Morphogenetic phenomena in higher plants and their mechanisms

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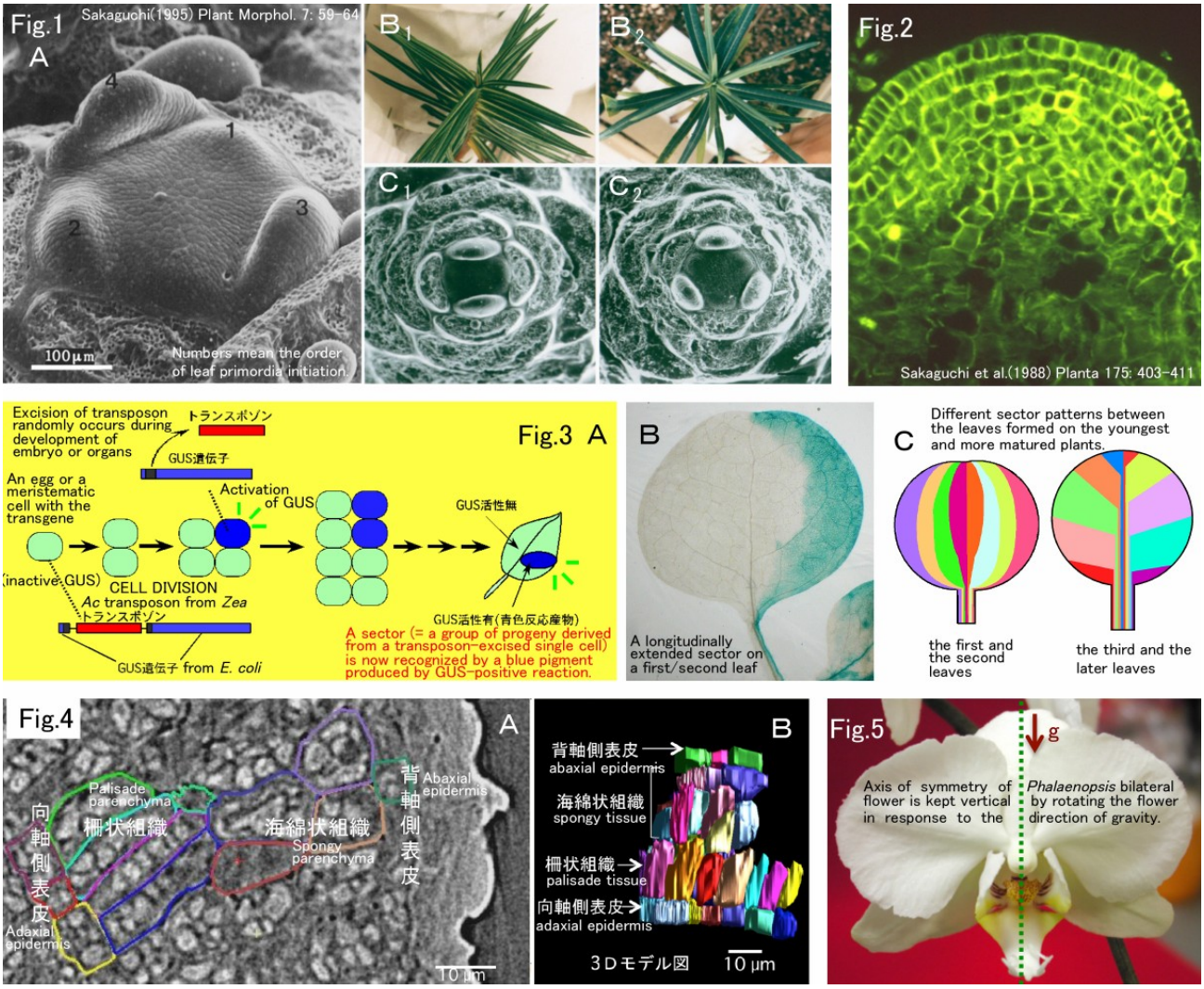

Fig.1. SAM (A,C_1,C_2) and shoots (B_1,B_2) of *Euphorbia lathyris* with a variety of phyllotaxes. Fig.2. SAM of *Vinca major* visualizing immunofluorescently stained microtubules. Fig.3. Clonal analysis of leaf formation, using transgenic tobacco: its principle (A), example of a sector (B) and a presumptive model for cell proliferation patterns upon development of leaves formed at different plant ages (C). Fig.4. Non-destructive, 3D observation of cotyledonal tissues of an *Arabidopsis* dry seed using micro X-ray CT: One of the tomographic images (A) and reconstructed 3D cell models (B). Fig.5. *Phalaenopsis* bilateral flower, whose axis of symmetry (*green dotted line*) is kept vertical.

Our research is about various morphogenetic phenomena of higher plants, especially in shoot apical meristems (SAM) (Fig.1A). In SAM, leaves are formed in a regular pattern called PHYLLOTAXIS. *Euphorbia lathyris* changes its phyllotaxis (Fig.1B,C). By comparing different phyllotaxes, we can test whether some factor, for example, the distribution of auxin transporter, is responsible for phyllotaxis or not. We also examine the microtubular structure in SAM (Fig.2). Our next interest is clonal analysis using transgenic tobacco plants (Fig.3A). The results showed that the patterns of cell proliferation during leaf development are quite different between the very young and more grown plants (Fig.3B,C). In addition, we are participating in the project, which aims at making a complete cell map recording a three-dimensional shape of each cell in an *Arabidopsis* embryo of a dry seed using micro X-ray CT at SPring-8 (Fig.4). Lastly we examine rotational movement of bilateral flower in response to directional change of the gravity (Fig.5).

Keywords : micro CT, microtubule, phyllotaxis, recombinant DNA technology, shoot apical meristem (SAM)