respecting centring tolerances with conventional large telescopes, i.e. maintaining the primary and secondary mirror optical axes sufficiently colinear. Very few telescopes maintain in practical use the centring tolerances required for high image quality and this leads to an ugly, asymmetrical image error known technically as *decentring coma*. Since this is the commonest and most serious optical "illness" of Cassegrain telescopes (the standard modern form because it is effectively a powerful mirror telephoto system giving a tube length much shorter than its focal length), the first author called it "Cassegrainitis". In the early seventies he concluded that it was hopeless to expect to maintain such absolute tolerances in a *passive* system, and some sort of *active correction* was necessary. While still at Carl Zeiss, he also learned from a colleague, Gerhard Schwesinger, the basic principles of the design of mirror supports. These principles were an essential prerequisite for the later development of active optics at ESO.

We have introduced above two fundamental terms, *passive* and *active*, which must now be defined. A normal, conventional telescope is *passive* in the sense that it is set up by some adjustment procedure and can only be maintained or modified by a subsequent *off-line* maintenance operation. Between such operations, the adjustment will degrade and will anyway be influenced by the telescope attitude. A further problem is that off-line access to telescopes is always difficult and in conflict with the observing schedules. The consequence is that telescopes are, in practice, virtually never in an optimum state of optical performance: often they are shockingly bad and nowhere near the quality achieved by the optician.

During the set-up and alignment of the ESO 3.6-m telescope in 1976 [3], the basic scheme for an *active* telescope became clear to the first author, although it was quite impossible to realize it with that telescope. Such an *active* telescope would monitor its own image quality *on-line* and correct any errors (i.e. optimize itself) automatically. The first and most important aspect of an active telescope is therefore *automatic maintenance* of optimum optical quality. Later it became clear that there was a second aspect of active optics which is hardly less important than the first: the relaxation of certain manufacturing tolerances which, with subsequent active correction, leads to an optimum level of quality far surpassing anything achievable with passive telescopes.

To understand this, we must introduce the term *Intrinsic Quality* (the IQ of a telescope!) which was defined in connection with the set-up tests of the (passive) ESO 3.6-m telescope in 1976. Figure 1 shows the results of these (Hartmann) tests for the zenith position and for zenith distances from 45° to 60° at the four azimuths south, west, east, north. In each case, the left-hand point of the histograms gives the actual image quality of the telescope as measured in the conventional way (image diameter in arcsec containing 80 % of the geometrical energy of a star image). Note that there is a significant variation of quality with telescope attitude, the quality being worst in the south and best in the north. The principal reason for this is quite simple: a residual of decentring coma is increased in the south by tube flexure (Serrurier) error, whereas it is compensated in the north. The histograms show the improvement that *would be* achieved *if* the errors shown were removed. Although the histograms must all fall monotonically towards the last point 5 on the right, their form varies significantly. However, within the error of measurement, the right-hand point is a constant for this telescope, independent not only of telescope attitudes but also of time. This is what we call the

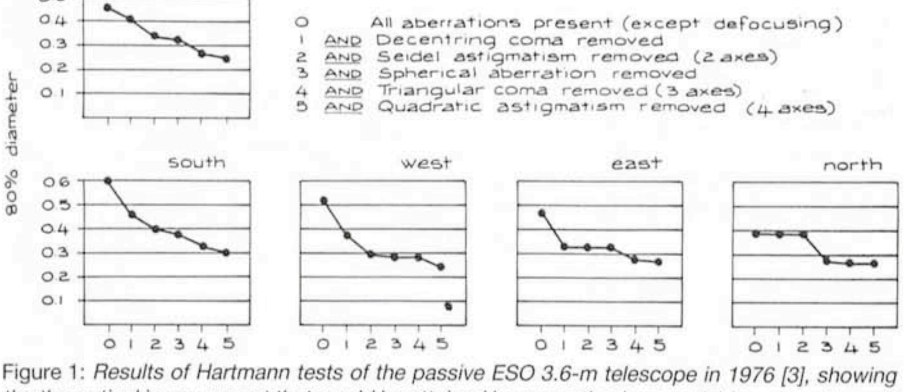

Figure 1: *Results of Hartmann tests of the passive ESO 3.6-m telescope in 1976 [3], showing the theoretical improvement that would be attained by correcting low spatial frequency terms if the telescope were active. The mean right-hand point of the functions gives the* intrinsic quality *(IQ).*

ESO Places Contract For World's Largest Mirror Blanks

After a period of intense negotiation, the European Southern Observatory and Schott Glaswerke, Mainz (F.R. Germany), reached agreement about the delivery of four giant mirror blanks for the ESO Very Large Telescope (VLT). The blanks will be spin-cast of Zerodur, a ceramic material. Each will have a diameter of 8.2 metres, an area of ~ 53 square metres and a thickness of only 17.5 centimetres.

The contract was signed on September 12 at the ESO Headquarters in Garching bei München, by Professor Harry van der Laan (right), Director General of ESO, and Mr. Erich Schuster (left), Member of the Board of Directors of Schott Glaswerke.