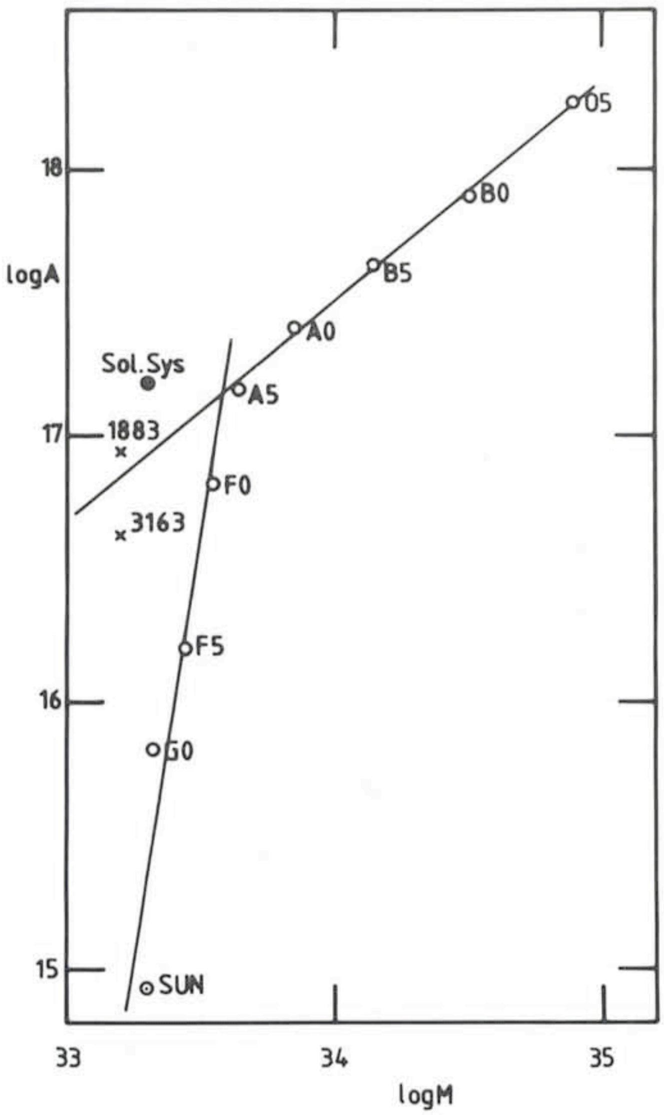


Fig. 4: *The relation between the angular momentum per unit mass (A) and the total mass (M) for average field stars, the solar system, the sun and two of the investigated K-type stars of the Pleiades.*

The Angular Momentum Distribution

In Fig. 4 we compare for average field stars their angular momentum per unit mass A and their mass M, following McNally (1964: *The Observatory* **85,** 166) who pointed out that there are two distinct relations with strongly different slopes, one for the O, B and A-type stars and one for the F and G-type stars. McNally also showed that the position of the solar system in this diagram seems to coincide with the O, B and A star relation while the sun itself follows the F, G star relation.

From this diagram McNally developed the following idea: The O, B and A stars are, because of their large masses, able to hold a high amount of angular momentum while the amount possible to hold for less massive stars rapidly decreases. The O, B and A star relation may therefore indicate the average amount of angular momentum present at the time of star formation. This would mean that the stars with a later spectral type than that of the turnoff point, at about spectral type A5, will not be able to hold all of their initial angular momentum and will somehow get rid of it. The fact that the solar system as a whole lies, in this diagram, very close to the O, B and A star relation suggests formation of planetary systems or double stars as mechanisms for losing excess angular momentum.

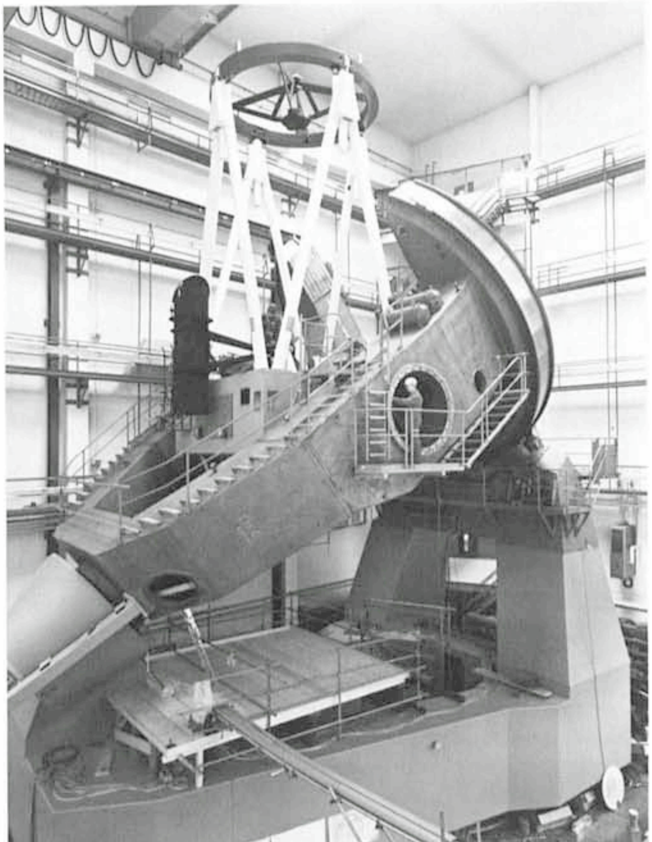
Looking at Fig. 4, we see that both Hz 1883 and 3163 follow the relation set by the O, B and A stars, which was assumed to be the initial distribution of angular momentum. This means that in this stage of the evolution, just before reaching the main sequence, the redistribution of angular momentum had not yet taken place. Our observations, together with the theory of deformation and breaking into two stars under fast rotation, may indicate that we observe this process for the K-type stars in the Pleiades.

We can conclude then that the redistribution takes place, for the K-type stars, on reaching the main sequence by forming double stars or possibly even planetary systems. These conclusions may also explain why so many field stars of the BY Dra type are known as close double stars. Finally, the disturbances as observed for the slower rotators like Hz 34 may be caused by material lost in the breaking-up process and which is still rotating close to the star.

A New Large Telescope for German Astronomers

On 9 March 1982 the largest telescope hitherto built in Germany was presented by Carl Zeiss to the public. It is the 3.5 m telescope of the Max-Planck Institute for Astronomy, which will be the center piece of the German-Spanish Observatory at Calar Alto in Southern Spain.

The 3.5 m telescope was built by Carl Zeiss in Oberkochen and its development and construction lasted about ten years.



The MPIA 3.5 m telescope in the assembley hall of Carl Zeiss, Oberkochen.

The instrument has a total height of 22 m and its weight is 430 tons. The primary mirror weighs 13 t and is made of glass ceramic Zerodur.

The instrument has meanwhile been dismounted and is being transported to Spain. The building has already been completed and it is expected that the instrument will become operational towards the end of 1983.

Optical Systems

Prime focus: focal length: 12.25 m; field diameter: with 2-lens corrector: 100 mm (28′), with 3-lens corrector: 243 mm (1°8′). *Ritchey-Chrétien focus:* focal length 35 m; field diameter 300 mm (30′). *Coudé focus:* focal length 122.5 m; field diameter 400 mm (11′). K. K.

Photographic Image Manipulation

Claus Madsen, ESO

Introduction

The Messenger No. 25 contained a short, general description of the non-atlas work being done in the Sky Atlas Laboratory. Briefly mentioned in the article were contrast manipulating methods ranging from masking—to reduce the contrast of a picture—to contrast enhancing methods used to obtain printable negatives (or positives). Here the procedure, the advantages and the problems connected with masking and image amplification, will be described in some detail.

Masking

Several ways of masking have been described during the recent years by Saxby and Dumoulin (1977), and Malin (1977). Yet, the subject does not seem to be exhausted. The masking method—which is capable of producing quite striking results with regard to extraction of information from high contrast plates—requires the application of a photographic mask (a reversed film copy of the original plate) of a somewhat lower contrast than the original.

At first, the masking film is exposed in contact with the original plate. Good results have been obtained by applying a diffuse light source and placing the masking film in contact with the *back* side of the original plate. Thus the mask becomes an unsharp, positive reproduction of the original photograph, the extent of unsharpness being determined by the thickness of the glass plate. After exposure the masking film is developed to a lower contrast (typically $\gamma \sim 0.6$) and then once again mounted to the original plate. The fact that the mask is unsharp makes superposition with the original plate less difficult, provided that the plate has been fitted with proper markings, and furthermore, the mask will not influence the finest details of the original. On the other hand, it tends to enhance the edges of the objects concerned.

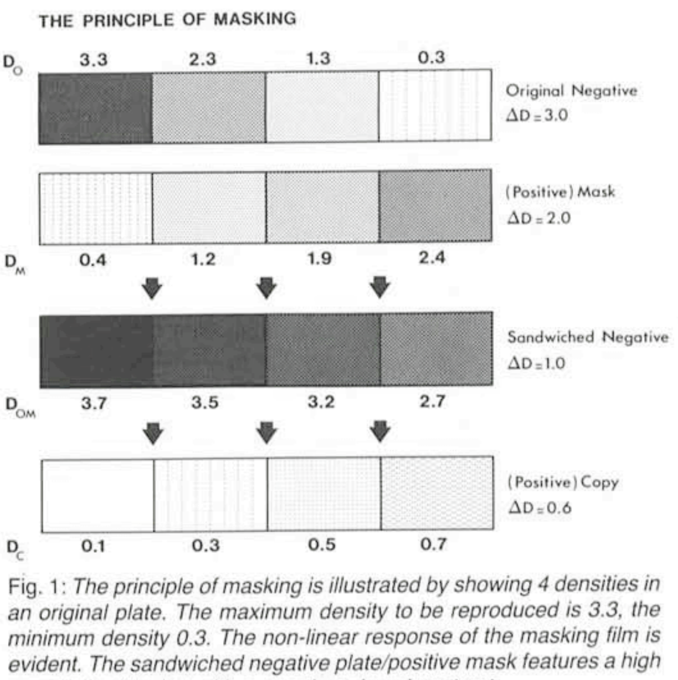


Fig. 1: *The principle of masking is illustrated by showing 4 densities in an original plate. The maximum density to be reproduced is 3.3, the minimum density 0.3. The non-linear response of the masking film is evident. The sandwiched negative plate/positive mask features a high overall density, but with a greatly reduced contrast.*

The sandwiched negative/positive is subsequently printed in a traditional way, either in a contact printer or by means of an enlarger, to get a positive film of a low contrast which still yields all the details of the original (Fig. 1). As almost any photographic emulsion the masking film has a non-linear response. In this case, however, this may be seen as an advantage, because accordingly, it does not exert its influence on the faint features of the original, thus securing a good reproduction of these, even if the density range as such is greatly decreased. It is to be noticed that the various (masking) film types will behave differently, thus having quite different effects on the final result, subject, of course, to the shape of their characteristic curves. Also the maximum density (D max) and the contrast of the mask is decisive with regard to its effect on the picture. Due to the fact that the developing has a vital influence on the density range of most emulsions, the characteristics of the mask are primarily controlled by the development, whereas the exposure plays a secondary role. (Apart from a few specialized emulsions, the effect of the exposure with regard to the contrast is secondary—but, by no means, unimportant—to that of the development.) Masked prints have appeared in the *Messenger* No. 25 (page 17) and in No. 26 (page 26).

Image Amplification

Perhaps of even more interest to many astronomers is the image amplification technique decribed by Malin (1981). The method which is used to enhance extremely faint objects on the original plates is based upon the fact that weak exposures are to be found in the uppermost layers of the photographic emulsion. Unfortunately, the density of a photographic film or plate is not exclusively determined by the exposure but also by the processing in which the development plays the most important—but by far not the only—role. The developer tends to react with the unexposed as well as the exposed silver halides, giving an overall density (fog). Furthermore, the carrier of the emulsion often has a density of its own. This is generally described as the base + fog density or the gross density. This "extra" density obscures the weakest images of faint stellar objects, leading to the apparent disappearance of these faint features in the overall density of the emulsion. In terms of photographic theory, these exposures are found in the area between the exposure threshold and 0.1 D above gross density