DEVELOPMENTAL BIOLOGY

On making a commitment

The regular tiling of the *Drosophila* adult eye — a precise array of ~800 units, or ommatidia — is a familiar sight to developmental biologists, who have used this organ to investigate how neuronal determination and differentiation occurs. Anatomical studies, and more recently, molecular genetic ones, have established that the eight photoreceptor cells (PRC 1–8) in each ommatidium arise through a series of stereotypical inductive interactions that take place in the larva. What isn't clear, however, is when each PRC makes the irreversible commitment to a specific fate. It is commonly thought that such a commitment is made in the larva, when each PRC expresses a distinct set of molecular markers; but Mollereau, Domínguez and colleagues now show that PRC determination occurs in two steps, each under separate genetic control. They do so by identifying the *spalt* (*sal*) gene complex as one component of this control.

The eight types of PRC are recognizable not only by their molecular markers, but also by their distinct position within the ommatidium, by their morphology and by the types of projection that they make to the optic lobe. PRCs 1–6 — the outer photoreceptors — have larger light-trapping organelles (rhabdomeres) and make axonal projections to the lamina; by contrast, the smaller, inner PRCs 7 and 8 project deeper in the optic lobe, to the medulla. The zinc-finger proteins encoded by the two genes of the *sal* gene complex, *sal major* (*salm*) and *sal-related* (*salr*), have similar expression patterns and functions in eye development. When the *sal* complex is removed from the eye (using a chromosomal deficiency), PRCs 7 and 8 of each ommatidium are cell-autonomously transformed into outer photoreceptors. However, the axons of the transformed PRC 7 and 8 cells project normally to the medulla, indicating that *sal* is not required for the initial inner PRC specification. Such a function for the *sal*-encoded proteins is consistent with their expression pattern: although *salm* is expressed in PRCs 3 and 4 in the larva, it is only present in PRCs 7 and 8 in the pupa and adult, at a time that coincides with R7 and 8 differentiation.

The data lead nicely to a model in which PRC development occurs in two steps: first, cells differentiate as neurons and send axonal projections to the brain; it's only in the second that they become mature PRCs and execute their differentiation programme. In such a model, the *sal* complex would be required for the terminal differentiation of PRCs 7 and 8, but not for the initial acquisition of neural characteristics by these cells.

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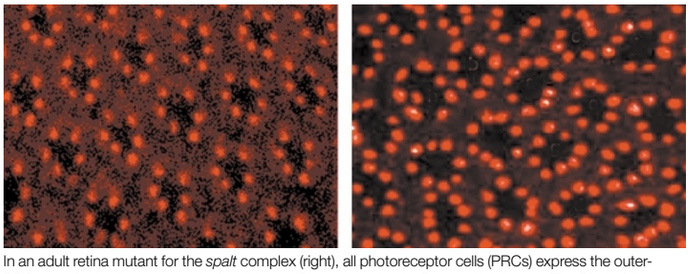
References and links

ORIGINAL RESEARCH PAPER Mollereau, B. *et al.* Two-step process for photoreceptor formation in *Drosophila*. *Nature* **412**, 911–913 (2001)

WEB SITE

Claude Desplan's lab: http://homepages.nyu.edu/~cd38/



In an adult retina mutant for the *spalt* complex (right), all photoreceptor cells (PRCs) express the outer-PRC-specific rhodopsin gene. Left, wild-type. Photo provided by Bertrand Mollereau, The Rockefeller University, New York, USA. Reproduced with permission from Mollereau, B. *et al. Nature* © (2001) Macmillan Magazines Ltd.

IN BRIEF

EVOLUTION

Molecular evidence for the early colonisation of land by fungi and plants.

Heckman, D. S. *et al. Science* **293**, 1129–1133 (2001)

Fossil evidence indicates that the establishment of eukaryotes on land occurred around 480–460 million years (Myr) ago. Molecular clock data, based on a ribosomal gene, however, place this event at around 600 Myr ago. Now, an estimate of fungal divergence times based on the alignment of nuclear-encoded proteins pushes the origin of land eukaryotes to as early as 1,000 Myr ago.

BIOINFORMATICS

Assembly of the working draft of the human genome with GigAssembler.

Kent, W. J. & Haussler, D. *Genome Res.* **11**, 1541–1548 (2001)

The draft human genome sequence data have been assembled using several approaches. One of the most successful and widely used assemblies is the "Golden Path" (http://genome.ucsc.edu) pioneered by these authors. This paper provides an overview of the algorithm that underlies the Golden Path assembly, shows how genome sequence data were combined with other types of data and gives useful insight into the strengths and weaknesses of the assembly.

PLANT GENETICS

Plant growth homeostasis is controlled by the *Arabidopsis BON1* and *BAP1* genes.

Hua, J. *et al. Genes Dev.* **15**, 2263–2272 (2001)

Organisms maintain their morphology under varying environmental conditions as a result of a poorly understood interplay between extrinsic and intrinsic factors. Hua *et al.* here identify a cell-membrane-associated, phospholipid-binding protein, BON1, and its partner BAP1 as factors that are necessary for normal *Arabidopsis* growth at low temperatures. BON1 and BAP1 co-ordinately regulate the rate of cell growth and division, possibly through their involvement in exocytosis or by controlling membrane lipid content.

HUMAN GENETICS

Human mtDNA and Y-chromosome variation is correlated with matrilocal versus patrilocal residence.

Oota, H. *et al. Nature Genet.* **29**, 20–21 (2001)

Mitochondrial DNA often shows greater genetic diversity between human populations than does the Y chromosome, possibly because many human societies practice patrilocality, in which males remain at their birthplace but women migrate to join marriage partners. By collecting and analysing DNA from patrilocal and matrilocal tribes in Thailand, Oota *et al.* found that genetic variation does indeed strikingly correlate with patterns of residence, proving that social structure can influence human genetic diversity.