Failsafe flowers

The design of regulatory circuits determines their function — for example, whether they behave like developmental switches — but the specific details of the wiring can also be influenced by evolutionary pressures. A study of flower organ development shows that the interaction between two key regulatory proteins arose not because it is indispensable for function, but because it provides robustness against incorrect cell fate decisions.

Class B floral homeotic genes encode transcription factors that specify petals and male reproductive organs. The authors specifically examined two such genes, *DEFICIENS* and *GLOBOSA*, the products of which heterodimerize and maintain their own expression via a positive autoregulatory loop. Given that a single gene is capable of maintaining an autoregulatory loop, why would it be necessary to retain heterodimerization? The hypothesis tested here is that obligate heterodimerization between these two ancient paralogues is necessary to filter out noise, and hence to canalize flower development.

The authors used a stochastic modelling approach to examine alternative evolutionary scenarios — homodimerization, heterodimerization or a mixture of the two. These alternatives were compared with respect to the activity (ON/OFF) of the self-regulating circuit once the initial activator is withdrawn. The robustness of the switch function is clearly favoured by heterodimerization, which allows the establishment of the autoregulatory loop (when it is most labile) to occur more accurately.

Given the generality of the mathematical model, the conclusions might apply to equivalent genetic relationships in other contexts.

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ORIGINAL RESEARCH PAPER Lenser, T. *et al.* Developmental robustness by obligate interaction of class B floral homeotic genes and proteins. *PLoS Comp. Biol.* **5**, e1000264 (2009)

FURTHER READING Wilkinson, D. J. Stochastic modelling for quantitative description of heterogeneous biological systems. *Nature Rev. Genet.* **10**, 122–133 (2009)