that the deduced abundance be the same whether we use lines from neutral or ionized iron places tight constraints on the stellar model fit. It was rewarding to find the solar abundance of iron in the converged model to be 7.50 ± 0.15 on the logarithmic scale where hydrogen has the abundance 12.00, as the value 7.50 equals the best modern value. At this point we changed the oscillator strengths of all our lines so that the solar iron abundance for all lines became exactly 7.50. These adjusted atomic data were then used for the iterations of α Cen A so that temperature, surface gravity, microturbulence, and iron abundance of α Cen A would be strictly differential to the same parameters in the Sun.

The difference in effective temperature was found to be +20°K ± 20°, surprisingly close to the Sun's value. The log of the surface gravity of α Cen A was found to be −0.1 ± 0.1 of the Sun's, pointing towards a somewhat smaller surface gravity than the Sun's. The microturbulence parameter emerges 0.2 km/sec smaller in α Cen A than in the Sun with an error of ± 0.2. The only significant difference in this analysis between α Cen A and the Sun spectroscopically occurs in the abundance of iron. We find that α Cen A has an iron abundance 65 per cent larger than the Sun's.

We may summarize this preliminary result in the following way: α Cen A has almost exactly the same surface temperature as the Sun but has a diameter around 20 per cent larger. The star is known to have slightly larger mass than the Sun and is probably somewhat more evolved. The iron abundance is sufficiently different from the Sun's that in the full and final analysis we will have to consider the impact of a higher metal abundance on the atmospheric structure of α Cen A. Still the two stars are sufficiently similar in physical properties that we can expect a very accurate differential analysis. In the continuation of this project we are in particular looking forward to the comparison of the enrichment of iron with that of other chemical elements and groups of elements.

Roaming in the Sco OB 1 Association

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OB associations are usually thought to be the youngest stars in a space volume infected by the virus of star formation. The combined effects of strong UV radiation and stellar winds quickly disperse the parent interstellar cloud and thus end the star formation episode. Details of this picture are, however, subject to debate, especially such questions as when, where and how long which types of stars are formed within the parent cloud. Only a vast amount of observations on as many associations and young open clusters as possible will allow us to draw final conclusions.

During a perusal of the literature on this subject we were struck by several discrepancies which are related to the well-known association Sco OB 1 and several open clusters and an H II region in the same area, e.g. NGC 6231, Tr 24, IC 4628, etc.

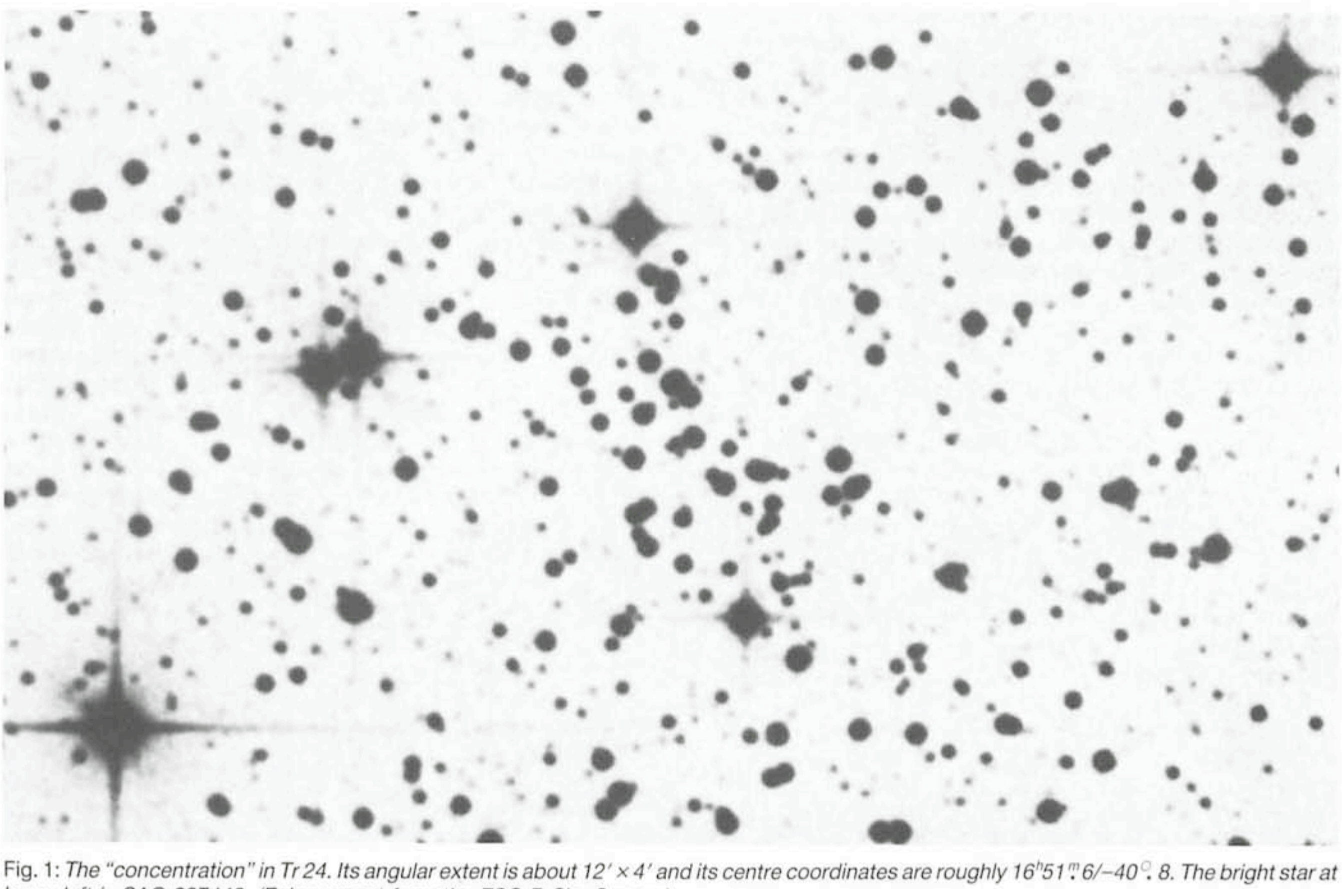

Fig. 1: *The "concentration" in Tr 24. Its angular extent is about 12′ × 4′ and its centre coordinates are roughly $16^h51^m.6/-40^\circ.8$. The bright star at lower left is SAO 227443. (Enlargement from the ESO B Sky Survey.)*

Among these are a difference in individual distance of Sco OB 1 (2,400 pc) and its alleged core NGC 6231 (1,600 pc), the very peculiar appearance of Tr 24 which seems to contain substructure at different distances in between, and the distribution of the youngest (O-type) stars in a half-ring, with Tr 24 proper in its vertex. Even basic photometric data were missing for most stars fainter than 9^m, except for the well-defined compact open clusters (e.g. NGC 6231) and the brighter OB stars of the association. Thus we obtained observing time in June 1983 for basic, but otherwise unspectacular UBV photoelectric photometry in the area of $1\overset{\circ}{.}3 \times 0\overset{\circ}{.}3$ between NGC 6231 and IC 4628, covering all the apparent substructure of Tr 24. The weather did not permit observations for stars fainter than 14^m with the 1 m telescope. In the range 9^m to 14^m good data were obtained for 288 stars with the Bochum 0.61 m. When we plotted the results in the standard colour-magnitude and colour-colour-diagram we were astonished to find that the stars strewn over such a large area gave one single, well-defined cluster diagram with a reddening of $A_v = 1\overset{m}{.}1$ and a distance of d = 2,300 pc. When we then plotted the published data on the stars of the OB association we found a perfect fit in the sense that these stars are a smooth extension to higher absolute magnitudes. We thus concluded that Tr 24 and Sco OB 1 are to be regarded as one giant cluster stretching over roughly 40 pc. The stars which previously defined the association are just those which have left or are leaving the main sequence. A further conclusion seems unavoidable, namely that NGC 6231 is a foreground open cluster albeit of similar youth (age less than 10^7 years). (These results are presently being published in *Astronomy and Astrophysics, Suppl.*)

At later spectral types (A, F) we also found that there are many stars which have apparently not yet reached the main sequence, some of them up to 3^m above it. About one third of our programme stars can be found there distributed all over the cluster area. Here we found another surprise, namely that about 20 of them are clustered in a small area. Such a concentration of pre-main sequence stars is rather unusual, especially as only one true pre-main-sequence star was found in this area. Fig. 1 shows this field (an enlargement from the ESO atlas). The linear extent of the clustering is 8 × 3 pc. Subject to verification, we dared to regard this configuration as a spatial association of pre-main-sequence stars. In fact, one would expect them to be some sort of RW Aur variables.

Therefore, we again requested observing time for May 1984 with four objectives: first to complete the photometry in the range 9^m to 14^m in a slightly larger area than the year before, second to test many suspected pre-main-sequence stars for variability, third to obtain photometry for stars fainter than 14^m especially in and around the "concentration", and fourth to observe spectra of all stars in the concentration and a number of the alleged pre-main-sequence stars in its neighbourhood. For objectives 1 and 2 we were again scheduled on the 0.61 m Bochum telescope, for objective 4 on the 1.5 m with IDS and for objective 3 again on the 1 m telescope. As in 1983, the weather again prevented all observations with the 1 m telescope.

We have just finished the data reduction with the help of the standard programmes in Garching. The interpretation is thus very preliminary. First of all, the extension in area contains relatively less cluster stars, which, we think, indicates that the boundary is reached. The linear extent is thus between 40 to 50 pc and we would rather call it a stellar supercluster. Second, most of the suspected pre-main-sequence stars are variable (between 1983 and 1984) a fact which one expects for such stars. The variability ranges up to half a magnitude.

If our assumption is right, namely that all cluster stars which are more than 1^m above the main sequence are genuine pre-main-sequence stars, one should expect them having intermediate spectra between those of normal dwarfs and T Tau stars which are the text book pre-main-sequence stars showing a large number of emission features. Our survey type spectroscopy in a wavelength range 4000 to 5000 Å indeed shows emission line features in almost all spectra but mostly fainter than in genuine T Tau stars. One of these spectra is shown in Fig. 2. Star No. 230 is a star just north of the area of Fig. 1. The iron emission features at 4506 Å and 4722 Å are faint but clearly visible. Together with the asymmetric Balmer lines of hydrogen, they are typical for T Tau, RW Aur and other pre-main-sequence stars.

Although we yet have to analyse all 64 spectra, we are still optimistic that we can prove our hypothesis for the "concentration", namely that it is a rather small volume in space of 8 × 3 (× 5?) pc containing about 2 dozen stars which have not yet reached the main sequence. We furtheron speculate that these stars are born together in this volume from one and the same filament of the parent molecular cloud. From stellar evolution tracks one would expect that they will be main-sequence stars of late B and early A type (3–5 solar masses). As the contraction time for this mass range is around 10^6 years they are definitely younger than the stars which presently leave the main sequence (about 10^7 years).

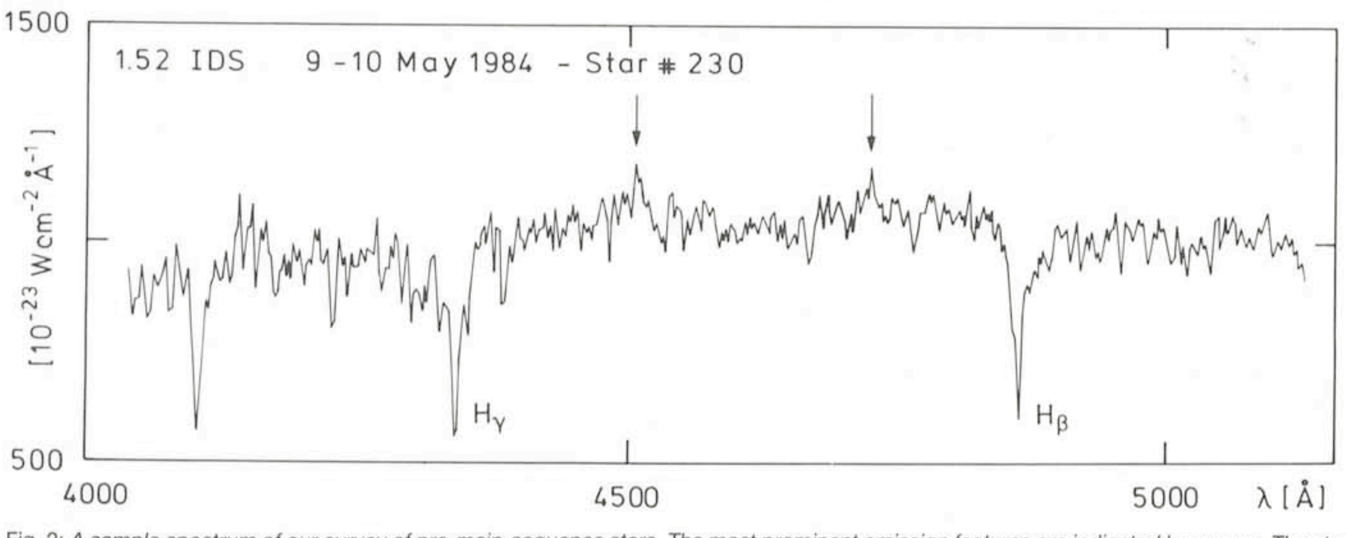

Fig. 2: *A sample spectrum of our survey of pre-main-sequence stars. The most prominent emission features are indicated by arrows. The star number is from our working list. (V-magnitude about 11$\overset{m}{.}$6). It is situated just north of the field shown in Fig. 1.*