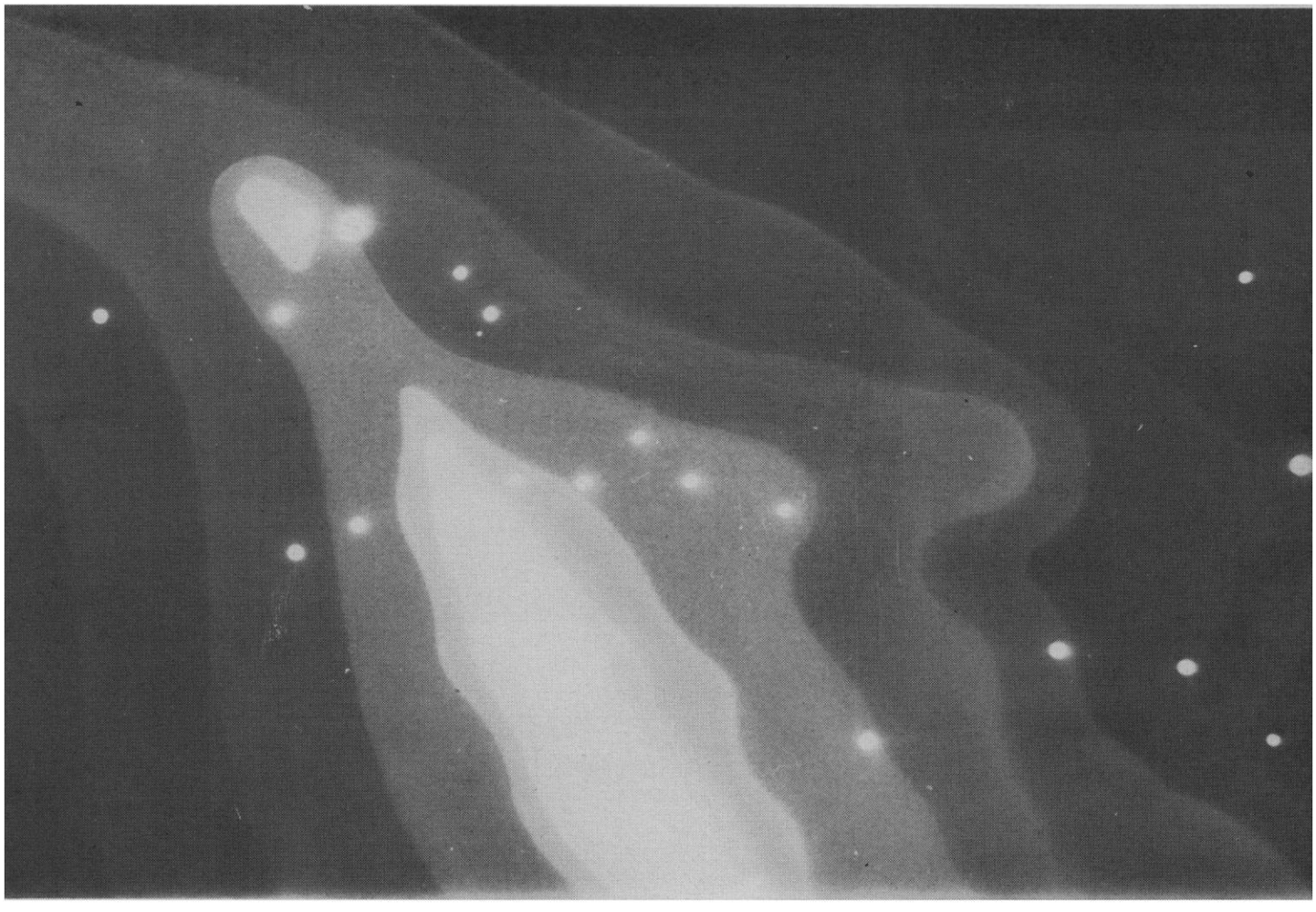
Now balloons and rockets are lifting observation instruments to altitudes of up to several thousand kilometers, a solar observatory is orbiting the earth, the first satellite astronomical laboratory is scheduled to go into orbit next year with a 750-pound (340-kg) payload. The jump above the atmosphere has already made it possible to extend the range of ultraviolet observations and to locate strong x-ray sources. At the other end of the spectrum, space-born instruments have captured infrared radiation, much of which is blocked by the atmosphere, and detected the very-low-frequency radio waves that do not reach the ground.



Kepler published this chart showing at N the supernova of 1604, which he and Galileo observed. Remnants of the supernova are studied now as a radio source. In Scorpio, an x-ray source has been found, undetectable optically or by radio.

At the same time, explorers of the starry universe have moved in the opposite direction; they are planning to bury a new sort of observatory in one of the earth's deepest mine shafts. This is a 100,000-gallon (378,000-liter) tank containing about 10^{30} chlorine atoms, which will react with a stream of massless particles that are perhaps the most penetrating energy in the universe. These are the neutrinos, postulated by Pauli, named by Fermi, and born in beta decay.

Simplest of the fermions, neutrinos seldom interact; thus they rain down on the earth from nuclear sources in all parts of the universe. Some 100,000 gallons of chlorine-37 are needed to capture the reaction of just one neutrino each day with the nucleus of a single chlorine atom. The yield, argon-37, will make it possible to count the



Radio astronomers mapped Galaxy by 21-centimeter wavelength emitted by reversal of spin in neutral hydrogen, occurring once in millions of years in each atom.

arriving neutrinos in the buried telescope planned by Raymond Davis of Brookhaven National Laboratory.

What the new methods of astronomy are revealing about the shape of the universe, the evolution of galaxies, and the future of our own solar system will be reported by some eminent observers at the annual AAAS meeting in Montreal, 26–31 December.

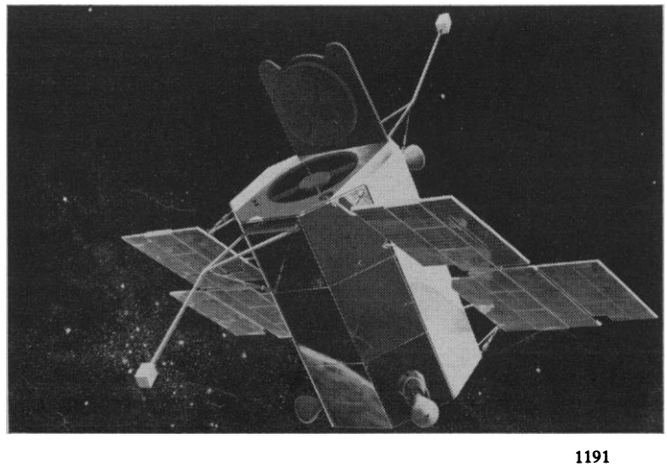
Philip Morrison, whose research is on the borderline between astronomy and particle physics, will give a "Moving Frontiers of Science" lecture on the new channels in astronomy (28 December). Morrison, professor of physics at Cornell and this year a visiting professor at Massachusetts Institute of Technology, was one of the first to suggest that radio telescopes be used to listen for possible signals from intelligent life elsewhere in the universe. More recently he has been a pioneer in suggesting the possibilities of neutrino astronomy.

Originating in the thermonuclear furnace at the core of the sun, neutrinos account for from 5 to 10 percent of the total energy output of the sun.

"Neutrinos are our only chance to study directly what otherwise we can only calculate, the nature of the conditions under which the sun burns protons," Morrison said.

Morrison will also tell what is being learned from the beams of cosmic rays, energetic nuclei that travel a twisting path from the depths of the Galaxy to the earth's surface. Bent by magnetic fields, cosmic rays may bring new knowledge of the fundamental force of magnetism, believed by some observers to be the force that binds the Galaxy into a spiral shape.

Radio sources now thought to be the most remote and brightest objects so far located in the universe will be discussed on 29 December by Maarten Schmidt of the Mt. Wilson and Palomar Observatories, where optical images of



Orbiting astronomical laboratory, shown in orbit in artist's drawing, is scheduled for launching next year. Built with NASA funds, this satellite will map the sky in ultraviolet and record ultraviolet spectra of the bright stars and galaxies.

these radio sources were found early last year. Schmidt told the recent International Astronomical Union congress in Hamburg that the evidence indicates that these objects, starlike in optical diameter but bright as a trillion suns, do indeed lie outside our galaxy. This means that unprecedented release of energy must be postulated to account for the intensity of the radio waves reaching earth from these objects over distances of billions of light-years.

Are such quasi-stellar sources the site of mass-annihilating interactions of matter and antimatter? Margaret Burbidge has suggested this, and has also said that exploding supernovae are not an adequate explanation. Some 10^8 supernovae, all implausibly exploding at once, would be needed to account for energies in these amounts, she said.

In his AAAS lecture, Schmidt, who was among the first to make spectral studies of the quasars, will tell what his studies have revealed about the composition and origin of these ten or so objects, whose discovery was one of the big prizes of radio astronomy.

While the big-dish radio telescopes can now reach distances close to the celestial horizon, 10 billion light-years away, man's space probes have been able to reach a distance of about 1 light-hour, and man himself has yet to traverse the less than 1 light-second that lies between the earth and the moon. What new knowledge the probes have returned, and what else we need to know before a manned spacecraft is launched for a lunar landing, will be considered at a program arranged by the American Astronautical Society for 29 December.

Planetary Environment

Lunar and planetary environments will be discussed by John M. Eggleston of the NASA manned spacecraft center at Houston. Co-authors of this paper are John W. Harris and Dallis E. Evans, NASA. What is known about meteoroid flux, radiation reflectance and topography of the moon and, some of the planets will be reported.

Carl G. Pfeiffer, a mathematician-physicist of the Jet Propulsion Laboratory, will describe some of the mathematical analysis by which computer programs are developed to guide spacecraft in flight.

A chromatograph/mass-spectrometer designed to detect life-related compounds on Mars or other planets will be described by K. E. Bentley, C. E. Giffin, and W. F. Wilhite, all of the Jet Propulsion Laboratory. This combination instrument is based on a design developed by Ragnar Ryhage of the Karolinska Institute, Stockholm, who is a NASA consultant. Ryhage's system permits use of very small samples; column effluent is fed through a molecule separator which permits the heavy molecules of the sample to enter rapidly the ionization chamber of the spectrometer, while the light carrier gas is pumped off. The designers hope to have the instrument ready to go on the 1969 Mariner-Mars shots.

The U.S.–Canada program of satellite exploration of the ionosphere will be discussed by C. D. Florida, of the Defence Research Board of Canada. O. L. Britney, Federal Government Department of Transport, Canada, will report on the design of the Canadian communication satellite ground station. Other speakers on this program are Donald N. Lascody and Gideon Markus, both of the Douglas Aircraft Company.

Another program to mark on your calendar is the day-long session (30 December) on physics of the upper atmosphere, arranged by the Canadian Aeronautics and Space Institute, with Philip A. Lapp, of de Havilland Aircraft of Canada, Ltd., as program chairman. Leading Canadian researchers in this field will report on such subjects as what was learned about geomagnetic control of the ionosphere from the Alouette satellite, spectroscopic studies of the aurora, and what infrared solar spectra are revealing about the composition of the stratosphere.

Proposed AAAS Constitutional Amendment

The Board of Directors recommends amendment of Article VII, which authorizes the establishment of regional divisions of the Association.

The present wording of Article VII is:

Section 1. Regional divisions and local branches of the Association may be authorized by vote of the Council, for the purpose of promoting the work of the Association in their respective territories.

Section 2. Each regional division or local branch shall elect its officers for such terms as it shall prescribe and shall hold its meetings and conduct its affairs as it shall deem desirable, subject to the the relevant provisions of this constitution and of the bylaws of the Association, and to such special provisions as the Board of Directors of the Association shall have established.

The Board of Directors recommends that the following wording be adopted in replacement.

Section 1. Regional divisions and local branches of the Association may be authorized by vote of the Council, and shall be organized and operated exclusively to carry out, within their respective territories, the objects of the Association.

Section 2. Each regional division or local branch shall make bylaws for its own government, which shall be subject to the approval of the Board of Directors of the Association and not inconsistent with the constitution and bylaws of the Association. Such bylaws and amendments thereto shall be submitted to the Board of Directors, through the executive officer of the Association, for approval, and each regional division or local branch shall elect its officers for such terms as it shall prescribe and shall hold its meetings and otherwise conduct its affairs as it shall deem desirable, subject to the relevant provisions of this constitution and of the bylaws of the Association, and to such special provisions as the Board of Directors of the Association shall have established.

This notice is published in accordance with the provisions for amending the Association's constitution as stated in Article XIII, Section 1.

DAEL WOLFLE
American Association for the Advancement of Science