

Editorial

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The late paleontologist Leigh Van Valen once remarked that evolution is the effect that ecology has on development. Some of the greatest resistance to accepting evolution as a valid scientific concept had come from early anatomists, who as a group were so struck with the intricacies of arrangement of muscles, bones, nerves, blood vessels, etc. that they had a hard time imagining how any anatomical component could be modified without ruining the smooth functioning of the entire body. Anatomy truly seemed to be all there was to destiny.

But once it became clear that life has indeed evolved, it became necessary to specify how anatomical change can indeed occur. Darwin's notion of natural selection was of course a major step forward—and he also cited close similarities between embryos as further evidence of the actual fact of evolution.

Soon after Darwin convinced the thinking world once and for all that life has evolved—with his stunning book *On the Origin of Species By Means of Natural Selection* (1859—the first edition sold out the first day it appeared on bookshelves), enthusiastic biologists such as the German Ernst Haeckel immediately began contemplating the changes in developmental pathways that *must* occur if adult anatomies change by natural causes through time. After Haeckel, came others: William Garstang and Gavin de Beer among the most notable. Indeed, Stephen Jay Gould [late colleague of one of us (NE); the tenth anniversary of Steve's untimely passing is being marked on many occasions the world over during 2012]

wrote his first papers and book (*Ontogeny and Phylogeny*, 1977) on just this very general subject.

Steve Gould was one of the first to suggest that changes in regulatory genes—those genetic elements that regulate the expression of protein-coding genes in development—might be critical to understanding the link between genetic information and development, including subsequent changes in developmental pathways through time so necessary for evolution to occur. Small changes in the timing of developmental events might well be imagined to have disproportionately large effects in the developmental process as the final adult form emerges.

Which brings us to what has, in the past few decades, developed into the exciting field of “evo-devo” (evolutionary developmental biology)—where finally the missing causal pathways linking evolution with development (namely genetic processes themselves, influenced by the external environment via natural selection) have become increasingly better understood in their basic molecular context.

Dr. Katherine Willmore has done a great job assembling a series of papers that explore the gamut of new knowledge and ongoing research in evo-devo. Her excellent introduction to this issue is a great jumping-off place, not only to this issue, but to the entire subject of evo-devo—and we are deeply grateful to her for producing the papers in this special issue on evo-devo!

Sadly, as this issue was going to press, we have learned of the passing of two of our journal's greatest friends. Joe Fail, member of our Editorial Board and an early and effective contributor to our pages, will be sorely missed. Joe had the vision that evolution can and should be incorporated as early as possible in the elementary school curriculum—and Joe said as much eloquently in our pages!

Ilaria Vinassa, who was in charge of educational programs at the Natural History Museum in Milan, Italy, has also recently left us. Many of us will know Ilaria especially

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through her annual “Darwin Day” programs in Milan, which were invariably rich in content, and well attended by professional evolutionists and laypersons alike. Ilaria was deeply devoted to presenting the concepts of evolution to the public even in those darker days when evolution was not in political favor. Thank you both—Joe and Ilaria—so much.

Finally, on a much happier note, we now know that great things are in store for 2013 for *Evolution: Education and Outreach*. Full details of our publishing plans in the years to come will be announced shortly—so please stay tuned. And please keep those educational and scientific papers coming in—we’re growing by leaps and bounds!