

The science of spring flowers—how petals get their shape

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Why do rose petals have rounded ends while their leaves are more pointed? In a new study published April 30 in the open access journal *PLOS Biology*, scientists from the John Innes Centre and University of East Anglia, UK, reveal that the shape of petals is controlled by a hidden map located within the plant's growing buds.

Leaves and petals perform different functions related to their shape. Leaves acquire sugars for a plant via photosynthesis, which can then be transported throughout the plant. Petals develop later in the life cycle and help attract pollinators. In earlier work, this team had discovered that leaves in the plant *Arabidopsis* contain a hidden map that orients growth in a pattern that converges towards the tip of the bud, giving leaves their characteristic pointed tips. In the new study, the researchers discover that *Arabidopsis* petals contain a similar, hidden map that orients growth in the flower's bud. However, the pattern of growth is different to that in leaves - in the petal growth is oriented towards the edge giving a more rounded shape - accounting for the different shapes of leaves and petals. The researchers discovered that molecules called PIN proteins are involved in this oriented growth, which are located towards the ends of each cell.

"The discovery of these hidden polarity maps was a real surprise and provides a simple explanation for how different shapes can be generated," said Professor Enrico Coen, senior author of the study.

The team of researchers confirmed their ideas by using computer

simulations to test which maps could predict the correct petal shape. They then confirmed experimentally that PIN proteins located to the right sites to be involved in oriented growth, and identified that another protein, called JAGGED, is involved in promoting growth towards the edge of petals and in establishing the hidden map that determines petal growth and shape.

Unlike animal cells, plant cells are unable to move and migrate to form structures of a particular shape, and so these findings help to explain how plants create differently shaped organs - by controlling rates and orientations of cell growth. From an evolutionary perspective, this system creates the flexibility needed for plant organs to adapt to their environment and to develop different functions.

More information: Sauret-Güeto S, Schiessl K, Bangham A, Sablowski R, Coen E (2013) JAGGED Controls Arabidopsis Petal Growth and Shape by Interacting with a Divergent Polarity Field. PLoS Biol 11(4): e1001550. doi:10.1371/journal.pbio.1001550

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