Ultrastructural features of pollen tubes of *Endymion non-scriptus* modified by cytochalasin D

**J. Heslop-Harrison**, **Y. Heslop-Harrison**, **M. Cresti**, and **F. Ciampolini**

1 Cell Physiology Unit, AFRC Institute of Grassland and Environmental Research, University College of Wales, Plas Gogerddan, near Aberystwyth SY23 3EB, UK

2 Dipartimento di Biologia Ambientale, Università di Siena, Via P.A. Mattioli 4, I-53100 Siena, Italy

**Summary.** The cytochalasins, known as inhibitors of various processes involving motility in plant and animal cells, induce far-reaching structural changes in the cytoplasm and walls of pollen tubes without destroying the capacity for subsequent growth in normal media. The fine structure of tubes of *Endymion non-scriptus* modified by cytochalasin D suggests that the changes all stem directly or indirectly from the interruption of the long-range cyclosis along the tube axis, which is sustained throughout the period of normal growth. The elimination of this movement breaks down the pattern of flow responsible for the sorting-out process that maintains the characteristic zonation of organelles and other inclusions at the apex of the extending tube, and leads gradually to re-distribution of the vacuoles and membranes in the vegetative cell, the disposition of which is normally correlated with the longitudinally oriented flow pathways. Random local migrations of organelles and other inclusions of greater amplitude than is to be expected from Brownian movement continue in the tubes in the presence of cytochalasin D, indicating that the motility system is not wholly destroyed. Following the interruption of concerted axial movement, the polysaccharide wall-precursor bodies (P-particles), normally inserted into the wall mainly in the apical part of the tube during tip growth, gradually become dispersed throughout the tube and are incorporated in the wall at random, entering even into the intine of the parent pollen grain.

**Key words:** Pollen-tube structure – Intracellular movement – Tip-growth mechanism – Cytochalasin effects

**Introduction**

Franke et al. (1972) and Mascarenhas and La Fountain (1972) established that the cytochalasins, known as inhibitors of various processes involving motility in animal cells (Wessels et al. 1971), block the movement of organ-
**Fig. 2.** Apical zone of a living pollen tube, DIC micrograph, 6 s exposure. The arrowheads indicate the directions of flow in the tube in the focal plane of the micrograph. Box A shows the approximate site of the EM of Fig. 3, and box B, that of Fig. 4. Approx. x 2400

**Figs. 3-5.** EMs of control pollen tubes. **Fig. 3.** Extreme tip region, corresponding in position to box A in Fig. 2. P-particles are seen apparently in discharge into the the wall (a), which in this region consists of a thin layer mainly composed of microfibrillar pectin. Approx. x 36000. **Fig. 4.** Tube flank in the sub-apical region, corresponding approximately to the position of box B in Fig. 2. Approx. x 15000. **Fig. 5.** Wall and contiguous cytoplasm of a partly vacated pollen grain. The exine with lipid inclusions still remaining in the sexine voids is seen at a, and the intine at b. Approx. x 23000