Currently the most widely used form of soft x-ray microscopy is one which does not employ x-ray optics, but records a light contact image of the specimen, using soft x-rays and an ultra-low-grain recording medium. (See R. Feder et al., in: X-Ray Microscopy, Springer-Verlag, 1984.) The contact image is then examined by electron microscopy. Resolution is limited primarily by diffraction blurring, and varies from 50 to several hundred Angstroms, depending on wavelength and specimen thickness. The technique is convenient, permits stereo, flash, and multiple-wavelength imaging, and can be used for the imaging of wet and/or living material. Examples will be shown, and future prospects for the technique will be discussed.

Other forms of "lensless" soft x-ray microscopy which are being investigated include soft x-ray holography and diffraction. A brief summary of the work in these areas being done at the Brookhaven soft x-ray ring will be given.

In theory, accurate structure factors can be obtained by estimating experimental reflectivities and applying appropriate methods to derive extinction-corrected integrated reflectivities. In practice, the classical procedure involves measuring the intensity profile, I(ω), whose one-dimensional nature obscures the required reflectivity information. In addition, the one-dimensional restriction conceals other limitations of the conventional procedure.

When one explores Bragg reflections two-dimensionally in the plane of reflection in terms of the parameters d_o, d_2, not only are these limitations made evident but the increased resolution and evidence of local which are characteristic of the experimental components allows, inter alia, the possibility of determining reflectivity variation within the individual Bragg reflection.

Even with correction for extinction, there is no guarantee that one-off measurements will necessarily give absolute structure factor values. To obtain such values requires extrapolation of a series of measurements made with a controlled range of an appropriate physical variable.