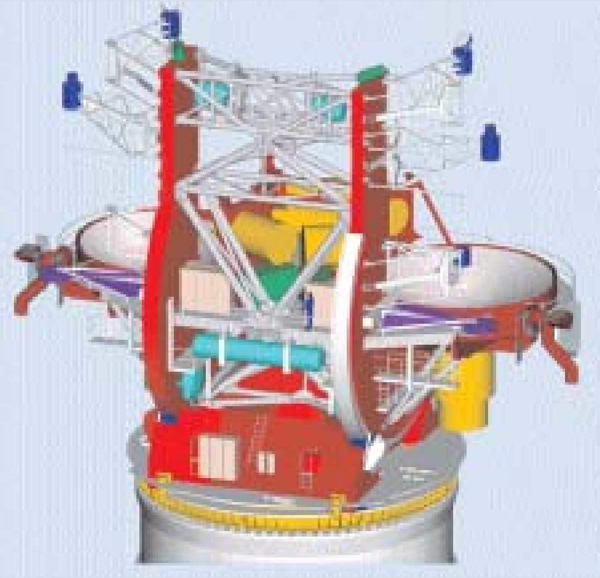


The small figure in the middle of the system gives an impression of the telescope's dimensions. © Large Binocular Telescope

A sharp view of space

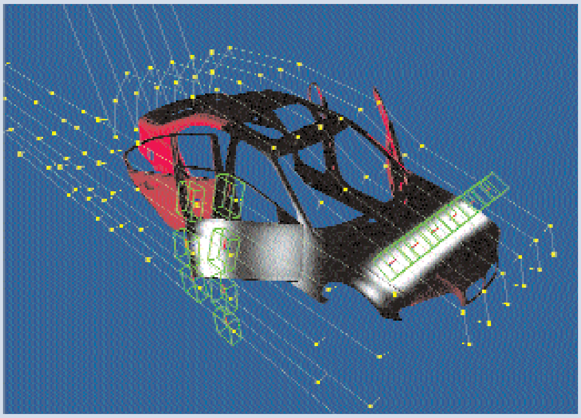
In order for the world's largest telescope in the U.S. State of Arizona to provide a clear view of the stars, the instrument's internal mirror assembly must retain its shape despite temperature changes and rapid movements. This is achieved through the use of mirrors made with a new combination of materials.

Two mirrors measuring eight meters in diameter combine the sensitivity of a 12-meter telescope and the resolving power of a 23-meter telescope. The piston mirror, an assembly consisting of two mirrors, each with a diameter of about 20 centimeters, also contributes to the telescope's performance by merging the two optical beams in the instrument and equalizing phase shifts in the ray beam. It therefore needs to be kept as small as possible so that it can be easily and rapidly moved, and it must hold its shape even when subjected to temperature variations and acceleration forces.

Working with associates from the Fraunhofer Institute for Applied Optics and Precision Engineering IOF in Jena, researchers at the Max Planck Institute for Astronomy in Heidelberg have introduced a new silicon-aluminum alloy as the mirror base. The novel material, which has special thermal expansion properties, is coated with a layer of chemical nickel and processed with high precision. The piston mirror is the first application in which this combination has ever been used.

Ultraviolet light for car paint

Car-wash brushes, garden shrubs, road chippings and many other things can scratch the paintwork on a car. To prevent damage to the protective coating, car manufacturers are now hardening the paint with a new process that uses UV light. In the paint shop, tiny particles of powdered paint flow through the air and come to rest on the car body, adhering only very lightly. Not until the powder has been melted in an oven, followed by irradiation with UV light, do the paint molecules cross-link into a dense network to form an extremely hard, scratch-resistant coating. Before the painting process can begin, the engineers have to re-position the UV ray emitters for each new car body.



Researchers determine the optimum UV radiation in advance on a computer. © Fraunhofer IPA

Researchers at the Fraunhofer Institute for Manufacturing Engineering and Automation IPA have joined forces with a car manufacturer to develop a simulation program that enables the optimum radiation to be determined in advance on a computer. This largely eliminates the need for expensive trial runs. The program enables engineers to interactively alter the positions and relative movements of the ray emitters and to simulate the radiation with any UV lamps they choose, for the specified period of time.

Shipbuilding made easy

Any new ship is a unique, highly specialized product made to the requirements of a particular customer. Technical innovations have enabled the German shipyards to maintain a leading edge in the face of stiff competition on global markets, but innovations always involve financial risks. Researchers at the Fraunhofer Institute for

A new type of planning and simulation tool links shipbuilders, suppliers and scientists.
© FSG-Flensburger Schiffbau-Gesellschaft

Algorithms and Scientific Computing SCAI have therefore entered into a joint planning and development project with leading German shipyards, suppliers and the German Aerospace Center DLR. The ship design and simulation system SESIS makes it possible to predict the ship's properties right from the early stages of development. The tool incorporates all the essential planning data. It supports the engineers in designing the ship and helps to optimize the workflow of the companies cooperating in its construction. A particularly important feature is its support of cooperation between internal and external development groups, for up to 70 percent of the ship is manufactured by external suppliers rather than being built at the shipyard.

SESIS runs in distributed computer environments linking Unix, Linux and Windows operating systems. Existing programs are to be incorporated in the network. The German Federal Ministry of Education and Research has allocated funds of some three million euros for SESIS.

Logistics experts have developed ingenious concepts for assembling the solar thermal power plant.
© Flagsol

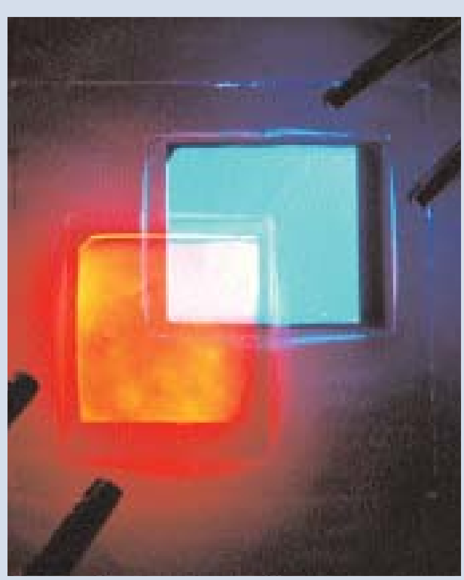
Solar panels ride the suspended railway

Europe's first commercially operated solar thermal power plant in southern Spain is scheduled to go online in 2006, with solar energy supplying electricity on an industrial scale. The construction of such a power station presents a huge logistical challenge, as the solar collectors are configured in vast arrays of mirrors.

Even the steel structural elements employed to build a single array of mirrors at the Andasol power plant in Guadix weigh a total of over 11,000 metric tons. During the construction phase these have to be delivered, temporarily stored, moved around and finally installed. The Fraunhofer Institute for Material Flow and Logistics IML has developed an assembly and material flow concept to cope with the logistics and organization involved in assembling such a field of mirrors. The scientists use an electrically powered overhead railway to carry the solar collector units to and from the processing stations along a linear production line.

Shining bright

Scientists at the Fraunhofer Institute for Applied Polymer Research IAP in Potsdam have succeeded in building transparent OLED displays using light-emitting polymers. The usually very small self-lit displays are installed primarily in cell phones and MP3 players. Their brightness, operational life and effectiveness is so great that initial commercial applications are conceivable. This has been made possible by a new kind of metal electrode that supplies the polymer film with electric current.



Until now, the polymer electrodes have been too thick to allow any significant amount of light to pass through. Electrodes that are too thin, on the other hand, detract from the electric conductivity and thus the luminosity and operational life of the displays. Because they are transparent, the OLED displays can be combined with the conventional and meanwhile very highly developed TFT liquid crystal displays. Optrex Europe GmbH of Babenhausen, Hessen, a partner in this project, has already built demonstrators for such hybrid displays.

Transparent organic light-emitting diodes are available in a variety of colors, which can be mixed to produce displays in almost any blended color.
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