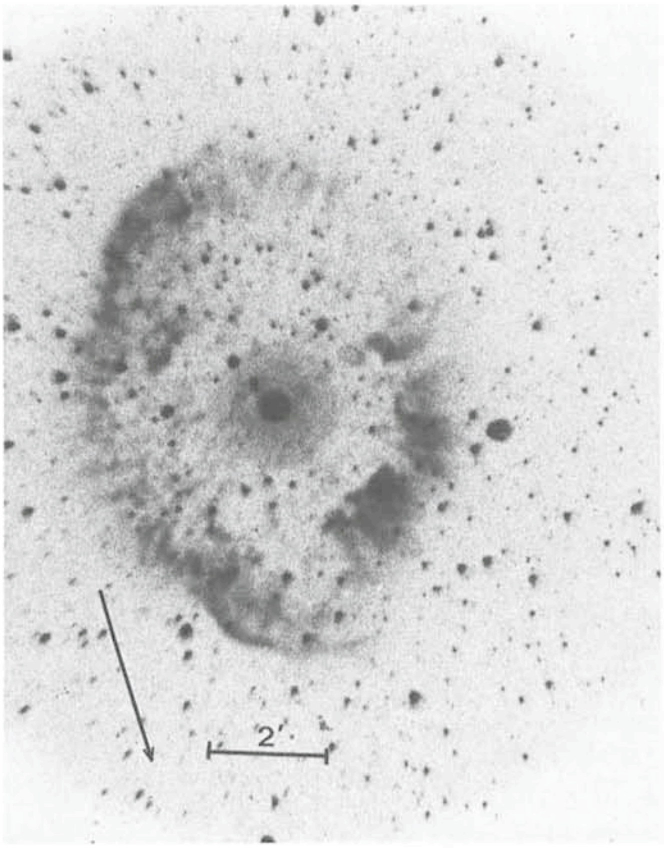

Fig. 1: *Hα monochromatic photograph of RCW 58 (plate taken by G. Tenorio-Tagle and L. Deharveng). The device used is the "focal reducer" attached at the Cassegrain focus of the 152-cm telescope at La Silla (aperture ratio F/1, exposure time 30 min, baked Kodak IIIa-F emulsion). The arrow indicates the direction of decreasing galactic latitude.*

system may be as large as 100 to 200 km s^{-1}. As no high radial systemic velocity is observed (the N IV line λ 4058, with V_R = –16 km s^{-1}, may have a velocity close to the systemic velocity, Moffat and Seggewiss, 1979), the motion may be nearly perpendicular to the line of sight. Its expected magnitude, about 5 to 10 10^{-3} arcsec per year, makes it detectable by the Hipparcos experiment to be launched in 1986 by ESA. The direction of the motion is expected to be nearly perpendicular to the galactic plane towards negative latitudes, as indicated on Figure 1.

Current work is going on in order to check the suggestion made by Chu (1980, 1981) that RCW 58 is primarily made of discontinuous ejecta from the central star, and to elucidate the process of formation of the southern curl and the radial filaments.

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Installation and First Results of the Coudé Echelle Spectrometer

Daniel Enard, ESO

Introduction

The Coudé Echelle Spectrometer was installed in the 3.6-m telescope building in November and December 1980.

Despite several unexpected difficulties—like the necessity of the replacement of the granite table supporting the monochromator, which arrived broken into three pieces, and the astonishing discovery that the wall paint of the coudé room was slightly fluorescent—the instrument was assembled and pretested. Unfortunately, and because of lack of time, the final adjustment and first improvement of the software in the light of the first practical observations could not be done during this period. It is only in May 1981 that the first test observations were done with the active collaboration of E. Maurice and P. E. Nissen.

The Instrument

The main characteristics are summarized in Table 1. The CES has already been described (D. Enard, *The Messenger* No. 11, Dec. 1977) and at the 1978 Trieste conference (D. Enard and J. Andersen, 4th Colloquium on Astrophysics,

Table 1. – CES CHARACTERISTICS

- *Resolving power: optimal 100,000 (FWHM of instrumental profile)*
- *Spectral range: 3600–11000 Å*
- *2 separate optical paths optimized for:*
  - Blue 3600 < λ < 5500
  - Red 5000 < λ < 11000
- Modes:
  - Scanner single/double pass: – Max scanning frequency 5 Hz
    – Detector PMT QUANTACON
  - Multichannel: – Camera F/5, dispersion about 1.2 Å/mm
    – Detector – Reticon RL 1872 F
    – CCD or photon counting device (not yet determined)
- Dispersive element: – 200 × 400 mm echelle grating; 79 grooves/mm, blazed at 63°26′
- Order separation achieved with a prism monochromator

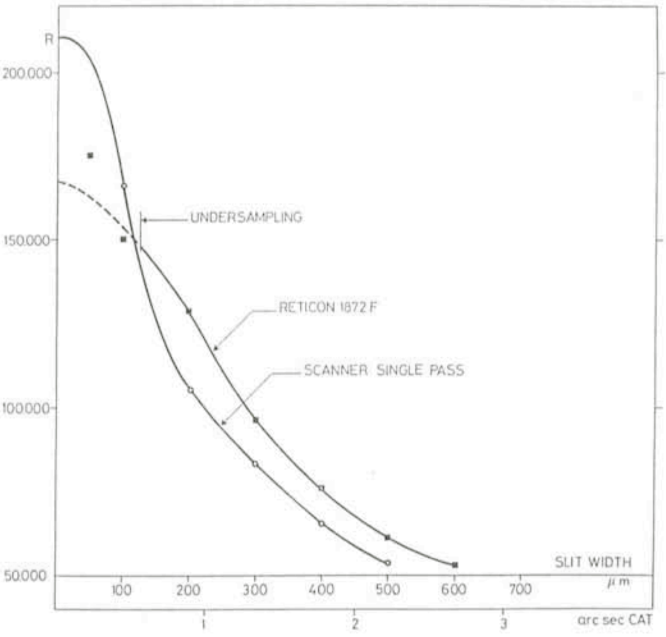

Fig. 1: *"Slit function" of the CES. These curves indicate the resolving power versus the slit width. The resolution criterion is the full width at half maximum (FWHM) of the instrumental profile measured with a narrow laser line. From these curves one can immediately derive that the combination CAT-CES is well optimized for resolving power of the order of 100,000.*

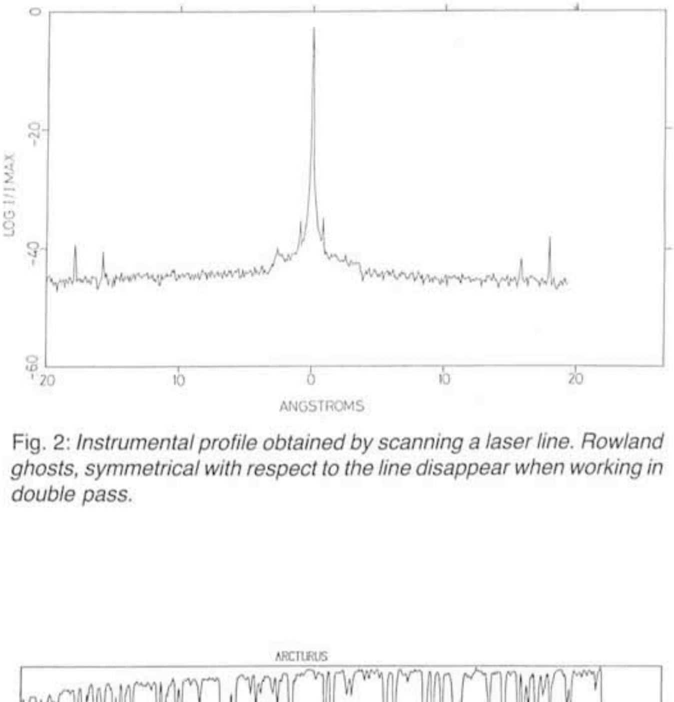

Fig. 2: *Instrumental profile obtained by scanning a laser line. Rowland ghosts, symmetrical with respect to the line disappear when working in double pass.*

Trieste, July 1978). At that time the instrument was still being designed. However, the characteristics have not changed significantly, except, unfortunately, the faint-object multi-channel detector (a Digicon) which became unavailable, so that the only multichannel detector available now is a Reticon. This detector, although it gives excellent results, is of course limited by its read-out noise.

The user's interface has been designed to be as far as possible friendly to observers, above all to visiting astronomers who may not be totally familiar with a computer-controlled instrument and the ESO image-processing system.

Achieving a high degree of automation implies, of course, complex software and a delicate analysis of the functioning of the instrument. For instance, setting the instrument basically requires that the observer types in the central wavelength and the resolution desired. However, the programme has to determine the correct order of the échelle grating, the position of the grating and of the pre-disperser prism, the slit width and—in the case of the scanner—the parameters of the scan from the desired length of the spectrum that the observer must also introduce. This apparently simple operation implies that a considerable number of parameters are previously determined and introduced into the programme.

The observer has a complete freedom to organize his sequence of observations: spectral and photometric calibration, dark signal and object measurement are all considered equivalent by the system and recorded on a disk and a mag tape chronologically. However, by placing the result of the calibrations into appropriate buffers before observing the object, it is possible to obtain a limited but immediate reduction of the data, so that the observer can immediately appreciate the quality of his observation.

The Telescopes

In principle, the CES can be fed by either the 3.6-m or the 1.4-m Coudé Auxiliary Telescope. The coudé focus of the 3.6-m is not yet operational so that only the CAT can presently be used. Surprisingly, the seeing of that telescope—despite the very long optical path—seems to be excellent. A typical resolving power of 100,000 corresponds to a slit of 1.2 arcsec and a slit throughput of the order of 70% has been obtained during roughly 70% of the nights. However, this figure, being based on the first preliminary observations, should be taken cautiously. Because the 3.6-m coudé operation is not very efficient, ESO is considering as an alternative the possibility of coupling the CES to the prime focus of the 3.6-m with a fiber optics instead of using the 5-mirror coudé train.

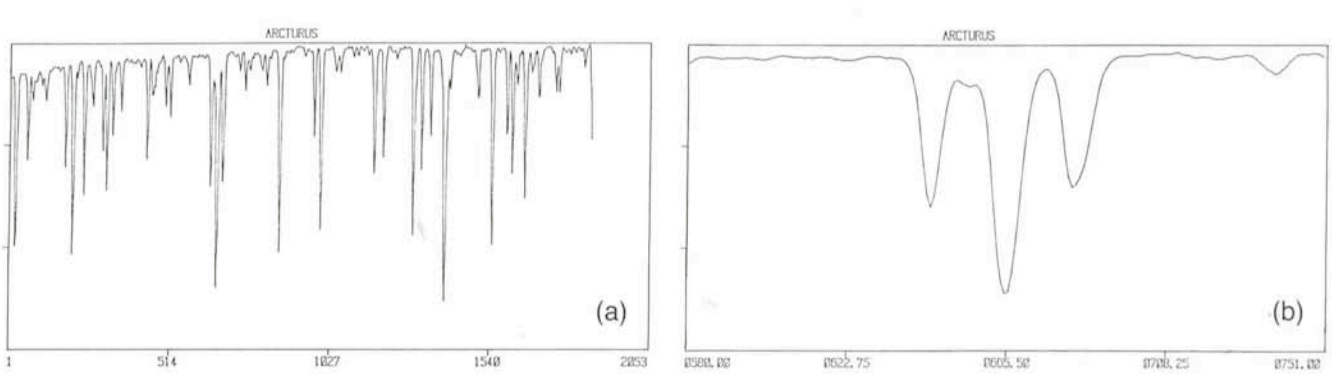

Fig. 3: (a) *Spectrum of Arcturus. It covers 50 Å (6085–6135 Å) at a resolution of 60 mÅ. A signal-to-noise ratio better than 1,000 is obtained in 200 seconds.* (b) *Expansion of the same spectrum showing the Ca lines around 6102 Å.*

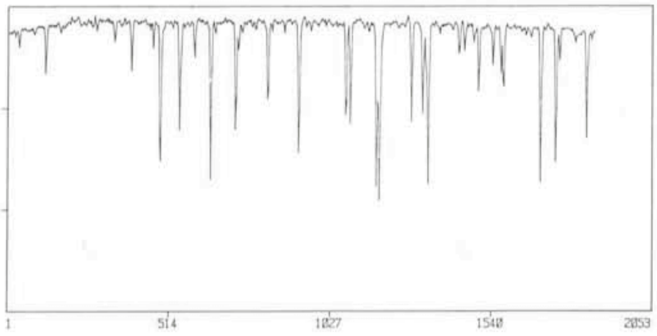

Fig. 4: *Spectrum of Nu Indus at 5135 Å. The spectrum covers 42 Å (5114 – 5156 Å) and a signal-to-noise ratio of 120 is obtained on this 5.2 magnitude star after 30 minutes at a resolution of 60 mÅ.*

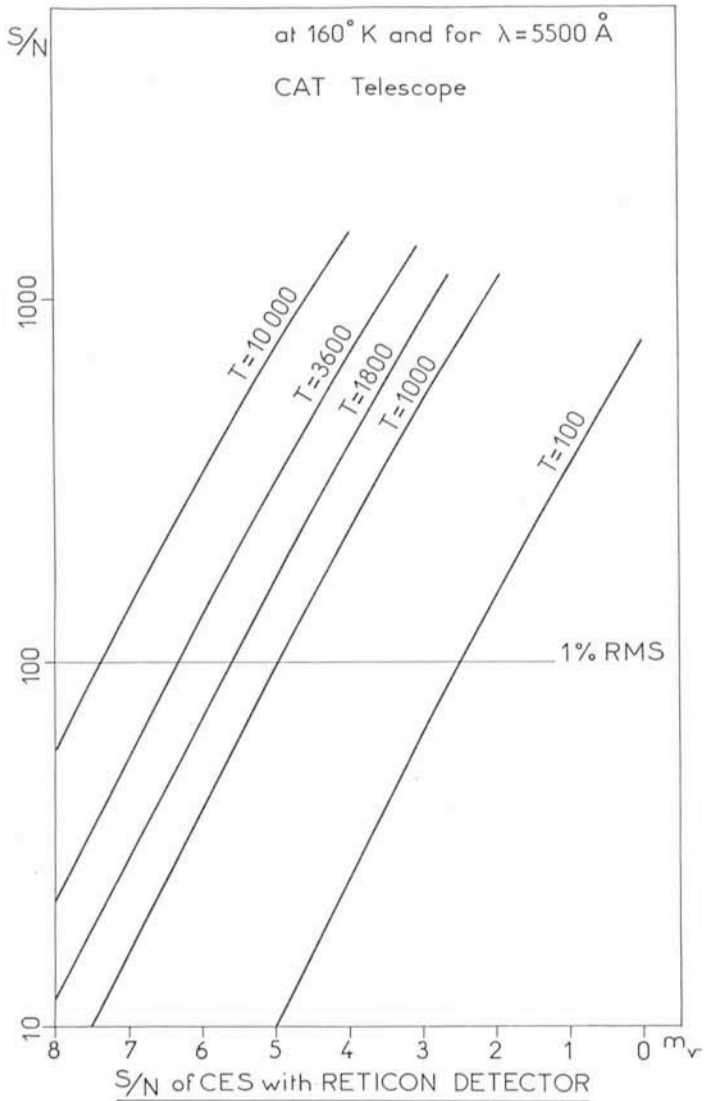

Fig. 5: *Efficiency curves of the CES with a Reticon. They give the signal-to-noise ratio one can expect for a given integration time and under reasonably good seeing conditions at 5500 Å. For lower wavelength the Reticon sensitivity decreases fastly and corrections must be applied.*

First Results

(a) *Resolution.* Results obtained in the laboratory have been confirmed. Effective resolution (FWHM of instrumental profile) versus slit width is shown by Figure 1 for the red path. Resolution in the blue is slightly worse because of the poor quality of the pre-disperser prism. It is foreseen to replace that prism in the near future. Figure 2 illustrates the extremely low level of stray light, a result of the high quality of the échelle grating and of the pre-disperser which introduces into the spectrometer a minimum of light.

(b) *Observations of Arcturus.* This very bright star has been observed in several wavelengths and provides an easy comparison with other observations. Figure 3 shows the spectrum obtained around 6110 Å with the Reticon, and an expansion of the same spectrum showing the Ca lines around 6102 Å. Results obtained with the scanner are very similar in quality to those obtained with the Reticon. Difference in depth of absorption lines was found to be less than 1%. Efficiency of the Reticon is however much higher because of simultaneous multichannel integration and high quantum efficiency.

(c) *Observation of Fainter Objects.* In order to determine the limit of the instrument, a number of objects up to magnitude 6.5 have been observed. As an example, Figure 4 shows a spectrum of NU INDUS (V = 5.22) obtained in the 6102 Å region with an integration time of 30 minutes.

The efficiency curves of Figure 5 have been calculated taking into account the average good seeing obtained with the CAT and the real noise level of the Reticon. These curves are in good agreement with practical observations so that they can be used as a guide for determination of observing time. However, many parameters have also to be considered such as:

- Relative quantum efficiency of the Reticon. (For example, the loss of sensitivity for H and K lines is nearly one magnitude.)
- Relative distance from the blazed wavelength of one order. The corresponding loss of efficiency can be as high as 50% and is calculated by the programme for the central wavelength.
- Actual seeing and slit width.

Present Status and Availability

The instrument is now operational at La Silla. However a few functions like the setting of the slit widths and the selection of neutral densities for the calibration are still manual. Full control from the main console is expected to be installed during the first half of 1982. The CES will be offered to visitors from January 1st, 1982.

Further improvement of the instrument will be considered in the near future. A very promising development would be the installation of a CCD detector possibly coupled to an F/3 camera. The resolution would be reduced to 60,000 but a gain of 3 to 4 magnitudes is to be expected.

New Large Interference Filters for the 3.6-m Triplet

D. Enard and M. Tarenghi, ESO

The triplet adaptor (see *The Messenger* No. 16, page 26 for a description by M. Ziebell) was put into operation in November 1979 and since then it has been used regularly both with large 240 × 240-mm plates and with the 40-mm McMullan electronographic camera (*The Messenger* No. 19, p. 33).

In the meantime new photographic possibilities at the prime focus of the 3.6-m telescope have been implemented. Thanks