# Smart Cameras Using The Logarithmic Asphere

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## Abstract

In electronic imaging an integrated consideration of image acquisition and image processing is leading to important new optical systems. We describe a smart camera consisting of a novel lens, CCD array, and a computer. In our research we have devised a circularly symmetric multifocal lens that has an extended depth of field. For this new lens which we call a logarithmic asphere, we describe the theory, the fabrication and testing, and several experiments. In photography limited depth of field has been a great nuisance and it has greatly complicated camera design. In our smart camera the picture acquired at the CCD has been purposefully blurred and digital image processing is required to obtain the final image. Digital processing can also be used for color correction. Experiments described are for a single lens logarithmic asphere and separately a phase mask with a Nikon 60 mm lens. Image processing results are described comparing the Wiener-Helstrom inverse filter and maximum entropy methods; the latter providing better image quality. Applications are foreseen in digital video and single-use cameras.

## Biography

Nicholas George is the Wilson Professor of Electronic Imaging and Professor of Optics at The Institute of Optics. Dr. George directs a group of 8 doctoral scholars conducting research in imaging through turbulence and fog, speckle at low light levels including wavelength effects, Fourier optics, automatic object recognition, and holography. He is the founding director of two major research centers at the University of Rochester. Prior to this he was Director of The Institute of Optics, serving during a period of unprecedented growth. Earlier he was a professor of electrical engineering and applied physics at the California Institute of Technology.