PROCEEDINGS OF SPIE

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Front Matter: Volume 10263

, "Front Matter: Volume 10263," Proc. SPIE 10263, Lens Design: A Critical Review, 1026301 (1 July 1992); doi: 10.1117/12.2284709

SPIE.

Event: OE/LASE '92, 1992, Los Angeles, CA, United States

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Preface

This critical review of lens design incorporates the work of no fewer than seventeen acknowledged experts in the field, each of whom has presented an authoritative review of some particular aspect of lens design. Mathematical lens design has existed since 1840, when Joseph Max Petzval designed his renowned Portrait Lens. Lens design and geometrical optics are well-established fields, yet they still grow and advance. Each year there are more and more individuals practicing lens design, and each year the art, the science, the tools, and the techniques of lens design show incremental advances.

In this review we have attempted to provide both a broad coverage of the basic elements of lens design as well as review of particular subjects that have undergone recent advances and innovations. Our first session included the basics of first-order optics, aberrations, design principles, and computer optimization programs. In the second session the ILDC lens design contest winner presented the winning design. Recent developments in zoom lenses and the peculiarities of IR lens design were covered, as well as the design and fabrication of a real diffractive/refractive lens. The third session included more on diffractive lens design, plus holographic applications in HUDs, a discussion of the special considerations of UV and x-ray optics, and a narration of the development of an eccentric pupil-reflecting telescope. The final session began with a paper on apochromats and superachromats, and another on the diffraction effects of a gaussian distribution of beam intensity. Up-to-date coverage of mirror anastigmats was followed by a review of microscope-objective development through the current optical disk applications. The session ended with a discussion of the interface between optics and the eye.

All in all it was a pleasant and instructive blend of background and new outlooks on the subject at hand. This volume should become a highly regarded reference and a worthy companion to the now-classic Critical Reviews of Geometrical Objects (1985, SPIE Vol. 531, R. E. Fischer, W. H. Price, and W. J. Smith, eds.). I would like to express my gratitude and appreciation to the cochairs, the experts who spoke, and the experts who attended and contributed to the discussions.

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