one has come to associate with the author. It goes straight to the heart of the subject and manages to cover a lot of ideas and material including some very recent ones. Some ideas have had to be introduced in a somewhat ad hoc fashion, like the cosmological constant and grand unification, but this should be acceptable to the general reader. The printing and getup are quite attractive and the price is a real bargain. The JNCASR deserves a pat on the back. I would warmly recommend it to students and the general reader.

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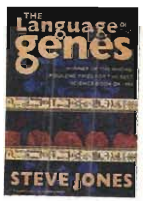
The Language of the Genes

Linking the Past and the Future

Amitabh Joshi



The Language of the Genes — Biology, History and Evolutionary Future
Steve Jones
Flamingo, An Imprint of Harper Collins Publisher, 1994
pp.xiii + 347, £4.50.

"*Kamaal-e-wahdat ayaan hai aisa ke nok-e-nashtar se tu jo chhede*
Yaqeen hai mujhko bahe rag-e-gul se qatra insaan ke lahu ka"
(So strong is the unity underlying each living form, that I well know
That if you prick a flower's vein, from it red human blood will flow)

Sentiments such as the one encapsulated in the above couplet by Allama Iqbal may well be dismissed as a poetic expression of the search for the Absolute. Yet, at the level of genes, all living organisms do in fact share a common underlying unity: despite the many differences between a human being and a simple bacterium, our hereditary material (DNA) is made up of the same molecules and, by and large, does similar things in similar ways. Theories explaining how organisms evolve, explain the evolution of every type of living thing from viruses to plants to humans. This is why genetics today is much more than just another branch of biology. Indeed, genetics now has ramifications for disciplines as diverse as agriculture, medicine, anthropology and behavioural studies. In *The Language of the Genes*, Steve Jones, himself a distinguished geneticist, has given a lively and eminently readable account of modern genetics and the many ways in which it affects not just our material well being but also our self image as humans and, potentially, how we look upon other groups of humans who differ from us in various ways.

Jones starts off by developing the metaphor of "the language of the genes", emphasising the point that our genes contain in their

DNA sequences a lot of information about our biological past. Moreover, being able to read the information encoded in our DNA has opened new avenues in medicine, raising the hopes of one day being able to cure inherited diseases. The author also discusses in this introductory chapter the sorry and often sordid tale of the misuse of genetics to justify the sterilisation or even elimination of those individuals deemed inferior or unfit to live, based on prejudices held by those in power in many societies of the twentieth century, from Nazi Germany to democratic America. The next couple of chapters are essentially an introduction to the basics of Mendelian genetics. However, even if you are familiar with this material, avoid the temptation to skip these chapters. Jones is an accomplished raconteur and his exposition of the basics of inheritance is unlike anything you'll come across in a genetics text. Interesting examples from human genetics and liberal doses of Jones' dry wit are interspersed among the technical details, and the combination is both interesting and easy to read.

Chapters four and five deal largely with mutation, and how accumulated wear and tear over a life-time's worth of mutation can lead to ageing. Here, too, Jones uses the example of a common and well studied inherited disorder, haemophilia, and shows how modern genetic techniques are helping to alleviate the symptoms of this once near-fatal condition. There is some interesting information about sources of ionising radiation that many of us would not commonly think about, as well as some discussion of the somewhat surprising results obtained after decades of genetic studies on survivors of Hiroshima and Nagasaki and their descendants. From mutations and ageing, Jones goes on to sex, and shows how the shuffling of genes that takes place during each bout of sexual reproduction is very useful in generating new genetic variation that natural selection can then act upon. Thus, though individuals age and die, sex restores the "vigour" of the lineage as a whole. Or, in Jones' own words, and this serves as a good example of many extremely quotable statements scattered throughout the book, "(sex) is the fountain of eternal youth — not for the individuals who indulge in it, but for the genes they carry".

In the next couple of chapters, Jones discusses human evolution, from early "ape-man" times, to the more recent mass migrations of humans after the development of agriculture. Evidence for many of these migrations has come from a combination of linguistic, archaeological and genetic approaches. There is an interesting discussion, in chapters eight and nine, about what genetics can tell us about human "races". Jones makes the point that if differences among individuals of the same race are partly heritable, and if races differ, it does not follow that differences among races are also heritable to the same degree. Unfortunately, he does not stress the allied fact that there is much more genetic variation within the human races than there is between them, clearly

suggesting that the various groups of humans do not constitute races in the biological sense. The final four chapters of the book are a potpourri of information about the diverse uses of genetics, in treating disease, in agriculture and in forensics. One issue that is of interest in India as we begin to use DNA fingerprinting, is the accuracy of the methodology. Jones has provided a lucid discussion of some of the statistical problems with DNA fingerprinting, as applied in criminal cases and points out that it requires a very good knowledge of the distribution of genetic variation in various ethnic groups.

All in all, the book is a very good read. There are relatively few typos, and the flow of the writing is excellent. A few things that I, as a geneticist found a little irritating, will probably not bother the average reader: some simplification of facts and issues is necessitated by the diverse and general audience at which this book is aimed. I especially liked the fact that Jones repeatedly stresses that decisions about how to deal with other humans, whether they are "racially" different, or have inborn diseases, are primarily social and moral ones; biology cannot and should not be considered as justification for such decisions. Indeed, as Jones points out, although our genes tell us a lot about what we are, how we came to be that way, and even a few things about our future, they do not answer the eternal question of *Who* we are. On this note, I will crave the indulgence of the reader one more time, and end by saying:

" *'Main kaun hoon' sadiyon se Adam poochhta phirta raha*
Juz yahi, 'Main hun' jawaab-e-rooh-e-Adam kuch nahin"
(Since Time began, on Mankind's lips has been the question 'Who am I?'
Yet nothing more than just 'I am!' is Man's immortal soul's reply)

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When Leibniz wrote – nearly 300 years ago – to Huygens: "I am chagrinned with algebra because it provides neither short nor best ways to construct geometry, and I think therefore that we need still another analysis, properly geometrical ... permitting a position to be expressed just as directly as algebra expresses a quantity", he was recognizing the need to develop nonmetric geometry! ... or was it topology?

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