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Modern Technologies in Space- and Ground-based Telescopes and Instrumentation

Eli Atad-Ettedgui
Dietrich Lemke
Editors

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Introduction

Astronomy is driven by the desire to understand our position in the universe, and by new technology.

For almost forty years, SPIE has organized conferences on astronomical telescopes and instrumentation. These events eventually became huge symposia with specialized parallel conferences on all major instrumental areas, such as space- and ground-based telescopes, detectors, interferometers, and adaptive optics. With the increasing complexity of the instrumentation; however, a further conference dedicated to the enabling technologies became necessary. This conference "Modern Technologies in Space- and Ground-based Telescopes and Instrumentation" was held for the first time in 2002 as part of the SPIE symposium of several conferences on astronomical telescopes and instrumentation, attended by ~ 2000 scientists and technicians. While the first two of these new technology-conferences started off with 47 and 79 contributions, respectively, the number of papers has increased to ~ 200 at this fifth conference. Six full days were necessary to schedule about half of the submitted contributions for oral presentations; the rest were posters. Several participants felt somewhat exhausted after a full conference week, which started early on a Sunday morning. The readers of these proceedings are in a more comfortable position: they can take their time to study the interesting and well written contributions from scientists and technicians from laboratories all over the world. However, they will of course miss out on the pleasure of listening to the number of committed speakers, and they cannot ask questions in real time.

This volume documents the impressive progress made in the technical preparation for the extremely large telescopes on both sides of the Atlantic since the 2008 meeting. The first large mirror segment for the Giant Magellan Telescope GMT was presented, including the alignment and test strategy for this 8m-off-axis giant. A first series of the 1.4m-hexagon segments for the 42m European counterpart E-ELT, made of different materials, proved that ESO and the European industry are ready to start building this giant telescope. Even "old" mirror materials such as Zerodur are good for a surprise. Its mechanical strength could recently be improved and measured to be nearly an order of magnitude higher than listed so far. This enables the manufacturing of "superlightweight" glass ceramic mirrors of only ~15% the mass of a full blank.

"Astrophotonics" was another major topic of this conference. With its novel devices such as starbugs, miniature spectrographs in multi-objects spectroscopy, array waveguide gratings, fiber Bragg and VPH gratings, it will revolutionize astronomy and reduce the size, mass, and cost of the next generation of instruments.

But sometimes progress at one front means a disaster at another: The modern closed cycle coolers for the large infrared instruments at the Very Large Telescope VLT have displayed a vibration level which is unacceptable for the operation of interferometers at the VLT- I. The solutions of the "vibration war" presented here look like an apparent, but sophisticated step backwards to Linde's good old liquid nitrogen.

We hope that the readers will find reading these proceedings exciting, and that they will stimulate ideas for their own research.

We look forward to seeing you at the next conference on "Modern Technologies…" in Amsterdam in the summer of 2012.

Eli Atad-Ettedgui
Dietrich Lemke