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Introductory Remarks

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II. SOME NEW DEVELOPMENTS IN SPECIMEN PREPARATION TECHNIQUES

Introductory remarks

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The purpose of any specimen preparation technique is to prepare a sample of material 'fixed' in some way as near as possible to its native state, so that its structure has not changed significantly by the time the specimen is examined in the electron microscope, stained if necessary so that it gives adequate contrast, and, in some cases, additionally stained or labelled so that some chemically distinct part of the structure can be identified.

Now, these techniques cover an enormous field of work, and at a relatively short meeting like this, one has to select some particular aspects of it. The subject-matter of section II is especially concerned with techniques which involve physical rather than chemical processing of the specimen, and in particular ones which are still only in rather restricted use.

As I mentioned in section I, it was a little surprising that relatively straightforward and indeed classical fixation techniques—for instance, the use of a solution of osmium tetroxide as a fixative—did in fact preserve biological structures quite well at levels far beyond the limits of resolution of the light microscope. Even better results are obtained with glutaraldehyde fixation, and in several cases where the structural preservation can be monitored by X-ray diffraction—for instance, in the case of certain crystalline proteins, and of muscle—the fine structure is preserved with remarkable fidelity, as far as the fixation step is concerned. It is in the subsequent dehydration steps of the standard processing that the deterioration in structure occurs; and so one of the key questions is: how can this deterioration be avoided, or at least minimized?

A very ingenious way of approaching this problem is the use of the freeze-etch technique, with which our first three papers in this section are concerned. Later papers will be concerned with other techniques of a somewhat physical nature—the development of suitable specimen techniques to use in conjunction with dark field microscopy; the study of nucleic acids absorbed to supporting films under suitable conditions; and the use of autoradiography.