The Evolution of HIV

Edited by Keith A. Crandall

Johns Hopkins University Press, Baltimore, MD
520 pages, US\$ 34.95 Paperback
ISBN 080 186 1519

The Evolution of HIV is clearly written for specialists. It puts together the various facets of this important but yet elusive disease, and compiles reflections on the evolution of this virus as seen by molecular geneticists, statisticians and specialists in the evolution of populations. While this is not the usual view one has of HIV, it is certainly an interesting one—but, remember, highly technical. The book separates two well-defined topics, those dealing with actual data—known histories of transmission and general population genetics—and those constructing models to represent and analyse the complex data set. The aim is to understand the present spread of the epidemic and predict future developments. As the book depicts just one moment in the epidemic, it is likely that some of its content is already obsolete.

But as a model for viral evolution, this book is a gold mine. No virus has been studied more intensely than HIV, and this provides us with a wealth of data to explore many models, particularly in population genetics. Also, I am tempted to emphasise one prominent conclusion from reading *The Evolution of HIV*, namely that blood—any type of conduct that leads to bleeding or easy access to blood—is the major contaminating source. Other pathogens associated with HIV provide much help in the infectious process, most probably by removing barriers to the blood stream. This book, therefore, should be used as a starting point for those who want to browse the huge literature on the subject

and who hope to escape duplication of efforts made by others. It may be of use, also, to those who devise policies for the containment of the epidemic.

While the book's wealth of data makes it so valuable as a starting point for further investigation, it also might make books such as this obsolete in the future. Indeed, one wonders how scientists are able to explore the full content of books—this book is a case in point—without having recourse to computers. When will all science books become electronic? Paper-based books will remain of immense use during travel and leisure, but gathering information just by reading books will soon be impossible, I am afraid.

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DOI: 10.1093/embo-reports/kve120

Colours of development

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The Art of Genes. How Organisms Make Themselves

by Enrico Coen

Oxford University Press, Oxford, UK
386 pages, UK£ 20.00
ISBN 019 850343 1

Reviewing Enrico Coen's book has proved to be a challenging task for me. Not because it is not good—on the contrary, it is a truly impressive book. The challenge for me has been to evaluate *The Art of*

Genes without considering similar ideas discussed in another remarkable book that I had recently reviewed: *The Triple Helix* by Richard Lewontin (*EMBO reports*, December 2000). But Coen's book is unique as it uses and transforms the process of creating a painting as a metaphor to explain developmental biology. By using painting as an example, the author, a Fellow of the Royal Society, and Professor of Genetics at the John Innes Centre in Norwich, UK, does not want to diminish the creative aspect of the other fine arts. Indeed, he admits that any human creative act comes closer to describing the process of development, rather than the prevalent notion of simply following a set of instructions.

Biological development of an organism is not merely a read-out and implementation of a set of genetic instructions. As in painting, development is a continuing interaction between the 'painter genotype' and the 'canvas phenotype' that finally produces a living organism. The generation of an individual entity through developmental processes is indeed a more creative act than the purely mechanical concept of molecular copying and reproducing could explain. It is due to the painting-like process of development that no two biological entities are exactly the same—not even monozygotic twins or clones. This does not, however, mean that there are no rules or boundaries for growth and development to proceed. Certainly, there is an intrinsic consistency and reproducibility in development, which ensures that the principle of 'like begets like' is maintained.

The Art of Genes is organised in eighteen metaphorically titled chapters, such as 'Painting a Picture', 'The Expanding Canvas', 'Scents and Sensitivities' or 'The Story of Colour'. Each chapter starts with the painting metaphor to describe different aspects of developmental biology. For instance, the second chapter 'Copying and Creating' introduces the basic mechanisms of DNA replication, transcription, translation and cell division. The following chapter, 'A Question of Interpretation', discusses formation of patterns during development by comparing the evolution of butterfly patterns and human designs. It also explains how such patterns can change through a series of modifications where each step depends on prior events. In this context, Coen argues that identifying an absolute starting point for development is not important,

but rather understanding the nature of a process in which the cells of an organism go through various stages of growth and differentiation. Although the fertilised egg may be primed with some initial 'colours' from the mother, it does not contain the final picture. Early colours are not like miniatures of the final painting; they just provide an elementary frame of reference, which is gradually elaborated through a series of further interpretations.

While dwelling on the metaphor of development as painting, Coen is fully aware of the fact that he could be misunderstood as a vitalist or creationist. His main point is to demonstrate that natural developmental processes cannot be simplified to notions of industrial production. His book is another effort, like that of Richard Lewontin, to liberate

biological organisms from the reductionist and deterministic clamps of physics and chemistry as well as from the metaphors of machines and computers. But apart from this philosophical undertaking, Coen's analysis of developmental biology, starting at the molecular level and ending with the development of an organism's shape and form, is a fascinating and entertaining read.

Finally, the author reverses his metaphor to explain human creativity, which, as he believes, is grounded in the biological and cultural heritage of each individual. In his view, creativity does not come out of the blue, but rather is a result of developmental processes, which continually interpret and build on our genes, our experiences and preceding biological and mental developments.

Indeed, the true art of genes lies in their ability to go through a process of painting the self and, in the case of human beings, enable them to create new paintings in both literal and metaphorical senses. Coen's book invites readers to share this vision and understanding of the process of development. But be prepared. Just like the act of painting, reading this book with its excursionist writing style also demands commitment, determination and perseverance. And in order to understand development, you should try your hand at painting too.

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DOI: 10.1093/embo-reports/kve119