zenith distance to a maximum of 30°, preferably less. However, *field rotation errors* were worse near the zenith. So it was clear that, at this stage of technical progress on the telescope, there were severe constraints on the position and brightness of suitable objects.

Excellent Seeing!

It soon became clear we were going to have a night of excellent external seeing. By 22.00 hours 0.7 arcsec was reported by Vizcachas (see the article by M. Sarazin on page 8). A number of excellent pictures of various objects were taken. Towards 23.00 hours Vizcachas reported the extraordinary seeing value of *about 0.4 arcsec!* It was already clear that we were privileged to have a night for our First Light of quite exceptional seeing. We were greatly assisted and encouraged by the presence and active help of two astronomers, Jorge Melnick and Sandro D'Odorico, to whom we extend our thanks. The author suggested that we go to the globular cluster *ω Centauri* to get a rich field of stars in a well-known object. The first exposure of 10 s without filter with zenith distance 23° was analysed by Jorge and found to give a FWHM of an arbitrarily chosen star of 0.44 arcsec! An atmosphere of great excitement prevailed: Jorge queried whether the pixel size (23 μm) and telescope scale (187 μm/arcsec) could really be correct? They were! An exposure of the same field in ω Centauri of 60 s was made, using a filter. Jorge deduced FWHM values for 5 stars between 0.42 and 0.36 arcsec! Field rotation effects (slight ellipticity at the upper left, less at the lower right on the screen) were apparent. So it was decided to reduce the exposure for the next picture to *30 s* with a zenith distance of about 18° (the minimum). The seeing was given by Vizcachas as 0.5 arcsec. Jorge measured one image of *0.35 arcsec,* others of 0.39 and 0.42 and expressed his amazement. Clearly, the dome seeing was negligible: a gentle and steady wind blew across the telescope, through the building fully open on both sides.

Shortly afterwards, the pictures taken were transferred to Garching via the satellite link, blocking the computer. There was telephone communication and mutual jubilation at the astonishing results. Our colleagues in Garching were working intensively to process the images, confirming our results. A wonderful spirit of a total team prevailed, separated by 12,000 km in two groups, all rejoicing at the remarkable proof of success of the NTT right from the start at first light.

Some final comments about the quality of these images should be made. With our image analyser and the force sensors on the M1 support, we had complete proof two nights before that the quality of the telescope optics themselves was better than 80% energy in 0.2 arcsec. On the night of first light we knew also from the force measurements that the quality was slightly inferior due to excess loads on the fixed points. This gives a slight triangular effect in the images which can be detected in the deconvolution of the images by Dietrich Baade. Nevertheless, it is unlikely that the quality of the optics was worse than 80% in 0.20 arcsec. *The slight ellipticity of the star images is entirely due to tracking errors (constant over the field) or associated field rotation errors (variable over the field).* It will require a lot more work on the tracking before it is within its specification of 0.1 arcsec rms with 15 min or more integration time. Until this is achieved, tracking errors will be the limitation of the optical quality achievable near the zenith. Also, we repeat, the inclined optical performance has still to be optimized. So, much technical work has still to be done to get the NTT fully within its extremely stringent specification.

A New Era

The real surprise of the First Light pictures was the extraordinary external seeing and the proof that, without optimization of the thermal conditions in the building and telescope, the dome seeing was effectively zero. This finally proved the point we have always made: that it is worth pursuing the goal of virtually diffraction limited quality of the optics (now readily achievable and *maintainable* with active optics) and optimized conditions for dome seeing because the real limits of external seeing have hardly been known or explorable in the past. A new era can start with the NTT and other telescopes using its principles, in which an image quality can be obtained which penetrates into the domain of space optics – but at costs of only a fraction of 1% of those of space optics!

Finally, our grateful thanks again to all those colleagues on La Silla and Garching who helped us achieve these results.

. . . and the View from Garching

During the early weeks of 1989, news about progress with the NTT at La Silla kept circulating through the ESO Headquarters in Garching. Whenever a staff member arrived from La Silla, he was immediately and persistently questioned by colleagues about the latest status. How happy we were to learn in February about the fine results reported by the optical group during the final trimming of the NTT optics!

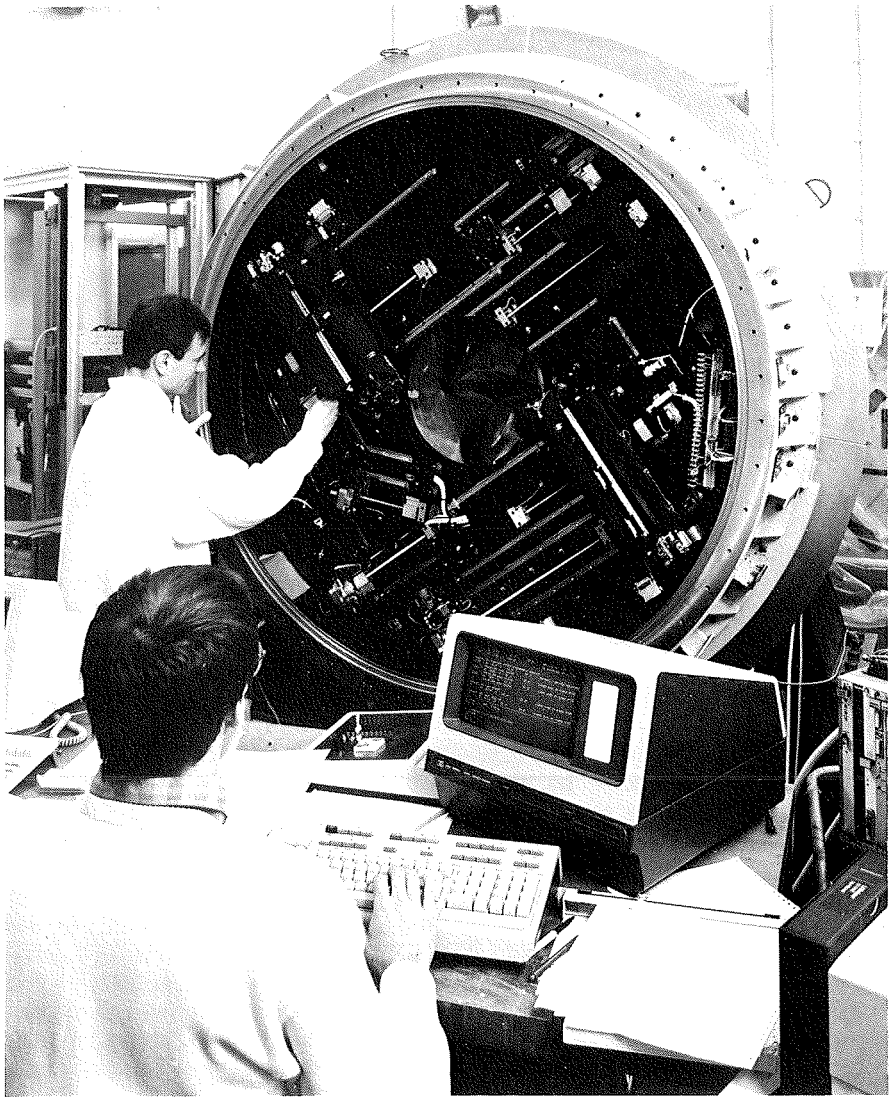
By mid-March we knew that the great moment was rapidly approaching. A Telefax from Ray Wilson informed us that the predicted optical quality was being achieved and that the night of "First Light" was imminent. We talked about the first astronomical pictures and how they would look, and we tried to forget that, even above La Silla, clouds might eventually spoil our hopes.

A Memorable Morning

On March 22, two days before Good Friday, we received the details about the NTT performance, which Ray Wilson has described above. We also learned that during the coming night the first attempt would be made to have "First Light". Would it be possible to obtain reasonably good images and would it perhaps also be possible to transmit them in near-real time to Garching via the permanent satellite link? And quite apart from the astronomical/technological significance of these first images, should we try to inform the world immediately about this important event or should we rather plan a Press Release for the week after?

In the evening that day, we decided to proceed as optimists and to prepare ourselves for the best. Some of the staff members agreed to be on call in the early morning hours. Massimo Tarenghi, Manager of the NTT project, said that he would already be in the Remote Observing Room at 2 o'clock in the morning, i.e. when the night fell at La Silla; the time difference was 5 hours.

Sure enough, there he was, speaking on the telephone with Lothar Noethe in the NTT control room on La Silla, when I arrived just after 3 o'clock. I sensed something unusual in the way they excitedly spoke to each other and then I



One of the two NTT adapter-rotators during integration at Garching in May 1989. Intensive tests on mechanics, electronics and software are going on and the optical integration will be started immediately after reception of the optics. The most optimistic planning foresees the start of the installation on the telescope at the beginning of October.

learned about the exceptional seeing, enabling the NTT optics to be tested to the limit, even at the moment of "'First Light"! It was just too good to be true! When would we get the first images? After some discussion, we agreed over the line that the most important thing would be to secure several good images in Chile, before attempting to transmit any of them to Garching. In this way, the images would be there, even if the complicated transmission process should lead to a crash of the NTT control system. And there we were, sitting, hearing the "Ah's" and "Oh's" 12,000 kilometres away, wishing as never before that we would soon be able to see those fantastic images.

The Images Arrive

Finally, shortly before 6 o'clock in the morning of March 23, Anders Wallander, one of the remote observing operators in Garching, took over the control of the NTT computer via the satellite link and requested it to transmit the first CCD image. At first something did not work, and Massimo later said that I went rather pale. (He never saw himself.) But then it came, and it took us a few minutes to measure the size of the stellar images with the IHAP system. We could not believe our eyes! More frames followed and were immediately written to tape. Preben Grosbøl rushed to the Terminal Room and read them into the MIDAS system on the VAX computer. David Chittim nursed the connected photographic Dicomed facility to incredible performance heights and soon Claus Madsen came with the first negatives from the darkroom. But then Massimo told us that the seeing was improving and even better images were on their way! We threw away an hour's effort and started all over again.

By 8 o'clock that memorable morning, we knew that we had in our hands the sharpest images ever obtained with a large ground-based telescope. Clearly, we should attempt to share them with the rest of the world as soon as possible. There was no longer any question of waiting until after Easter, and all available resources were switched into high gear. Two hours later, Hermann Heyer was ready with most of the 650 photographic copies of the ω Centauri field; equally many photocopies of the rapidly compiled Press Release and figure captions soon came back from Harry Neumann's Xerox machines; Elisabeth Völk was busy with the address labels and the envelopes that had been stamped in record time by Herbert Zodet and Marianne Fischer. And just before 12 o'clock, Hans-Jürgen Kraus delivered the entire lot to the Garching Post Office, less than six hours after the image was first recorded by the NTT at La Silla. Early the following week, European newspapers began reporting about the event, quite a few of them reproduced that famous picture.

The Future

The moment of "First Light" for the ESO NTT signals a new era in observational astronomy and none of those who participated in that exhilarating experience will ever forget the team spirit which permeated the staff on both sides of the link. For the time being, further adjustments are being made by the engineers. And soon it will be time for the astronomers to think seriously about how they can best exploit the exciting new capabilities of the ESO NTT, so dramatically demonstrated that Thursday morning. No doubt they will know how to take full advantage of this beautiful new tool. *R. M. WEST, ESO*

Operating Manuals Now Available

The following updated Operating Manuals have recently become available:

- B & C Spectrograph
- CASPEC
- CAT/CES
- ECHELEC
- EFOSC
- IR Photometers
- PISCO

Copies of these manuals can be obtained from Visiting Astronomers' Service, ESO Headquarters, Karl-Schwarzschild-Str. 2, D-8046 Garching bei München, F.R.Germany.