

...tioning such an apparently complex phenomenon as  
the elucidation of a fascinating development  
and tempo of speciation and macroevolution.

### **'disposes'**

said. The recent renaissance based on newly available technology is certainly demonstrated. An example is provided by a paper published by Brakefield *et al.* who is at the vanguard of a new search is the affiliation of some from departments of Genetics, Molecular Biology, and Cell Biology. Such a variety of disciplines in the study of development can be called the 'black box'.

...ed on the development of the genus *Bicyclus*. The patterns and colorations are related to the differentiation of the structures that carry them and have been studied in years. The implications are both developmental, but evo-

the background brown leucism was previously demonstrated that the African species.

### **Gene regulation and pattern**

But how is eyespot development regulated? How do they respond to external environment? Pivotal to the answer is the isolation of three mutations that control the phenomenon, together with the expression of another protein. *Distalless* is a homeobox gene specifically restricted to the dorsal organizing center of the eye during eyespot development. We have constructed antibodies against it to enable a precise mapping of its expression. Since this gene marks the dorsal organizing center, its expression is an ideal marker to determine what aspects of eyespot development are affected by other mutations.

low temperature (dry season form) (1994). Artificial selection is effective in two ways: selection for increased plasticity breaks the relationship, so that still more plasticity can be selected for, but the dry form never appears; on the other hand, selection against plasticity has resulted in a change in the relationship with respect to the wild type (see also ref. 1).

It proceeds in four stages, from the color and position of the spots, and then also by *Cyclops* determination of size and color, about the plasticity? The developmental window which is controlled by determining the switch to the 'wet-season' or the 'dry-season' is very late, once stage III has passed and the signaling foci are signaling.

## Plasticity, and the other way

From the organismal to the molecular level, it has been mirrored by an inverse relationship. As Feld and colleagues have shown, the degree of seasonal plasticity is inversely related to the

regulatory genes and the amount of (intra-specific) genetic variation (1994).

Where is all this leading? The use of molecular tools and of mutant screens in molecular genetics for some time now, however, are starting to shed light on alienated developmental processes in the realm of ecology and evolution as they evolve, and they do so in a way to which they have to adapt independently of its environment (the 'physics' approach) has been used in several cases has produced interesting results, but epigenetics is still a long way from genes with the external environment. The more we understand the mechanisms through that still fairly often

## References

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- 5 Ma, H. (1994) The unfolding of the genome. *Development* 120, 111-120.