
SPECIAL SECTION EDITORIAL

The eye lens is a biological organ which functions as an optical element. What better subject for a special section of the Journal of Biomedical Optics? The role of the lens in the eye is twofold: to aid the cornea in refraction and to alter the focus of the eye providing clear vision over a range of distances. With age, lenticular function is altered. The focusing capacity decreases, making it harder and harder to see close objects clearly. In addition, there is an increase in light scatter and fluorescence. In some cases the structure of the lens undergoes changes that result in the formation of an opacity. This is termed cataract and it produces a further increase in scatter and fluorescence as well as a loss of visual function.

In this special section, seven invited papers deal specifically with light scatter and fluorescence in the eye lens. They include review articles together with theoretical and experimental papers covering several aspects of the topic.

van Best and Kuppens summarize work on the measurement of autofluorescence and light transmission by fluorophotometry and show how values vary in diabetics compared to nondiabetic subjects. Weale provides an indepth analysis of *in vivo* and *in vitro* measurements of lenticular fluorescence, discussing the contribution of factors such as refraction and absorbance. In the paper by van den Berg, lenticular light scatter, for different ages and types of cataract, is derived from *in vivo* measurements of straylight and the effect of fluorescence on visual function is determined from measurements on *in vitro* lenses.

An important parameter of refractive power is the refractive index. From the relationship between refrac-

tive index and light scatter, Hemenger suggests that underlying structural changes in the organization of proteins found within the cells of the lenses cause an increase in both scatter and index.

Scatter, using polarized light, is used to study the factors contributing to the loss of transparency in induced cataracts, in the paper by Bettelheim, Churchill, Robinson, and Zigler. Changes in lenticular birefringence are shown to result from the breakdown in structural organization.

A new method of simultaneously measuring the fluorescence and Rayleigh scatter at various positions in the living lens is described by Yu, Krantz, Eppstein, Ignatz, and Samuels. This is suggested as an effective way of detecting diabetes, the latter producing biochemical and optical changes in the lens that lead to cataract.

In the clinic, the lens is viewed routinely using biomicroscopy. The image screen is formed by the light which is scattered from the surfaces and from internal features such as opacities. The Scheimpflug technique, adapted to biomicroscopy, permits a three-dimensional evaluation of the lens. Masters demonstrates how Scheimpflug images of a cataractous lens can be analyzed, using an interactive image processing program, to reconstruct the three-dimensional image of the lens showing the exact positions and extent of the opacity.

The diversity of studies presented in this section on Light Scatter and Fluorescence of the Eye Lens is hardly surprising given the nature of this biological tissue which serves an optical function.

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