

**P003** Vectorial information for planar polarity of *Arabidopsis* root hair positioning

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Cell polarity is often coordinated within the plane of a single tissue layer (planar polarity) and hair positioning has been exploited as a visual marker for planar polarization of animal epithelia. The root epidermis of the plant *Arabidopsis thaliana* similarly reveals planar polarity of hair positioning close to root tip-oriented (basal) ends of hair-forming cells (trichoblasts). Hair positioning is directed towards a concentration maximum of the hormone auxin in the root tip, but mechanisms driving this plant-specific planar polarity remain elusive. We report that combinatorial action of the auxin influx carrier *AUX1*, *ETHYLENE-INSENSITIVE2* (*EIN2*) and *GNOM* genes mediates the planar polarity vector for coordinate hair positioning. In *aux1;ein2;gnom<sup>eb</sup>* triple mutant roots, hairs display axial (apical or basal) instead of coordinate polar (basal) orientation. Accordingly, localization of Rho-of-Plant (ROP) GTPases to the hair initiation site reveals a polar-to-axial switch in *aux1;ein2;gnom<sup>eb</sup>* triple mutant roots, where the auxin concentration gradient is virtually abolished. Conversely, local auxin overproduction in root sectors enhances ROP and hair polarity over long and short distances. Our findings suggest that auxin provides or enhances vectorial information for planar polarity that requires combinatorial *AUX1*, *EIN2* and *GNOM* activity upstream of ROP positioning.