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Technological trends are multiple and interactive. We seriously pursue only those concepts that design tools can describe, fabrication capability will allow, metrology can verify, and market needs currently justify. Most of us work within the current limitations; we naturally envision the familiar and diligently improve upon it.

For well over a century we have exploited the natural tendency of lapped surfaces to become spherical, the batch production allowed by their symmetry, and the simplicity of spherical metrology. We have used design methods that, assuming those symmetries, attempt to minimize the aberrations intrinsic to spheres.

A few pioneers push design description, fabrication capability, and metrology verification. At some point, the previously impossible or impractical becomes an emerging trend. It has long been known that a single aspheric surface can replace 2–4 spherical elements and eliminate their size and mass, but at over 20 times the cost of a sphere, aspheres were seldom prescribed beyond projects for which size and mass were dominant: astronomic telescopes, space probes, and high-end photography. Yet in the last thirty years, new fabrication and metrology have reduced asphere costs an order of magnitude, and as a result aspheres have become commonplace even in consumer applications such as DVD players and cell phone cameras.

This is such a time for freeform optics. The territory may be unfamiliar, but maps are becoming available. Practical experience is rapidly evolving. In this special section, we are pleased to present new work on design, description, fabrication, and metrology of surfaces and systems with fewer symmetries and unaccustomed mathematical representations:

Youngworth et al. speak to the communication of requirements through the framework of ISO standards.

Maksimovic investigates radial basis functions as a global descriptor and introduces a novel Fibonacci distribution for placement of RBF nodes.

Nikolic et al. examine orthogonal polynomials appropriate for rectangular apertures.

Chrisp et al. introduce a design and optimization code for use with NURBS, and provide several examples of its capabilities.

Blobel et al. examine the use of a freeform artifact to characterize and compare contact versus noncontact evaluation methods.

Beutler describes a coordinate measuring machine utilizing both an optical and tactile probe and its practical application including the importance of fiducials.

Vu et al. tackle the vicissitudes of precision glass molding of freeforms; in particular, the use of a nonisothermal heat cycle to increase throughput and mold lifetime while reducing energy consumption. They identify and discuss four strongly interdependent process parameters, and claim a potential for high-volume production.

We hope these featured articles will encourage readers to "think outside the axis" and re-examine their assumptions about what is possible.

Oliver Fähnle received his PhD from Delft University in the Netherlands in optics fabrication and testing and has been head of the Optics Fab Technology group at FISBA AG in Switzerland ever since. Since 2002 he is "Visiting Lecturer" to the Technical University of Delft where he gives an annual lecture on optical fabrication and testing. He has been carrying out research in this field for more than 23 years seeking deeper insights in glass processing of optical elements.

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Ray Williamson has been an engineer in precision optics manufacturing, testing, and quality since graduating with a BS in physics, optics option, from San Diego State University in 1970. He is a Senior Member of SPIE and OSA, a member of Florida Photonics Cluster and CREOL Industrial Affiliates, and a voting member of OEOSC. He consults in optical manufacturing, testing, and general problem-solving, and teaches. He wrote the SPIE *Field Guide to Optical Fabrication*.