Optics and Special Techniques: Advances and Trends

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The advent of third-generation synchrotron radiation sources has opened up the scene for the conception and realization of several new experiments, with a unique impact in many areas of science, structural biology in particular. The titanic science and engineering effort in the construction of such facilities is now flourishing with the wealth of information derived from experiments that make use of the photons there available. The challenge is now the creative innovation in optics and complementary techniques that will allow the full use of the unique features of the synchrotron light in a wide spectrum of applications. One example is the development of optical elements based on mirrors, Fresnel zone plates, capillaries, and waveguides to form highly focused microbeams that could be extremely useful in imaging, diffraction, and fluorescence. Another area of interest has been the use of the unique time-structure of synchrotron radiation, with the developments that have made feasible sub-nanosecond time-resolved crystallography experiments, which are now allowing the elucidation of the dynamics of the molecular mechanisms involved in biological catalysis. The possible use of the polarization of the synchrotron beam in the direct measurement of phases in multiple-beam x-ray diffraction is also a new challenge. Although not reviewed in this panel due to the natural limitations in the program, many other new developments are being made in monochromators, mirrors, detectors, and other instrumentation, which will certainly make for a much more effective use of the full spectrum of photons available at different facilities around the world.