detected. It is important to identify these sources to study the optical clusters in detail. In 1958, George Abell compiled a catalogue of all the rich clusters (down to a certain magnitude) that appear on the Palomar Sky Survey, i.e. in the northern hemisphere to $\delta \simeq -20°$. This list has helped astronomers to identify X-ray clusters in that area of the sky, but in the south this task has been rather slow. With the ESO/SRC sky survey in progress, today the job is easier.

Plate collections of the southern skies were searched for X-ray cluster identifications. One of them was the proper-motion plate collection of the University of Chile taken with the Maksutov camera at Cerro El Roble between 1968 and 1973. On positional agreement (sometimes rather poor because the X-ray error boxes were big) some identifications were suggested based on this material and the 3 UHURU catalogue of X-ray sources (Jorge Melnick and Hernan Quintana, *Astrophysical Journal* 198, L 97, 1975).

The Ariel 5 satellite has recently confirmed one of the suggested interpretations (J. P. Pye and B. A. Cooke: *Monthly Notices* 177, 21 P, 1976). The source 3U 0328 – 52 lies within an area of 18 square degrees that includes three rich clusters of galaxies, but one of them appears as the likely source because of morphological reasons. The source detected by Ariel 5 has a much more precise position and coincides with the proposed cluster: CA 0340 – 538. This fairly spherical cluster contains many hundreds of galaxies, mostly ellipticals concentrated towards the centre, and has three giant ellipticals which show extended halos. Previous examples of such galaxies in clusters appear isolated or in pairs (see photo of the cluster).

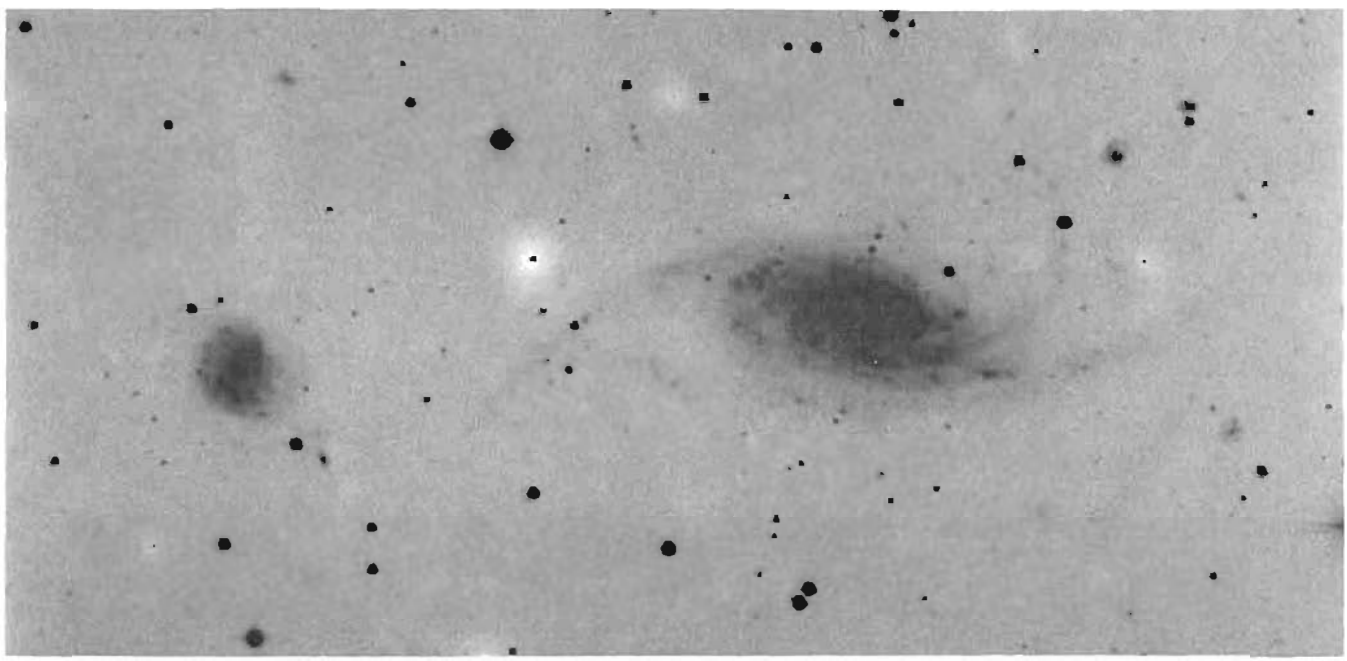
A programme was started at ESO to study this interesting cluster. Radial velocities have been determined for a number of galaxies using the 152-cm telescope. In this way a velocity dispersion can be estimated. A photometric study is in progress, comprising both photoelectric photometry and measures of direct plates using the PDS densitometer at the Nice Observatory. Also, a study of the morphology and distribution of the various galaxy types throughout the cluster is being carried out from plates taken with the ESO Schmidt telescope at La Silla. All this information, when combined with the X-ray data, is expected to restrict the types of models that can be constructed to explain the origin of the intracluster gas and its heating mechanism. Because the answer will bear on the evolutionary history of the clusters and their formation, one hopes to approach a solution to the problem of the "missing mass".

Spectroscopic Observations of Galaxies in the ESO/Uppsala Lists

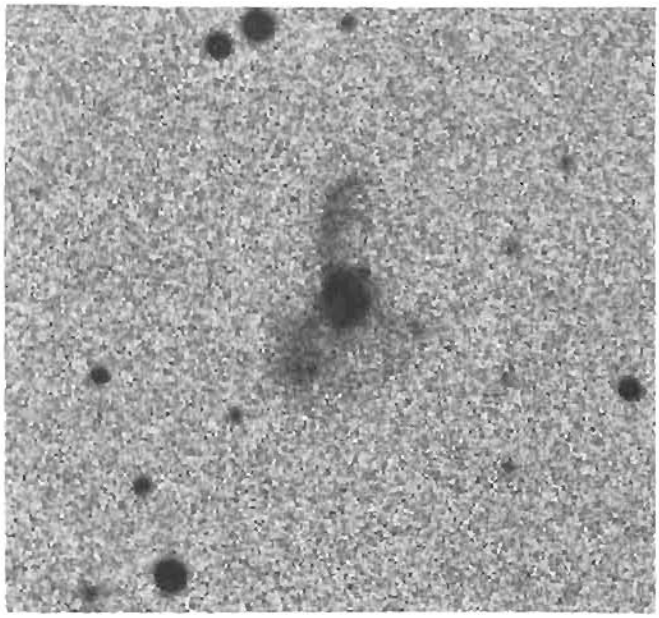
In the June 1976 issue of THE MESSENGER (No. 5, p. 5), we reported on the joint ESO/Uppsala programme, the aim of which is to establish a catalogue of conspicuous objects on the ESO (B) plates. Since that time good progress has been made and about 300 fields (or half of the ESO (B) Atlas) have now been searched. Approximately 9,000 objects have been listed; just recently, the fourth ESO/Uppsala list was published in the *Astronomy & Astrophysics Supplement Series* (Holmberg *et al.*, 27, 295).

There is no doubt that many southern astronomers have already made efficient use of these lists as a basis for their observing programmes. In the southernmost fields, more than 70 % of the listed objects are new. Most are galaxies and a large number of potentially "interesting" ones (interacting, peculiar, etc.) are found in the lists.

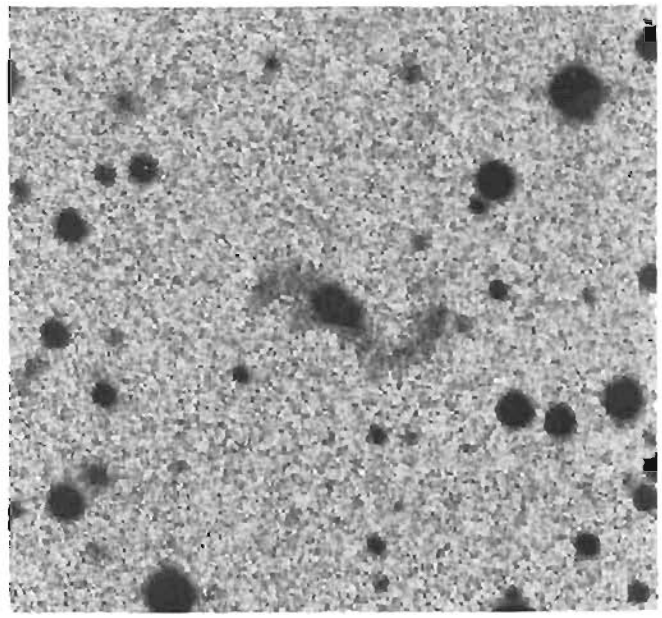
In order to exploit optimally this extremely "rich" material, a systematic approach is desirable. In addition to American astronomers at the Cerro Tololo Interamerican



Interacting system ESO 122-IG01/IG02. On this photo, obtained with the ESO 3.6-metre telescope on November 24, 1977, one may clearly see a "bridge" connecting the larger galaxy (IG01) with the smaller (IG02). The system resembles to some extent the much brighter M51 system. The distance is about 45 Mpc and both components show emission lines. (Plate 110, 90 min exposure, IIIa-J + GG 385; observer Dr. H.-E. Schuster.)



ESO 148-IG02. A new galaxy of Seyfert class 2. The measured velocity is V_0 13,270 km/s; M_v 22^m.5. Largest diameter 76 kpc (with H_0 55 km/s/Mpc). Note the wispy "arms" extending from the nucleus. ESO Schmidt telescope, 60 min, IIa-O + GG 385.



ESO 184-IG65. A supergiant galaxy with a very bright nucleus and two opposite arms. Largest diameter (from tip to tip) 100 kpc, V_0 = 18,500 km/s. On the original ESO Schmidt plate, the West arm (to the right) may be traced far to the North, indicating an even larger size of this galaxy. ESO Schmidt telescope, 60 min, IIa-O + GG 385.

Observatory and British/Australian astronomers at Siding Spring, astronomers in the ESO member countries are now beginning to observe the ESO/Uppsala objects. This note describes the progress in another joint ESO/Uppsala "spin-off" project: the spectroscopic investigation of peculiar and interacting galaxies from the mentioned lists.

Two teams of astronomers from Uppsala (Drs. Bergvall, Ekman, Lauberts and Westerlund) and ESO (Drs. Breysacher, Muller, Schuster and West) have made spectroscopic and photometric observations of more than 150 galaxies during the past twelve months. The basic observing list was established in Uppsala, by Lauberts and Westerlund, and includes several hundred galaxies, most of which are apparently abnormal in some way (distorted, relatively bright nucleus, interacting with neighbouring galaxy, etc.). The aim of the ESO/Uppsala astronomers is to obtain physical information about these peculiar galaxies, in particular to measure the radial velocities and to discover the systems with strong emission lines. Galaxies that turn out to be especially interesting (Seyferts, etc.) may then later be further investigated with a large telescope in order to obtain a fuller astrophysical understanding of the processes going on in their interiors.

Spectra have been taken with the ESO 1.5-metre telescope on La Silla and the ESO Boller & Chivens image-tube spectrograph with a dispersion of 254 Å/mm (spectral region 3500–5500 Å). These spectra show clearly the H and K lines in absorption for most galaxies, and quite often also a strong G-band at 4300 Å. For the galaxies with emission lines, the 3727 Å [O II], the 5007 Å and 4959 Å [O III], and the hydrogen lines (Hβ, $H\gamma_1$), are within the observed spectral region. Many spectra were also obtained with the Carnegie image-tube spectrograph attached to the 1-m Las Campanas telescope. The necessary observing time was kindly made available by the Carnegie Institution of Washington and the Director of the Las Campanas Observatory, Dr. H. Babcock. These spectra were of a similar dispersion, 284 Å/mm, but cover a somewhat broader part of the spectrum (3600–7500 Å). Whenever emission is present, the line at 6562 Å, and frequently the [S II] and [N II] lines in the red as well. A higher dispersion (135 Å/mm) was used for a number of galaxies with strong emission lines.

A large number of the objects in the ESO/Uppsala observing list have turned out to be of great astrophysical interest. Among the 150 first observed, about 50 % showed emission lines, and about thirty very strong lines. Many had broad lines, and about ten may be classified as of Seyfert class 2. Of the observed galaxy pairs, most had similar velocity. In several groups of galaxies, all components have emission lines. A number of supergiant galaxies (diameters around 100 kpc) were found. The illustrations show some of these cases.

In order to estimate the absolute magnitudes, UBV photometry was carried out with the ESO 1-m photoelectric telescope. So far, more than forty galaxies have been observed, and observing time has been made available for the ESO/Uppsala team in period 19 (April–September 1977). Some of the emission-line galaxies are rather bright, with $M_v \sim$ 23^m.

The observations continue and the astronomers involved have—naturally—decided that the results shall be made available to all interested parties as soon as possible after the observing runs. Several papers have already been published (*Astron. & Astrophys.* 46 (327), 53 (435), *A&A Suppl. Ser.* 27 (73)) and more are in preparation. Those who want to learn the latest status of the project should write to either Dr. A. Lauberts, Uppsala Observatory, Uppsala, Sweden, or Dr. R. West, ESO, c/o CERN, CH-1211 Geneva 23, Switzerland.

All those involved in this project are looking forward to the day when the ESO 3.6-m telescope will be available with a spectrum scanner for further studies of the "best" galaxies. The ESO/Uppsala programme is a classical illustration of practical astronomical research: discovery of the objects with a wide-angle photographic instrument (the ESO 1-metre Schmidt telescope), preliminary spectroscopic investigation for further selection, and finally the detailed study with a large, powerful telescope. At the same time, there are signs that several other astronomers in the ESO member countries are becoming interested in similar, extragalactic programmes and will soon make parallel contributions to the study of our exciting Universe.