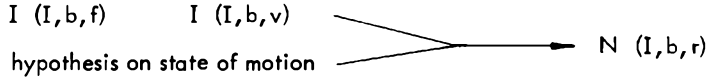
INFORMES

RADIO ASTRONOMY AT LEIDEN UNIVERSITY

H.C. van de Hulst
(Sterrewacht, Leiden University)

The radiotelescope of 25-meter diameter at Dwingeloo is now 10 years in almost continuous operation. The Observatories of Leiden and Groningen share the observing time. A doctor's thesis is often based on several thousand hours of observation, not all taken by the man himself. A good part of the registration and reduction is automatic. In the following a selection of some recent results is presented.

1. Low-velocity 21-cm studies. We have never yet decided to make a complete survey as was made with the earlier 7-meter telescope in 1953, but many special regions have been thoroughly studied. The usual reduction has been



The conversion from v to r is too uncertain in some directions and for the nearby gas. An example is Raimond's study of the Monoceros associations. The method also breaks down when the motion obviously differs from differential galactic rotation, e.g. in Rougoor's study of the central region. Shane is now studying whether beyond 3 kpc from the center similar deviating motions can be detected. He has also derived a new rotation law from his data.

2. High-velocity 21-cm clouds. Some clouds with high velocities had been detected accidentally. A search was made by taking systematic sample profiles at high galactic latitudes from -200 to +200 km/sec. A dozen clouds have been discovered, all with velocities of approach and all in one quadrant of the sky. Here no distance criterion exists at all. Oort believes that the hypothesis of a nearby supernova shell, as well as other suggestions, would lead to too strange conclusions. He favours the interpretation which identifies these clouds with gas falling in from outside. The point of origin could be the Virgo cluster. Work on this subject is being continued (a) by more observations and (b) by a study of the deceleration of clouds falling into the galactic halo from outside.

3. Continuum polarization. About ten years ago the detection of optical polarizations in the Crab nebula proved that its light arose from synchrotron emission. Ever since that time radio astronomers in many observatories have wanted to measure such polarization in the general galactic continuum but only in the last years have the severe instrumental problems been surmounted. The studies by Brown and others, with a special receiver designed by Muller, have so far given complete surveys at 408 and 610 Mc/sec (75 and 50 cm).
One region shows prominent polarization in the form of a fan at both frequencies.

Assuming that in each point of the sky the diference between the directions of polarization at the two frequencies is due to the difference of the Faraday rotation, we can eliminate the Faraday rotation altogether. The fan shape then makes place for a field aligned roughly along the galactic plane.

The beginning space research effort at Leiden holds a close conection to these problems. The synchrotron emission gives the product H N_e where H is the magnetic field strength and N_e is the number of relativistic electrons. The cosmic-ray experiment in preparation for OGO-E may give N_e itself. The combination of these will then teach us more about the magnetic field.

4. The large antenna project. This project, formerly known as the Benelux Cross Antenna project is now in the stage that the construction work on the antennas will begin. The present design is different from the one that has been published. It has 10 mirrors of 25-meter diameter fixed at intervals of 150 meters along an East-West line. The output of each of these is correlated with the output of one other mirror on tracks at the end of the same line. This gives 10 Fourier components simultaneously. Further Fourier components are obtained consecutively (a) by the earth's rotation and (b) by shifting the mirrors on tracks. By special arrangement Belgian astronomers will take part in the observations.

The chose wavelength is 21-cm, partly because of hopes that a shift to line observations may be made in later years, but partly because we were forced to go to the only spectrum band where protection against interference could be guaranteed. The fight for sufficient protection of radio astronomy bands which gave somewhat gratifying results at the 1959 conference of the International Telecomunications Union, must go on. The radio astronomers in the Latin American countries should realize that their work in these matters can be very weighty and that it is important to convince the administrations in their own countries of the vital necessity of such protection for radio astronomy.

MULTIPLE SCATTERING IN PLANE ATMOSPHERE

H.C. van de Hulst
(Sterrewach, Leiden University)

Studies on multiple scattering and radiative transfer began early in this century by the work of Schwarzschild, Milne, and Eddington. In the 1950's the important books of Chandrasekhar, Kourganoff and Sobolev on this subject appeared.

In spite of the fact that almost all important questions in this very classical problem have now been solved, it often takes long to obtain the numerical answer to a simple question. For that reason I stated some years ago to prepare a book which should contain many tables and graphs together with a condensed text. In the course of this work it was found useful to deviate from normal usage in some respects, which I shall briefly review.