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Thylakoid Membrane Proteins of the Green Alga *Acetabularia mediterranea*

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The two major chloroplast membrane components, the chlorophyll-protein complexes of 125 and 67 kdaltons, were isolated from the chloroplasts of *Acetabularia mediterranea* and their polypeptide components identified. The 67 kdalton complex contained two different subunits of 23 and 21.5 kdaltons. The 125 kdalton chlorophyll-protein complex could be dissociated into free chlorophyll and a major polypeptide of 79 kdaltons. The localization of these polypeptides inside the thylakoid membrane was determined by fractionating the chloroplast membrane with EDTA and Triton X-100, by using pronase treatment and by labelling the surface-exposed proteins with ^{125}I. The 125 kdalton chlorophyll-protein complex seems to be buried inside the lipid layer. The 23 kdalton subunit of the 67 kdalton complex is largely exposed to the membrane surface and only the chlorophyll-binding subunit of 21.5 kdaltons is buried inside the lipid layer.

Ultrastructure and Fluorescence Emission Spectra of the Chloroplasts of *Acetabularia* and *Batophora*[2]

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Three species have been investigated: *Acetabularia mediterranea, Acetabularia peniculus* and *Batophora oerstedii.* These unicellular algae possess well known species-specific morphological characters. However, their cellular organization is very similar. They look like cylindrical stalks fixed by their basal, differentiated rhizoids. Growth and morphogenesis take place at the apical region. To this peculiar morphology corresponds a polarized internal cell structure: the nucleus is found in the basal part while the stalk contains an heterogeneous population of numerous small plastids distributed along a morphological gradient (PUISEUX-DAO and DAZY 1970, PUISEUX-DAO, DAZY, HOURSIANGOU, and MATTHYS 1972). In *A. mediterranea*, the apical chloroplasts are small and poor in carbohydrate grains, contain numerous lamellae and divide. In the basal region of the cell, many chloroplasts look bigger and are full of storage material; their lamellae are reduced and they divide relatively rarely compared to the apical plastids. The ultrastructural organization of the chloroplasts in *A. peniculus* and in *Batophora oerstedii* is similar to that observed in *A. mediterranea:* the plastids are limited by an external double envelope; peripheral lamellae surround each polysaccharide grain in such a way that one chloroplast seems to be composed of one or several units marked by the grains. Moreover, like in *A. mediterranea,* the plastid population of *A. peniculus* and *Batophora oerstedii* is heterogeneous. From the ultrastructure only, it is rather difficult to distinguish the plastids of the three algae, though some small morphological differences seem to exist, for example, between the chloroplasts of *A. mediterranea* and *A. peniculus.*

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Examination of the 77 °K fluorescence emission spectra (FES) provides a good criterion for distinguishing chloroplasts of the apical, middle and basal region of the stalk of *A. mediterranea* (SIRONVAL, BONOTTO, and KIRCHMANN 1973). Extraction increases the differences between the FES of apical (maximal emission at 700–720 nm) and basal (maximal emission at 685–690 nm) chloroplasts (DUJARDIN, BONOTTO, SIRONVAL, and KIRCHMANN 1975). The examination of the FES of chloroplasts extracted from cells at stage 4 (BONOTTO and KIRCHMANN 1970), has shown that differences exist between the three species. The most striking difference has been found between *A. mediterranea* and *A. peniculus:* in the latter, the fluorescence emission at 715 nm is important even in basal chloroplasts. The differences should permit one to follow the fate of chloroplasts in grafts between *A. mediterranea* and *A. peniculus* (PUISEUX-DAO, BONOTTO, and VALET 1970).

Modes of Surface Membrane Formation During Cytotomic Cleavage in Caps of *Acetabularia*

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In the cap rays of *Acetabularia mediterranea* the total cell surface area increases during coenocytotomic cleavage. In early stages of cyst formation the cytoplast is characterized by the appearance of relatively large and prolate vesicles ("cleavage vesicles") which represent ca. 80% of the total membrane area of the plasmalemma and the endomembranes (nuclear envelope, ER, Golgi apparatus vesicles) and reveal on their cytoplasmic surface typical columellar or spinous coat structures. These vesicles are closely associated with the surface of plastids and/or mitochondria. Regularly spaced, densely stained intermembraneous cross-bridge structures appear to maintain this association. The vesicles contain a finely fibrillar material structurally similar to the texture of the mucilage of the hyaline layer of the cell wall. In addition, specific plaques of attachment of such vesicles with the plasmalemma are described which resemble the "preexocytotic attachment plaques" described in other systems (cf., FRANKE *et al.*, J. Cell Biol. **69**, 173—195, 1976; DAVIDSON, Cell Tiss. Res. **170**, 353—365, 1976). It is hypothesized that the cleavage vesicle membrane is the immediate precursor to the postcoenocytotomic surface membrane and that the intermembraneous cross-bridge elements are related to bristle coat structures and play a role in the establishment of the cleavage lines. Similarities of this mode of surface membrane production with mechanisms described in a variety of other plant and animal systems are discussed.

Role of the Cell Apex in Elongation of *Acetabularia* Cells

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Exposure of only the apical portion of an *Acetabularia* major cell to light causes the cell to elongate as much or more than cells which are totally illuminated. No elongation takes place if the apical region is kept in dark while the rest of the cell is illuminated. Elongation is therefore not regulated by the photosynthetic activity of the cell. A photomorphogenetic process which controls the elongation is probably localized in the apical region of the cell.