fibulae expanded into flanges as in iv., delimiting circular or oval portulae (F.985).

Some of these groups are narrowly circumscribed, e.g. iv., vi., while others, especially ii. and vii., contain a great variety of fibula morphologies; within the latter groups it should be possible, after further study, to distinguish further categories. The details of fibula construction in various species will be given later, in the taxonomic section.

Proximal and/or distal ridges (Text F.5A) may be present joining the fibula bases. The subraphe canal wall, where a canal may be distinguished, is usually perforate, but it is entire in members of the sections Fragilariopsis and Pseudonitzschia (F.971-3), and in some of the sect. Lanceolatae (see Hasle 1964, 1965a, b), and of the sect. Tryblionella.

4.6.4 Cincture

As in Hantzschia, few generalizations may be made about the structure of the cincture. In many species the girdle bands are very thin and delicate; thus, the SEM is of limited use because of its relatively poor resolution and because specimen penetration becomes limiting, while little information can be gained from TEM studies because of the opacity of silica to electrons. Carbon replica studies may prove to be helpful, but are unlikely to aid the determination of whether a particular band is open or closed; this is because, except where the cincture of a diatom is known in great detail, such determinations must be made on complete frustules, and it is just where carbon replicas rarely yield much useful information, at the poles of the frustule (see Dawson 1972), that the open ends of bands usually occur.

So far only open bands have been observed, but very few species

have been studied in the necessary depth; (only N. amphibia, N. mollis, N. hantzschiana, N. linearis, N. sinuata, N. sigma, N. vitrea). Details, where known, will be described in the section on taxonomy. It will be a long time before comprehensive information is available concerning the girdle of Nitzschia, unless the resolution of the SEM can be improved without an accompanying increase in specimen penetration.

4.6.5 Chromatophores and cytology

Most of the published data concerning the chromatophore structure in Nitzschia species is contained in the works of Karsten (1899), Mereschkowsky (1901, 1903a, b) and Heinzerling (1908). Very little has been published recently, although Geitler (1969, 1970, 1975a) gives some details of the chromatophores of N. amphibia, N. frustulum var. perpusilla and N. palea in the course of discussions about auxospore formation or cell division. Virtually nothing is known about the nucleus, except for the information given by Lauterborn (1896) in an excellent account of nuclear structure and mitosis in N. sigmoidea. In the last twenty years a few papers have been published giving some details of the ultrastructure of Nitzschia cells. Gibbs (1962a, b) illustrated chloroplast and pyrenoid structure in a variety of algae, including N. angularis, while Drum (1963) and Lauritis et al. (1968) gave more thorough accounts of fine structure in N. palea and N. alba respectively. The last-mentioned species is apochlorotic and its structure must therefore be to some extent atypical of Nitzschia. In these studies the usual organelles - dictyosomes, mitochondria, nucleoli, etc. - were found and had much the same structure as in other diatoms (see review by Duke & Reimann 1977).

Mereschkowsky (1903a) distinguished eight types of chromatophore structure occurring within the presently accepted limits of Nitzschia - seven in Nitzschia and two in Nitzschiella, which is now included