rule them out. The weight of the old observations, the quality of which is not as good as the new ones, is too important. The standard deviation of the residuals is more than 1 arcsecond after complete calculation and it is difficult to choose which old plate has to be removed without seeing it. . . . The only solution is to get more plates of Nereid in order to increase the number of recent good positions. Observations are planned at both ESO and CFH observatories in 1982. Potential observers are also required: For such a work, it is important to diversify the source of available data.

Conclusion

This observing run at La Silla for studying the motion of faint satellites of outer planets has been very fruitful. We have obtained many results showing that both the site and the instrument are well suitable for accurate astrometric observations of faint objects. It would be very useful to get more positions of the satellites moving on the orbits of Thetys and Dione in order to precise their libration motion. The observations of the Uranian and Neptunian system have also to be carried on to reach a better accuracy in the determination of the orbital elements of their satellites. We plan to make again such a work with the Danish-ESO 1.5-m reflector in May and to extend the programme to the CFH 3.6-m reflector in March this year (1982).

PERSONNEL MOVEMENTS

STAFF

Arrivals

Europe

UNDEN, Christiane (B), Secretary, 8.2.1982

Departures

Europe

JANSSON, Jill (S), Secretary, 30.4.1982

FELLOWS

Arrivals

Europe

PERRIER, Christian (F), 15.2.1982 (transfer from Chile)
KOTANYI, Christopher (B), 15.2.1982
ROSA, Michael (D), 1.3.1982

ASSOCIATES

Chile

BEZANGER, Christian (F), Coopérant, 20.1.1982
DUFLOT, Christophe (F), Coopérant, 20.1.1982

EXPERIENCES WITH THE 40-MM MCMULLAN CAMERA AT THE 3.6-M TELESCOPE

Absolute B,V Photometry of cD Galaxies

Edwin Valentijn, ESO

The ESO 40-mm electronographic McMullan camera was delivered for general use at the 3.6-m telescope in April 1980 and has been used since then at regular intervals. A description of the camera, which can be mounted on both triplet correctors of the 3.6-m telescope, has been given in the *Messenger* No. 17.

The McMullan Camera Compared to the CCD

In 2-dimensional photometry the McMullan camera is a unique instrument, since it combines a relatively large field of view (12′ diameter at the 3.6-m telescope) with a relatively high sensitivity (detected quantum efficiency [DQE] ~10–20%). Therefore, the camera is a sort of intermediate system between the normal photographic plate (DQE ~2%, field diameter 1° at the 3.6-m) and the CCDs (DQE 40–90%, field 4′ × 2.5′). If one expresses the data rate of the cameras in terms of field of view and sensitivity, then the 40-mm McMullan camera has a 2.5 times higher rate compared to the present ESO CCD. The new ESO 80-mm McMullan camera, which will be installed in the near future, will exceed the CCD data rate by a factor of 10. The electronographic camera is UV sensitive, in contrast to the CCDs which are red sensitive. Another advantage of the electronographic camera is its supposed linear response, i.e. the density (D) on the plate relates linearly to the intensity of the exposed light: $m = C - 2.5 \log D$, m is the magnitude of the object and the so-called zeropoint (C), is a constant representing the total sensitivity of the camera plus telescope. For a proper working tube it was found that the gain of the system does not change (< 0.5%) over periods of a few nights. This property is important for doing absolute photometry and is better than the CCDs which can have much faster gain variations. A major drawback of the McMullan camera was that the only available nuclear emulsions from Ilford (uncoated high speed G5, and fine grain L4) were actually not manufactured for astronomy. These plates showed a lot of artifacts and non-uniformities. Besides this, it is very difficult to keep the large 3.6-m dome free of dust, which leads to dust particles on the filters, entrance window and mica window of the camera. I suspect that this was one of the main reasons why the 3.6-m McMullan camera was never taken seriously enough and only a few observers have tried the system. As a result they had to work with an untested system which came straight from the factory and ran into all sorts of instrumental troubles which occurred during their observing run. Most of these problems could have been avoided if more test time had been devoted to the instrument. Thus, the more or less bad reputation of the 3.6-m McMullan camera became self-fulfilling, in contrast to the electronographic camera used on the Danish 1.5-m telescope, where substantial testing has been done and the camera is often used with much more satisfaction. In a recent run, I have tested a new Kodak nuclear emulsion (fine grain SO-647) which was actually developed for astronomical specifications. The Kodak plates are supercoated and were found to be almost free of artifacts and very uniform. The introduction of this much more satisfactory emulsion makes the electronographic camera an up-to-the-mark instrument, unique in 2-dimensional astronomy because of its high data rate. One profits the most from the typical McMullan camera characteristics in doing 2-dimensional photometry of 2′–8′ sized objects.

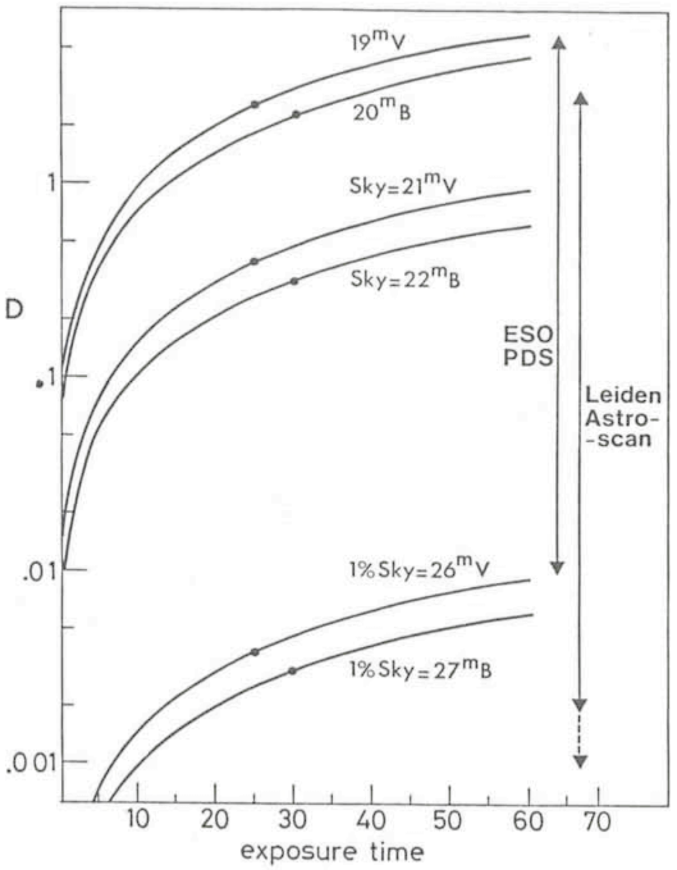

Fig. 1: *Relation between the actual relative density on Ilford L4 plates and exposure time using the 40-mm McMullan camera at the 3.6-m telescope (quantum efficiency in B is 20%, in V 12%) for different surface brightness levels. The measurable and reproducible density ranges of the ESO PDS and the Leiden Astroscan microdensitometers are also indicated. The points indicate optimal exposure times (25 min V, 30 min B) for observing galaxies, when plates are scanned with the Astroscan.*

The Programme

I have carried out a programme measuring the very low surface brightness haloes of cD galaxies in clusters, which have angular dimensions in this range. It was my intention to obtain absolute photometry of ~30 cD galaxies (all known to have extended X-ray haloes) in a homogeneous way and down to very low light intensities. In four observing runs, 10 nights of 3.6-m telescope time were allocated to this project and essentially due to the above-mentioned reasons 5.7 nights were lost because of instrumental problems and another 3 nights due to bad weather conditions. In the remaining 1.3 night both the Ilford L4 and G5 and the Kodak emulsions were tested and absolute B and V photometry of 10 cD galaxies was obtained down to surface brightness levels ranging from 25 to 28 magnitude or 2.5 to 0.5% of the night sky brightness. This shows how fast and effective one can collect data with the McMullan camera when it is properly working.

Calibration

Since I wanted to obtain absolute photometry it was necessary to determine the total sensitivity (zeropoint) of the system. It was decided to use two different techniques: (i) plates were taken of photoelectric sequence stars, (ii) the sky brightness was recorded during the observations at the Dutch 90-cm telescope by M. Pakull.

Fig. 1 shows the relative density recorded on L4 plates, as a function of the exposure time. The Ilford G5 emulsions are 4 times faster but have a larger grain and worse non-uniformities. The Kodak fine grain SO-647 is slightly slower than L4. The reproducible delta density ranges of the Leiden Astroscan and the ESO PDS microdensitometers are also indicated. It can be seen that optimal results for elliptical galaxy photometry can be obtained in 25 min V and 30 min B exposure time, when the plates are scanned with the Astroscan. If non-uniformities of both the plates and the sky were not the restricting factor in 2-dimensional photometry, then one could with a high speed emulsion obtain measurable delta densities at the 1‰ sky levels after 20 min (V) and 30 min (B) exposure time. Another reason for using the Astroscan is its known (Swaans, Ph.D. Thesis, Leiden) linear response, allowing us to check the linearity (zeropoint independent of D) of the electronographic system. Fig. 2 shows the zeropoints derived in both the B and V band from our two calibration techniques as a function of the actual density on the L4 plates of the considered object (sky or star).

All four independent measurements (Sky and Stars in B and V) show a similar and significant deviation from linearity of $0^{m}.45$ per 1D (1 magnitude difference over a 8^{m} range). It is very interesting that the short exposure (low density) sky measurements relate to the longer sky exposures in the same way as the stars do. This proves that the non-linearity in the system originates in the emulsion, since the sky had always more or less the same intensity. If the tube were the cause of the non-linear response, it would not give an exposure time dependent zeropoint for a similar intenstiy. C.S. Petersen (Copenhagen Observatory report) found a similar non-linearity in his G5 exposures but could not trace the origin (PDS, emulsion or tube). The Ilford G5 has probably the same non-linearity as the L4 type. Results for the Kodak emulsion will be available in the near future. Once the non-linearity of the system is known, it is easy to correct for it.

Flat Fielding and Removing of Artifacts

The main restricting factor in 2-dimensional low surface brightness photometry is the sky subtraction, which, in practice, means that one wants to obtain a flat and uniform background. The S-20 cathode in the McMullan camera, however, has a smoothly varying gain (~25%) over its area. One usually corrects for this by taking exposures of a uniformly illuminated part of the dome and subsequently divides the original images of the objects by this flat field image. However, then, every artifact and the noise in the flat field is reproduced in the image of the object. In order to avoid these problems, a refined technique (L. Swaan's programmes installed at the Max-Planck Amdahl computer) has been used to optimize the flat field by combining different exposures. First the bad pixels

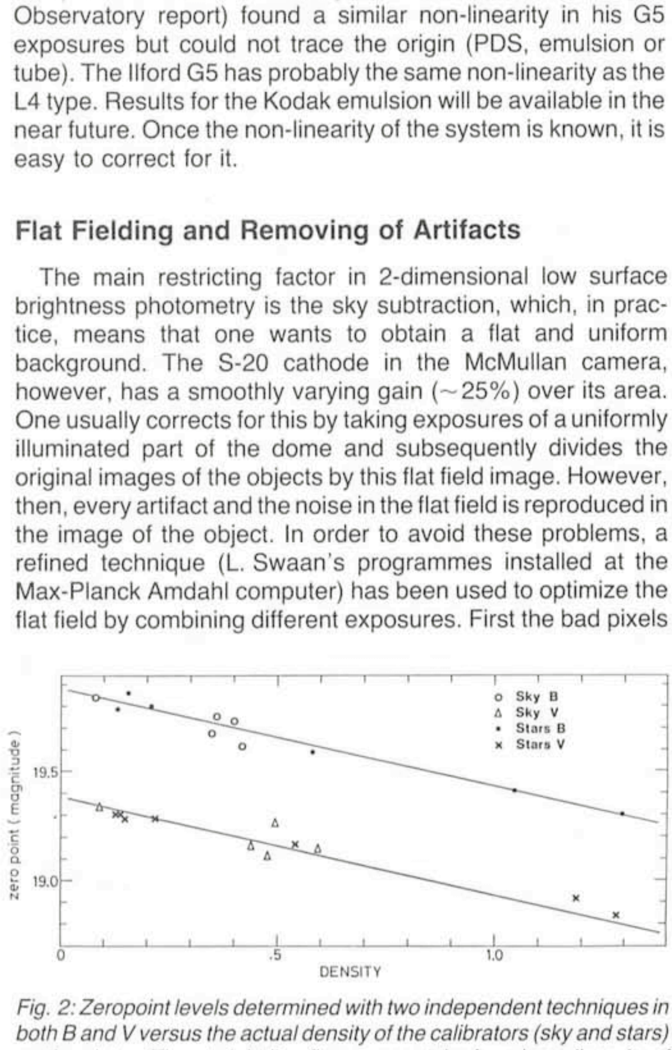

Fig. 2: Zeropoint levels determined with two independent techniques in both B and V versus the actual density of the calibrators (sky and stars) on the plates. The straight line fits represent the found non-linearity of the L4 nuclear emulsion.

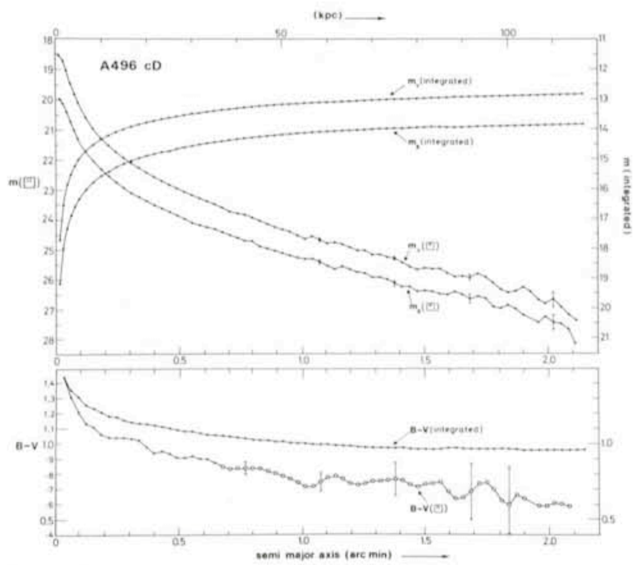

Fig. 3: *Absolute, differential and integral luminosity and colour profiles (sampled in ellipses) of the cD galaxy in the cluster Abell 496. Open circles are smoothed points, all filled circles are independently measured points (the separation between the points corresponds approximately to the FWHM seeing). The error bars indicate the estimated systematic uncertainties due to large-scale plate non-uniformities.*

in the flat fields were filtered (upper limit, lower limit, second derivative limit) and then the four flat field exposures were combined, skipping those pixels which deviated too much from the mean ratio in intensity of the different images. Finally, the resultant image was convolved with a Gaussian.

Results

The images of the cD galaxies were filtered in a similar way, cleaned from stars in the IHAP system and divided by the flat field. As a next step the final images of the cD galaxies were fed to a computer programme fitting ellipses at different isophotal levels surveying for isophotal twisting, asymmetries and ellipticity. In most cases no isophotal twisting larger than 5° or asymmetries were found, but most programme galaxies showed a significant decrease in eccentricity with increasing radii. So, the elliptically shaped cD galaxies showed a much rounder outer halo. Once the ellipse parameters of the galaxies were determined, they were used in a photometry programme to determine the radial luminosity profiles sampled in ellipses. Fig. 3 shows an example of the results of one programme galaxy. The halo of this cD galaxy has been traced out to a distance of 115 kpc (H_0 = 50 km s^{-1} Mpc^{-1}) from the galaxy centre and down to 0.5 % of the intensity of the night sky. The B-V profile shows a very red (B-V = $1\overset{m}{.}4$) nucleus and a very significant colour gradient out to a distance (semi-major axis) of 50 kpc from the galaxy centre (B-V = $0\overset{m}{.}8$). In the outer halo an additional $0\overset{m}{.}2$ colour gradient is observed, which is of low significance because of possible systematic effects due to plate non-uniformities. These results were obtained on a L4 plate. The Kodak plates have a more uniform response and will give smaller systematic errors.

The observed pronounced colour gradient is an interesting result which has implications on the stellar evolution and the presence of interstellar matter in cD galaxies. In the other galaxies of the sample similar gradients have been found. All the cD's of this programme are found to have extended X-ray haloes with the Einstein Observatory. The combination of these optical and X-ray data poses intriguing questions which will be discussed elsewhere.

Letter to the Editor

In my article "The Large Scale Structure of the Universe" published in the *Messenger* No. 26, December 1981, the statement: "However, this evidence was based on a sample of ten galaxies only. The first confirmation of this result was obtained by Tifft and Gregory (1976, *Astrophys. J.* **205,** 696) from the study of a larger sample", was added by the Editor of the Journal without consulting the author. The statement is incorrect and misleading. It misinterprets the work by Chincarini and Martins and does not reflect my knowledge of the work published by various authors and the sequence of events which led to some early estimates of the distribution of galaxies.

Guido Chincarini

ALGUNOS RESUMENES

Suiza, país miembro de la ESO

El día 1° de marzo de 1982 el Consejo Federal de Suiza hizo entrega del documento que lo atestigua como país miembro de la ESO debidamente firmado al Minsterio de Relaciones Exteriores Francés (donde se guardan los documentos de la ESO), y desde entonces ESO cuenta así con siete estados miembros.

Actividad social en la atmosfera exterior de La Silla

Sonia Rodríguez-Larraín, ESO-La Silla

¿ A quien se le ocurriría pensar que existe otra forma de vida – una vida social – en esta nebulosa oscura del Norte Chico? Se creería que al eliminar deliberadamente todo lo que es ruido, luz, vino y otros tipos de polucíon, automáticamente desaparecerían las especies buenas para pasarlo bien y que solamente sobrevivirían aquellos abstemios extraterrestres cuya única preocupación en esta vida es generar trabajo y publicarlo.

Y sin embargo . . . no es así. No todos estan en estado de coma en este Observatorio. Las especies mas fuertes han sobrevivido!

La primera pauta de que aquí no todo es tan prosaico como se imagina, son las palabras mágicas y poéticas: "el Bar está abierto". Por supuesto, a eso se refieren cuando hablan de "prepararse para la noche". La tradición del Bar se inició hace muchos años y para frecuentarlo cualquier razón es buena, un viaje al extranjero, un contrato nuevo, un corte de pelo nuevo, etc.

Hablando de tradiciones, es costumbre chilena que un recién llegado "pague el piso". Esta costumbre da paso a muchas reuniones sociales las que de preferencia se hacen a principio de turno, cuando aún hay provisiones. Habiendo buena música, eximios bailarines y hartas provisiones que más se puede pedir? Bueno, es cierto que hay pocas mujeres, mejor dicho hay sólo unas seis y no todas están siempre en el Cerro. Por lo tanto hay que hacer cola para bailar, pero esto también tiene un lado bueno. Ninguna mujer en La Silla se puede quejar de estar planchando, el éxito en la pista está asegurado, le guste o no bailar.

Las raras ocasiones en que hay muchas chiquillas en La Silla, es cuando un Líceo de Niñas de Coquimbo decide hacer una visita cultural (?) a La Silla. De repente aparecen tantos guías voluntarios como hay visitantes (sin contar a la madre superiora). Si a la hora del té hay muchas risas coquetas en una mesa, es porque el guía se ha desvíado del apasionado tema de astronomía y ha incursionado en tópicos mas personales. Entonces no falta el amigo que se le acerque y le diga: "Tu señora llamó dice que está donde tu suegra con los niños" (¡ Bajen el telón !)