

faculty spotlight

Organismic and Evolutionary Biology

By Professor Andrew Berry

Evolutionary Biology seeks to explain and understand the staggering biological diversity we see around us. Watch a David Attenborough documentary and you are receiving a subliminal invitation to become engaged with this, arguably the central problem in biology. In this context, studies comparing genomes and probing into the basic developmental processes that assemble organisms have proved weirdly paradoxical: we see extensive “deep homology” -- even organisms as disparate as a fruit fly and a human are, in genetic terms, extraordinarily similar. In this, Darwin’s 200th year, evolutionary biology’s quest to understand biological diversity has thus been reframed: how can we account for the differences among species when, at a fundamental organizational level, they have so much in common? Our brief now is to explore the basis of evolutionary variation upon a few basic biological themes.

Traditionally evolutionary biologists have “borrowed” their scientific tools from other biologists. I did my graduate work on the population genetics of *Drosophila melanogaster* not because the population genetics of this charismatic little beast is inherently interesting but because I could take advantage of its status as a model organism. Standing on the substantial shoulders of the geneticist giants who had come before me, I could address questions that simply could not be addressed in other species. For these pragmatic reasons, then, I worked on a the insect equivalent

of a weed, a species whose population structure in the US is dictated more by the routes of inter-state fruit trucks than by its own biology. The exciting thing today is that we are no longer tied to model organisms because genomic tools are readily exportable to whatever species we want to study. We can choose a study species because it is biologically interesting, not merely because other people have studied it before.



▲ Portrait of Charles Darwin made by George Richmond in the late 1830s.

Harvard’s OEB Department is a particularly exciting place to be from this point of view because several labs are in the process of bringing powerful genomic tools to study species that have hitherto been difficult to study genetically or downright intractable in this regard. Prof Arkhat Abzhanov is studying the precise developmental pathways whereby Darwin’s finches produce such a distinct array of bill types in the Galapagos; Prof Hopi Hoekstra is studying the molecular basis of adaptation in *Peromyscus* mice; Prof Jonathan Losos is trying to understand the genetic basis of the extraordinary diversity of *Anolis* lizards on Caribbean islands; and Prof Elena Kramer is studying the genetic basis of floral diversity in columbines, *Aquilegia*. Genome projects are under way for all these species, yielding a basic map of each ones genetic terrain. With the map in hand, exploring that terrain is suddenly practical. This export of genetic tools from model species to biologically interesting ones promises extraordinary new insights into

that new twist on an old problem: how can species have so much in common and yet differ in so many wonderful ways? **H**