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Ever Larger and More Powerful

At the world's largest astronomy conference held in Hawaii, 2,200 participants discussed current and future telescope projects. SCHOTT Glas was represented by experts and an exhibit.

"The goal was to inform the designers of astronomical telescopes about the latest developments in our production processes," explains Dr. Thorsten Döhring, "Zerodur" Project Manager in the Optics for Devices Business Segment at SCHOTT Glas in Mainz. "The response was very good. After all, optical glass and 'Zerodur' glass ceramic are key engineering materials in telescopes."

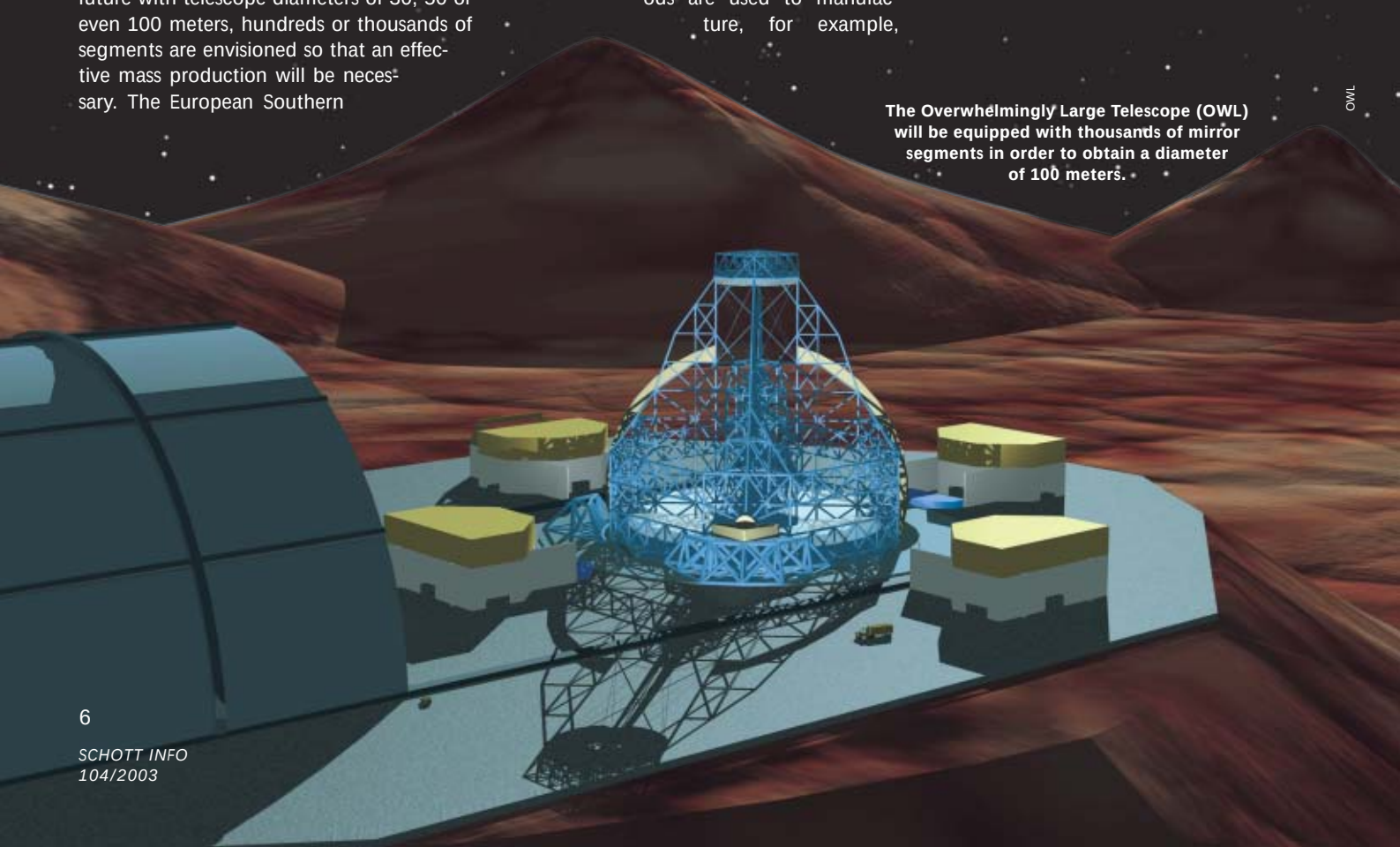
Segmented primary mirrors

As the performance of a telescope mainly depends on the diameter of its primary mirror, the trend is towards ever-increasing dimensions. Measuring ten meters in diameter, the primary mirrors of today's classic telescopes for visible light are so large that they cannot be produced in a single piece, but instead are assembled from many hexagonal segments. For the projects of the future with telescope diameters of 30, 50 or even 100 meters, hundreds or thousands of segments are envisioned so that an effective mass production will be necessary. The European Southern Observatory (ESO) already commissioned a detailed feasibility study for the most ambitious project, the Overwhelmingly Large Telescope (OWL) featuring a mirror diameter of 100 meters.

Production and measuring methods optimized

SCHOTT is well prepared for these developments. For instance, the company has developed a new casting process for mirror segments made from "Zerodur" glass ceramic, which utilizes hexagonal casting molds instead of the conventional round ones. The casting molds are therefore much closer to the final shape, which means that less material and less time are required for casting and cutting. The production processes for optical glass in large dimensions have also been improved. Such methods are used to manufacture, for example, lenses and prisms for telescope optics. Newly developed measuring methods have made a major contribution to improving quality.

X-ray telescopes will also be larger in the future. With the "Constellation X" and the "XEUS" respectively, both NASA and the ESA are planning ambitious projects for which the necessary tubular mirrors are going to be composed of thousands of segments. They will no longer be produced individually, but instead with the help of reproduction processes using so-called mandrels. "Zerodur" has been chosen as the engineering material for these mandrels because it best fulfills the extremely high demands regarding quality. SCHOTT has already successfully produced the first demonstration prototypes for these applications.



OWL

The Overwhelmingly Large Telescope (OWL) will be equipped with thousands of mirror segments in order to obtain a diameter of 100 meters.

With a process developed by SCHOTT, “Zerodur“ blocks can be directly cast as hexagonal blanks.

SCHOTT/Erwin Johh

Laser-aided measuring instruments detect the slightest deviations from the control values.

NASA

For the “Constellation X” X-ray telescope commissioned by NASA, SCHOTT Glas produced a so-called mandrel for Zeiss, with which the mirror segments can be reproduced.

Carl Zeiss