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Photon Counting Detectors For Time-Resolved X-Ray Diffraction in Structural Biology. Gerd Rosenbaum, Dept. of Biochemistry, Univ. of Georgia, Athens, GA 30602.

Two developments, occurring in the early 1970s, made time-resolved X-ray diffraction studies of biological systems feasible: the availability of monochromatized and focused hard X-ray synchrotron radiation and of position sensitive photon counters. Even the early one-dimensional single wire detectors presented a quantum leap not only in time resolution but also in efficiency. Progress from resistive wire to delay-line read-out increased total count rate and the development of 2-D wire chambers increased spatial resolution and coverage. These detectors were extensively used for time resolved studies on muscle. The steeply increasing brilliance of synchrotron sources made possible much faster time resolution and recording of weaker reflections that are more indicative of structural changes. However, the fact that the count rate is limited for the wire detectors as a whole placed a severe limit on the usefulness of these detectors. Fast photon counting detectors with read-out per pixel, though 1-D and with limited number of pixels, have been developed and used. High gain CCD-detectors in streak mode can provide fairly high time resolution and quantum efficiency. The pixel array detectors under development will give 2-D coverage with fairly high spatial resolution but limited time resolution for weak reflections.