

Progress in Optics: encyclopedia of modern optics

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The 45th volume of *Progress in Optics* (Amsterdam: North-Holland, 2003) was brought out. The first volume of this ongoing series of review collections appeared in 1961, a year after the first laser was launched — the occurrence spurring numerous striking developments in and indeed transforming the world of modern science and technology. Since then, *Progress in Optics* has published about 260 reviews on various aspects of the fast growing field of optics, which has been enriched, over this period, with many new research directions and has come to embrace a wide variety of physics branches as a method for studying matter. The continuous editor of the series, E Wolf, is well known both for his scientific work and for *Principles of Optics* 3rd ed. (Oxford: Pergamon Press, 1965), a much-read book he co-authored with M Born (Russian translation was published by Nauka, Moscow, 1970). Combined with the efforts of a representative editorial board of ten plus prominent experts from around the world, E Wolf's enthusiasm and tenacity has made *Progress in Optics* a kind of encyclopedia of fundamental and applied optics, a vivid display of the field of optics' new scope, so enriched with the developments in lasers over the last 40 years. The spectrum of the themes the reader is offered is extremely broad, as the following list of example reviews amply shows:

fundamental problems

- Light and information, by *D Gabor*, Vol. 1,
- Fluctuations of light beams, by *L Mandel*, Vol. 2,
- Theory of photoelectron countings, *C L Mehta*, Vol. 8,
- Tools of theoretical quantum optics, by *M O Scully and K G Whitney*, Vol. 10;

basic methods of optical investigation

- Light beating spectroscopy, by *H Z Cummins and H L Swinney*, Vol. 8,
- Doppler-free multiphoton spectroscopy, by *E Giacobono and B Cagnac*, Vol. 17,
- Interferometric testing of smoothed surfaces, by *G Schulz and J Schwider*, Vol. 13;

basic optical phenomena in a substance

- Echos at optical frequencies, by *I D Abella*, Vol. 7,
- Interaction of very intense light with free electrons, by *J H Eberly*, Vol. 7,
- Self-induced transparency, by *R E Slusher*, Vol. 12;

instrumental optics

- Holographic diffraction gratings, by *G Schmahl and D Rudolph*, Vol. 14,
- Michelson stellar interferometer, by *W J Tango and R Q Twiss*, Vol. 17,
- Principles of optical disk storage, by *J Carriere et al.*, Vol. 41.

Despite the abundance of published reviews, finding one's bearings is very easy with each volume, including the series's entire retrospective content. It is time now to look at the series's latest two volumes, Nos 44 and 45. A reader interested in nonlinear effects in fibers and concerned with femtosecond measurement techniques will enjoy the review "Femtosecond pulses in optical fibers" by *F G Omenetto*, appeared in Vol. 44. The same volume contains the review "Optical coherence tomography" by *A F Fercher and C K Hitzenberger*, which describes 'imaging' techniques suitable for strongly scattering media and intended for medical applications.

In the 45th volume, 6 reviews are presented. The paper "Anamorphic beam formers for laser and diffuse light" by *N Davidson and N Bokor* is concerned with transformers of light beams with substantially different transverse dimensions, a highly topical theme due to the appearance of laser diode arrays in which very good energy characteristics are combined with poor spatial radiation quality. Anamorphic beam transformers are also necessary for focusing symmetric beams into narrow spots (for laterally pumping laser rods with sunlight, as an example). The paper "Ultrafast all-optical switching for optical networks" by *I Glesk et al.* concerns with modern developments in ultrafast light signal control, developments which employ nonlinear optical effects and are aimed at the telecommunications networks of the future. "Generation of dark-hollow beams and their application" by *J Yin et al.* describes how dark-hollow (i.e., tubular) beams are produced. Such beams are widely used today as optical 'tweezers' and manipulators for microscopic objects like tissue cells, atoms, and molecules. *D J Gauthier's* paper "Two-photon lasers" is devoted to the unusual properties of radiation resulting from stimulated two-photon emission (two incoming photons cause an atom to make a transition in which two photons are produced). "Nonradiating sources and other 'invisible' objects" by *G Gbur* deals with examples of the rather bizarre phenomenon of distributed charges moving without radiation. The study of such sources, besides its knowledge-enhancing significance, is of fundamental importance in solving the inverse problem of reconstructing the nature of a source from the radiation it emits. Rather unusual lasers with feedback due to light scattering by inhomogeneities in a medium are the subject of the paper "Lasing in disordered media" by *H Cao*. The paper presents experimental data on the dynamics of such lasers, as well as descriptions of such things as the spatial distribution of radiation, spectra, photon statistics, etc.

Unique in its scope, the review collection *Progress in Optics* is in fact an encyclopedia of modern optics and is of interest to a wide range of research workers, both those already using optical methods and those mastering new research areas. There is no doubt that both the well-versed researcher and one only beginning on the path to science will find a solidly presented and extensively referenced review on the theme of their choice in the *Progress in Optics* volumes.

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