

**ASSOCIATION OF A SPECTRIN-LIKE PROTEIN WITH AN APICAL
ACTIN-ORGANIZED ENDOPLASMIC-RETICULUM AGGREGATE
AND ITS PUTATIVE FUNCTIONS IN GRAVITROPICALLY TIP-
GROWING PLANT CELLS**

MARKUS BRAUN

Botanisches Institut, Universität Bonn, D-53115 Bonn, Germany

Spectrin-like epitopes were immunochemically detected and immunofluorescently localized in gravitropically tip-growing rhizoids and protonemata of characean algae. Antiserum against spectrin from chicken erythrocytes showed cross-reactivity with rhizoid proteins at about molecular masses of 170 and 195 kDa. Confocal microscopy revealed a distinct spherical labeling of spectrin-like proteins in the apices of both cell types tightly associated with an apical actin array and a specific subdomain of endoplasmic reticulum (ER), the ER aggregate. The presence of spectrin-like epitopes, the ER aggregate and the actin cytoskeleton are strictly correlated with active tip growth. Application of cytochalasin D and A23187 has shown that interfering with actin or with the calcium gradient, which both cause the disintegration of the ER aggregate and abolish tip growth, inhibits labeling of spectrin-like proteins. At the beginning of the graviresponse in rhizoids, the labeling of spectrin-like proteins remained in its symmetrical position at the cell tip, but was clearly displaced to the upper flank in gravistimulated protonemata. These findings support the hypothesis that a displacement of the Spitzenkörper is required for the negative gravitropic response in protonemata, but not for the positive gravitropic response in rhizoids. Evidently, the actin/spectrin system plays a role in maintaining the organization of the ER aggregate and represents an essential part in the mechanism of gravitropic tip growth.