New Southern Dark Dust Clouds Discovered on the ESO (B) Atlas

Dr. Aage Sandqvist from the Observatory of the Stockholm University has recently compiled a list of dark dust clouds seen on the ESO (B) Atlas. It is less than ten years since radio astronomers discovered the presence of organic molecules in dark clouds of interstellar matter, and Dr. Sandqvist's list now helps observers to locate the clouds in the southern Milky Way. Radio investigations of these have already been started and will not only increase our knowledge of the distribution of the organic molecules but also give better insight into the kinematics (velocities) of the nearby interstellar matter. Dr. Sandqvist explains how this is done:

At the present time, a research group at the Stockholm Observatory is studying what is suspected to be a local, slowly expanding interstellar cloud, or rather a cloud complex of interstellar matter and relatively young stars. The expansion age of the cloud, as derived from 21-cm observations, appears to be about 60×10^6 years and its dimensions in the plane of the Galaxy of the order of 600 by 300 pc, the Solar System passing through the outer parts of the cloud. In radio spectra of the interstellar neutral hydrogen, this structure reveals itself through a narrow emission component called "Feature A" (Lindblad, Grape, Sandqvist and Schober, *Astronomy and Astrophysics* **24,** 309, 1973) with a velocity dispersion of about 2.5 km s^{-1}. It is observed over a large part of the celestial sphere and has positive radial velocity with respect to the local standard of rest almost everywhere in and near the galactic plane. Concerning young stars of early spectral type, this complex may be revealing itself through the so-called Gould's Belt.

Radio Observations of Dark Clouds

In connection with the investigation of this complex, extensive surveys of dark clouds of small angular diameters in the region of Gould's Belt have recently been undertaken by us in the 3335-MHz CH, 4830-MHz H_2CO and 1420-MHz HI lines using the 25.6 m radio telescope at Onsala, Sweden, and the 42.7 m and 91.5 m radio telescope at NRAO, Virginia, USA. These and other comprehensive surveys of molecules in interstellar dust clouds have depended heavily upon Lynds' Catalogue of Dark Nebulae (*Astrophysical Journal Supplement* **7**, 1, 1962) as a source for clouds. The dust clouds thus surveyed are

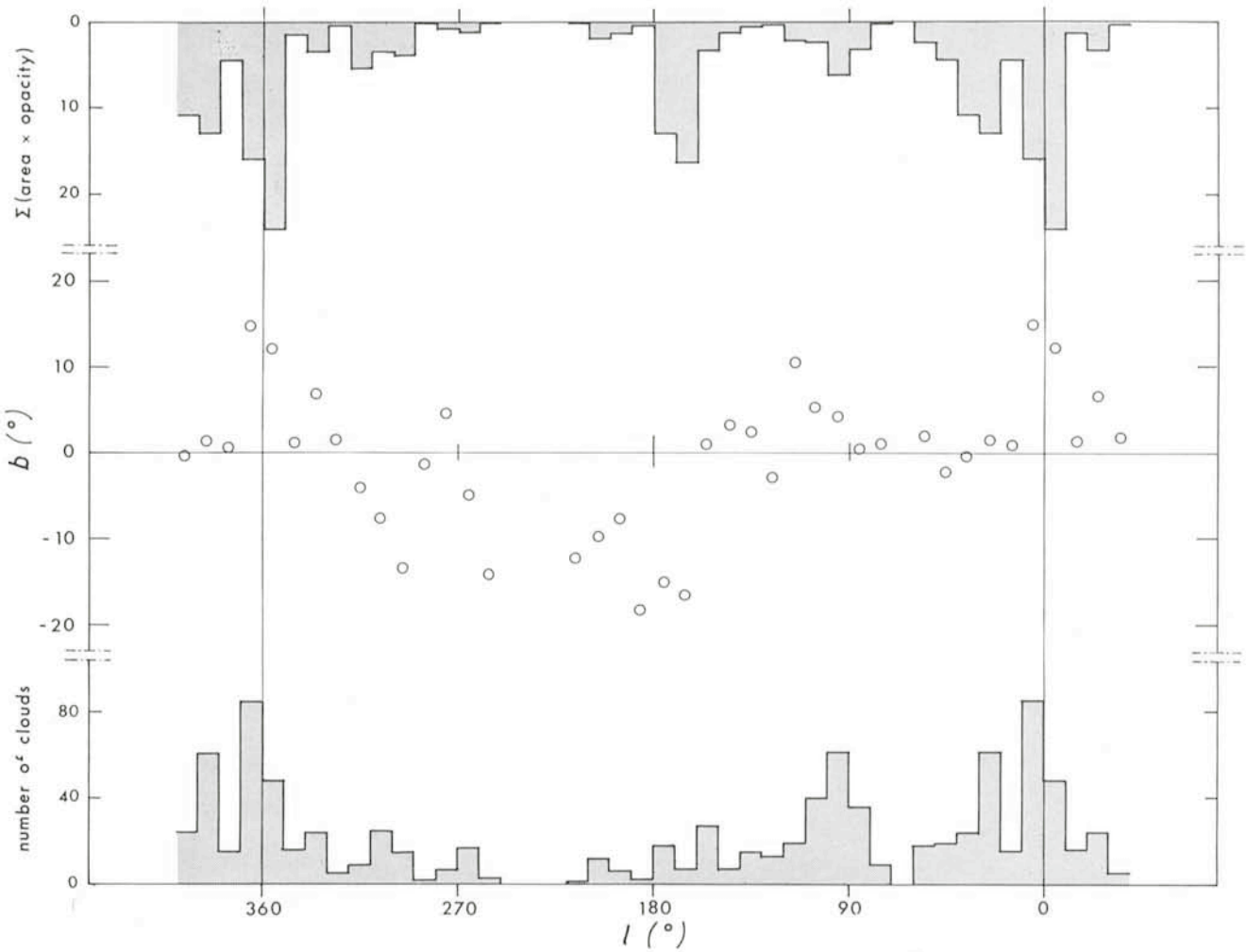

Fig. 1. — *The galactic distribution of the centres of mass of dark dust clouds of high opacity. The upper histogram shows the sum of (area x opacity class) vrs. the galactic longitude; the lower histogram shows the number of clouds as function of the galactic longitude.*

limited to the galactic longitude range of 350°–0°–240° by the mere limitation of sky coverage in declination ($\delta > -33°$) of the plates in the National Geographic Society-Palomar Observatory Sky Survey from which Lynds catalogued the clouds.

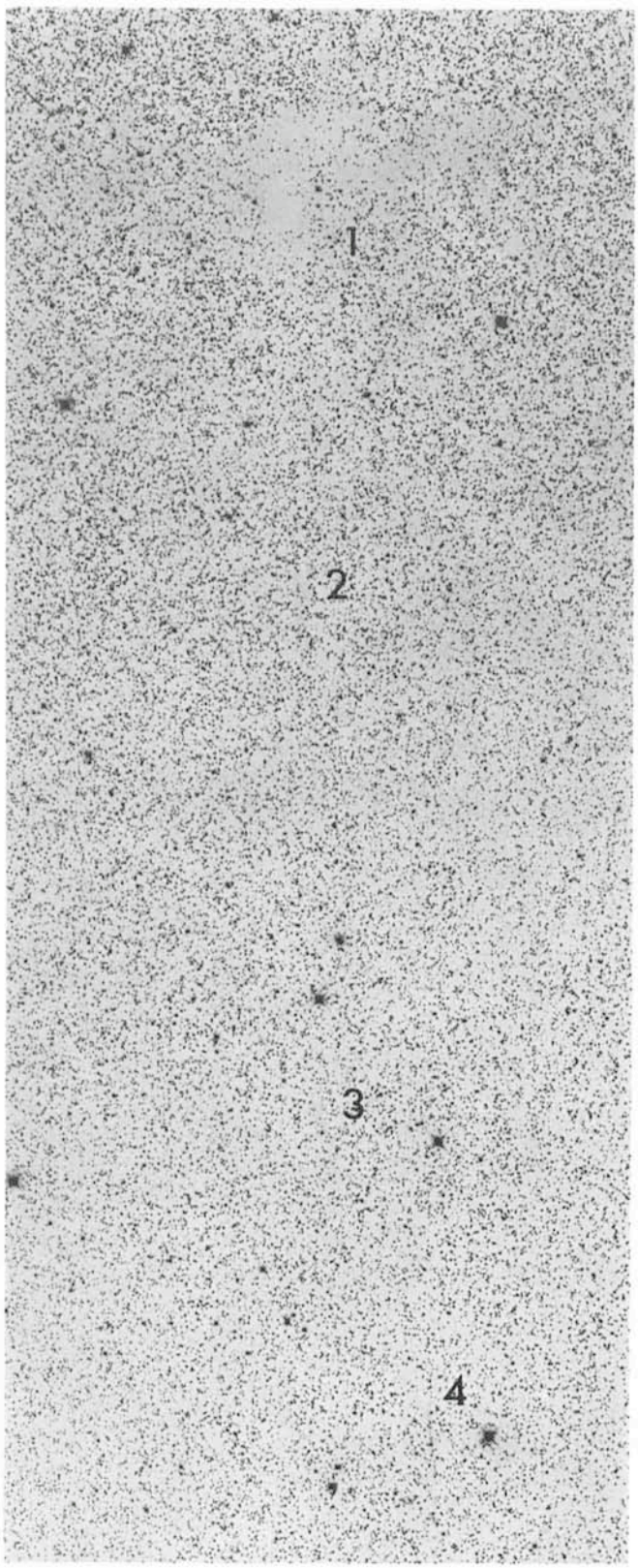

Fig. 2. — *Four new dark dust clouds discovered in ESO (B) Atlas field no. 208. No. 1 is an extended dark nebula and nos. 2 to 4 are so-called "cometary" globules. They are seen to the left of the numbers.*

In a project purporting to extend the sky coverage to $\delta > -46°$ we have surveyed the Whiteoak southern extension to the Palomar Sky Atlas and have presented a catalogue (Sandqvist and Lindroos, *Astronomy and Astrophysics,* **53,** 179, 1976) of 42 dark dust clouds of opacity classes ranging from 4 to 6. The reason for limiting the survey to high opacity clouds was that these clouds were subsequently observed in the 6-cm line of the formaldehyde molecule (H_2CO) which favours clouds of high opacity. This has extended the galactic longitude range of clouds surveyed for H_2CO to 336°–0°–271° which, however, still leaves a large part of the fourth quadrant unobserved. This quadrant is of great importance for the study of the kinematics of the local interstellar matter since it is here that different models predict the strongest kinematical divergence from each other (e.g. Lindblad et al. 1973; Burton and Bania, *Astronomy and Astrophysics* **34**, 75, 1974).

Dark Clouds on the ESO Plates

When the ESO (B) Atlas made the remainder of the southern sky accessible for a similar cloud survey, a complementary catalogue (Sandqvist, *Astronomy and Astrophysics,* **57,** 467, 1977) of 95 southern dark dust clouds was compiled with future molecular line observations from the southern hemisphere in mind. In order to estimate the positions of the centres of mass of all the darkest clouds along the *complete* Milky Way band, the mean galactic latitude, weighted by the area and the opacity class, of the clouds in intervals of 10° in longitude were computed. All Lynds' clouds of opacity class 5 and 6, together with all the clouds in our two catalogues were used for this analysis. The result is shown in Figure 1, which also contains histograms of the number of clouds and the sum of the (area x opacity class) for the clouds in longitude intervals of 10° versus galactic longitude.

Lynds found a tendency for the darkest clouds to lie slightly above the galactic plane and not to exhibit any association with the inclined Gould's Belt of bright stars. It is obvious from Figure 1 that this conclusion can no longer stand after the southern clouds have been included in the sample. The distribution of the darkest clouds clearly shows a preference towards the general direction of the galactic centre, but it can easily be seen that, whereas the clouds in the longitude range 320°–0°–120° do indeed lie mainly at *positive* latitudes, there is a strong cloud preference for *negative* latitudes in the longitude range 120°–320°. This reflects a behaviour similar to that of Gould's Belt which is not surprising since Lindblad et al. (1973) have already suggested that some of the dark clouds, the local neutral hydrogen and the Gould's Belt of early-type stars may be related. We have strengthened this suggestion by obtaining kinematic data for some of the clouds in the fourth galactic quadrant, observing them in the 6-cm H_2CO line, and further molecular line surveys of remaining southern dark dust clouds will soon be completed at the Parkes radio observatory in Australia, so that kinematic studies can be applied to the full system of the local interstellar matter.

Cometary Globules

Among the new clouds discovered on the ESO plates were four more cometary globules (Sandqvist, *Monthly Notices of the Royal Astronomical Society,* **177,** 69P, 1976), three of which are shown in Figure 2 together with a bright dark nebula. The cometary globules are "comet-like" objects with compact dusty heads, almost completely opaque but with bright leading rims and faintly luminous

tails, found predominantly in the outskirts of the Gum Nebula. The tails generally point away from the centre and, in the case shown in Figure 2, the cometary globules lie almost along a straight line intersecting the bright dark nebula, possibly suggesting that they have been torn away from it by the activity in the central region of the Gum Nebula.

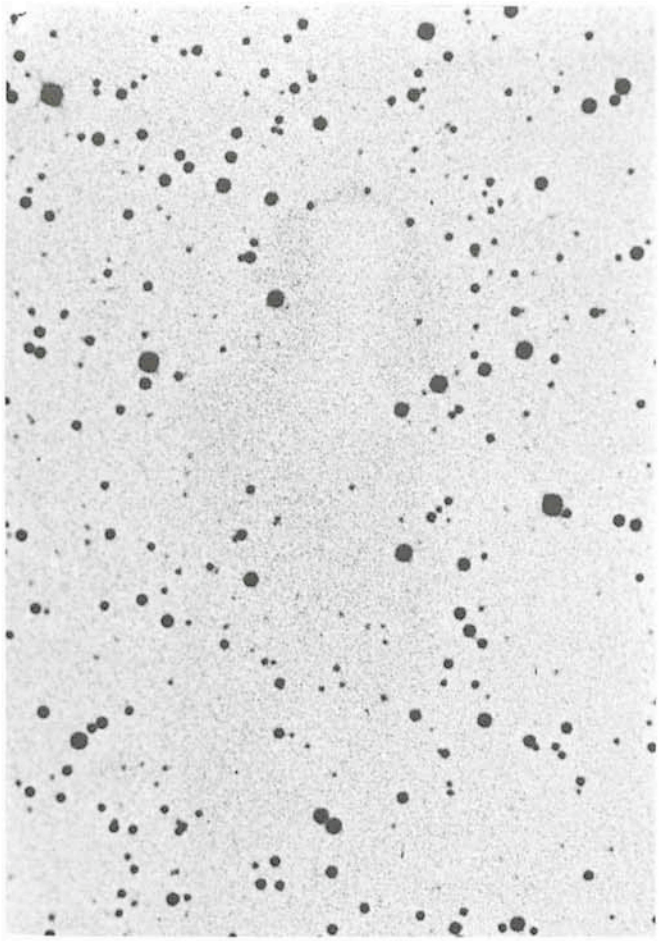

Fig. 3. — *An enlargement of cometary globule no. 2 from figure 2, Note the complete absence of stars inside the area of the globule, indicating at the same time its closeness (no stars between us and the globule) and its dense structure (no stars behind can shine through).*

ANNOUNCEMENT OF AN ESO CONFERENCE

"Optical Telescopes of the Future"

The European Southern Observatory is organizing an International Conference on the subject "OPTICAL TELESCOPES OF THE FUTURE", to be held in Geneva on the premises of CERN in the period 12-16 December 1977.

The preliminary programme of the Conference includes the following topics and speakers:

1. General Introduction (L. Woltjer – ESO; A. B. Meinel – Tucson).
2. Conventional Large Telescopes (R. Wilson – ESO; W. Richter – ESO).
3. Incoherent Arrays and Multi-mirror Telescopes (M. Disney – Herstmonceux; P. Strittmatter – Tucson; R. Angel – Tucson; D. N. Hall – Kitt Peak; E. H. Richardson – Victoria).
4. Coherent Arrays and Interferometers (A. Labeyrie – Meudon; R. Hanbury-Brown – Sydney; R. Ekers – Groningen; C. Townes – Berkeley).
5. Image Processing and Live Optics (F. Dyson – Princeton; A. Labeyrie – Meudon; A. Lohmann and G. Weigelt – Erlangen; J. W. Hardy – ITEK Corporation).
6. Astronomical Implications (J. Greenstein – Pasadena).

Scientists wishing to participate and eventually present a short contributed paper in any of the above sessions are invited to write and to send an abstract (10-20 lines) of their proposed contribution to

R. N. Wilson
ESO-TP Division
c/o CERN
CH-1211 Geneva 23
Switzerland

The deadline for receiving abstracts is 15 October 1977.

PERSONNEL MOVEMENTS

(A) Staff

ARRIVALS

Geneva

Instrument Development Group: Philippe ROSSIGNOL (French), systems analyst/programmer, 17.10.1977.
Scientific Group: Renate TRÖNDLE (German), secretary, 16.9.1977.

TRANSFERS

Svend LAUSTSEN (Danish), senior astronomer; from Chile to Geneva Scientific Group, 1.8.1977.
Fernand SIMON (Belgian) designer/draughtsman (mech.); from Chile to Geneva Engineering Group, 1.10.1977.

(B) Paid Associates – Fellows – Coopérants

ARRIVALS

Geneva

Scientific Group: Irena J. SEMENIUK (Polish), paid associate, 1.10.1977.
Massimo TARENGHI (Italian), fellow, 1.10.1977.
Robert A. E. FOSBURY (British), fellow, 21.11.1977.
Ivan R. KING (American), scientific associate, August 1977.

Chile

Astronomy: Christian BAREAU (French), coopérant, October 1977.

DEPARTURES

Geneva

Scientific Group: Evangelia O. ATHANASSOULA (Greek), paid associate, 31.8.1977.
Pierre TURON-LACARRIEU (French), fellow, 30.9.1977.
George CONTOPOULOS (Greek), paid associate, 15.9.1977.