

# Optical Engineering

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## Advances in Optical Design

Peter Clark  
Julius Muschaweck  
Richard Pfisterer  
John Rogers

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### Peter Clark

Optikos Corporation  
Wakefield, Massachusetts  
E-mail: [pclark@optikos.com](mailto:pclark@optikos.com)

### Julius Muschaweck

Arnold & Richter Cine Technik GmbH & Co.  
Betriebs KG  
Munich, Germany  
E-mail: [JMuschaweck@arri.de](mailto:JMuschaweck@arri.de)

### Richard Pfisterer

Photon Engineering, LLC  
Tucson, Arizona  
E-mail: [richp@photonengr.com](mailto:richp@photonengr.com)

### John Rogers

Synopsys, Inc.  
Pasadena, California  
E-mail: [jrogers@synopsys.com](mailto:jrogers@synopsys.com)

The eight papers in the Special Section on Advances in Optical Design are a selection of items adapted from the International Optical Design Conference (IODC), which was held in July 2017 in Denver, Colorado. The IODC is a long-running series of meetings of the optical design community, dating back to 1966. These days, IODCs are held roughly every four years, and they are highly anticipated. Reviewing the programs and proceedings of old IODCs can give us an instructive look at where we've been. We see the development of powerful software and numerical methods that analyze and optimize lens designs. As new topics arose, they were covered at IODCs: IR systems, aspherics, gradient index optics, diffractive optics, and computational optics, all have been important issues, presented by the most prominent individuals in the field.

At this meeting, 495 attendees gathered to share their mutual interests and passion for optical design, fabrication, and testing. IODC was co-located with Optical Fabrication and Testing (OF&T) and the OSA Freeform conference.

A conference proceedings was published by SPIE, with a total of 82 papers. The eight papers in this special section are a reasonable sample of that proceedings. The design of "freeform" optical systems is an active research topic these days, and two sessions of freeform-related design papers were shared by IODC and Freeform, covering theory and practical design methods. The adaptations of three of those papers appear in this issue.

We might say that optical design for imaging systems has been done seriously since the early days of photography, about 175 years ago, but new developments continue to come and more challenging requirements need to be met. As an example of that, we include a paper about a statistical approach to primary and secondary color correction, and there were many more at the conference regarding theory,

standards, tolerancing, methods, and examples of imaging and nonimaging system designs.

The contribution about mounting of aspheric optics represents the crossover of OF&T and optical design at IODC. And, finally, we have three papers with historical interest, showing the richness of the field of optical design. We continue to learn from those years of experience.

**Peter Clark** is an Optical Engineering Fellow at Optikos Corporation, where he works in optical system design, analysis, and testing. He has developed ophthalmic and medical optics, infrared optics, and other consumer and commercial products. Earlier career highlights include twenty years with Polaroid Corporation, designing optical systems for cameras and a variety of other products, and nine years with LensVector, a startup company with innovative technology for tunable lens elements. He has degrees in optics from the University of Rochester and Northeastern University. He is a fellow of OSA, a member of SPIE, and he is active in the optics community, having served on the board of directors of OSA, and as a co-chair of IODC, the premier conference on optical design.

**Julius Muschaweck's** career in optics started as a visiting scholar at the University of Chicago with Roland Winston, designing and building concentrating optics for solar energy collection. After returning to Germany, he became CEO and co-founder of OEC, an independent optical design service for illumination, pioneering freeform optics. He then joined OSRAM, the LED and lamp manufacturer, where he served as senior principal key expert for optical design, and later moved on to ARRI, the leading company for movie cameras and lamp heads. He is now an independent optical consultant, providing engineering services, teaching illumination optics and writing. Julius supports the optics community as a senior member of OSA, where he serves on the board of meetings, as an active SPIE member, and as co-chair of IODC.

**Richard Pfisterer** is president and co-founder of Photon Engineering, LLC, where in addition to company and project management, he develops FRED software, performs stray light analyses, designs optical systems, and teaches courses in stray light analysis techniques and surface scatter theory, and physical optics modeling. During his career, he was head of optical design for TRW (now Northrup Grumman), a research scientist at Breault Research Organization working on ASAP software, and an independent consultant. He has BS and MS degrees in optical engineering from the University of Rochester. He is a Fellow of SPIE, a member of OSA, and has

served the optical engineering community as convener of the SPIE lens design technical group since 2003, invited speaker and committee member for numerous SPIE conferences, and as co-chair of IODC, the premier conference on optical design.

**John Rogers** earned a PhD in optical science at the University of Arizona in 1983. After receiving his degree, he worked in optical design and testing at Kern AG and at Wild Heerbrugg (later Leica)

in Switzerland. Between Kern and Wild, he was an assistant professor at the University of Rochester, where he taught geometrical optics, optical testing, and optical design. In 1997, he joined the optical design group at Optical Research Associates, now Synopsys Inc., where he has worked on a wide variety of projects including undersea, space, medical, ophthalmic, and military applications. He is a member of OSA and a fellow of SPIE.