odyssey which was at the same time 'fed by the Victorian institutions of self-help, the mechanics' institutes and local lending libraries, popular journals and magazines'.

We are often tempted to force explanations of human behaviour within a simplistic Nature-versus-Nurture framework. If one were to do so, Wallace's life could be said to be dominated by the Nature end of the range of inputs. Luckily there is an interesting 'control experiment' available for us to compare with Wallace. He and Bates were friends and contemporaries, had similar backgrounds, aspired to similar careers, made similar choices and, most importantly, were intrigued by similar questions (as early as 1847, Wallace is writing to Bates about a possible 'theory of the origin of species'). Yet Wallace discovered natural selection whereas Bates did not.

Finally, a striking fact that comes through this biography is that Darwin and Wallace saw themselves preeminently as theorists. Both were convinced of the central importance of theory even in a field as rooted in observation as natural history. Wallace has been quoted above. Here is Darwin to Wallace, in a letter that went to Ternate and just predated Wallace's momentous announcement to him: 'I am extremely glad to hear that you are attending to distribution in accordance with theoretical ideas. I am a firm believer, that without speculation there is no good and original observation'. That was in 1857, approximately fifty years before genetics and developmental biology began to provide two more theoretical underpinnings to biology and about a hundred years before neurobiology ushered in a third. We would do well to ponder the irony here. Namely, modern biology, whose practitioners tend to look down on old-fashioned descriptive botany and zoology, often seems to involve little more than accumulating facts for their own sake. It has become in its turn a refuge for stamp collectors, only this time the stamps are molecule-sized.

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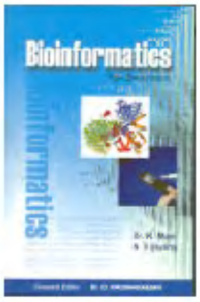

Bioinformatics for Beginners. K. Mani and N. Vijayaraj. Kalaikathir Achchagam, Coimbatore. 2002. 276 pp. Price: Rs 260.

Bioinformatics comes in many flavours. There is the mathematical flavour, in which the subject is indistinguishable from rarefied computer science. There is the database flavour, the essence of which is management of enormous quantities of data. There is the biological flavour in which the most important thing is the new biological knowledge generated. And there is the biotechnological flavour, where IT and biotechnology skills (and sometimes lack of them) are sought to be 'leveraged' to generate money. With regard to the last, a perceptive observer of the scene, not entirely unconnected with *Current Science*, recently likened the development of bioinformatics to the inflation of a balloon. Like all balloons, this one too, I suppose, requires a constant supply of hot air to keep it aloft and moving. My very first impression of the present book was that it was nothing more than an attempt to fulfil some of the great demand for this insubstantial commodity, much like a couple of other such books published recently from Hyderabad. My second impression, however, was more positive. The printing, binding and the general production qualities of this volume are of a superior level, and obviously some care and effort has gone into it.

The book is divided into three sections, somewhat whimsically named information *in vivo*, *in cybo* and *in silico*. I have no complaints against whimsy, but after a famous series of books overloaded with this quality, I now feel like a dummy whenever I encounter it in a technical book. This book is however written for beginners, not dummies. Appropriately, the first section introduces modern molecular biology. This is apparently aimed at non-biologists who are looking for a quick digest of the subject. Biologists studying bioinformatics, presumably, would already be familiar with the topics addressed here. Nevertheless, there is something for such students too. Several words and phrases frequently used in the context of bioinformatics, such as ESTs and contigs, are explained in this section. There are several useful diagrams such as the one that presents the contents of the human genome in the form of a tree (Figure 1.4.3). However, the section, and therefore the book, starts off poorly. The first paragraph, entitled 'The Biological Concepts for Bioinformatics' (*sic*) is an overambitious attempt to start at the very beginning. Unfortunately, science is still undecided about the details of the beginning of life on earth, and the authors state as facts, hypotheses which are by no means universally accepted, such as the Cairns–Smith's theory of clay providing a scaffolding for a self-replicating system. Another complaint I have against this section is that it pays scant attention to structural biology, but perhaps now *I* am being overambitious.

The book continues *in cybo*, which apparently means 'on the Internet'. This consists of a probably redundant section on 'Internet Basics', though I must confess to frequently meeting students, even those who are city-educated, who have had no previous exposure to this resource, and who therefore will find this tutorial-like description useful. A list of interesting URLs, an overview of databases accessible over the Internet, a whiff of relational database theory, and details of MS Access as an example of an RDBMS, constitute the rest of this third of the book. All the profuse illustrations here are screen shots, in black and white, though the high quality of the printing makes up for the lack of colour. All in all, this is a well-written and useful section, though somewhat elementary. The fact that the book is meant for beginners probably justifies the large amount of space given to this topic.

The final section of the book is entitled *in silico*. It begins with a chronology of the major events that led to the development of bioinformatics. This table seems to have been paraphrased from a commercial handout, perhaps downloaded from the net, and is full of references to the founding of various companies, almost all of them American (of course). The rest of the section reinforces this suspicion, viz. that it has been rewritten

from material found on the Internet. It refers to almost all aspects of sequence analyses and makes mention of numerous programs and software packages. Unfortunately, there is only a very cursory discussion of the algorithms underlying these. There is, for instance, almost just a passing reference to the Needleman–Wunsch and Smith Waterman algorithms that lie at the core of almost all sequence retrieval and comparison techniques. Even where explanations are attempted, these are seldom satisfactory. As, for example, the description of dynamic programming as being 'something like finding a shortest point through a maze'. In making this statement the authors appear to have confused the very last step of the algorithm, namely the trace-back procedure in its entirety. Further, in the paragraph previous to the one where that phrase occurs, they state that pair-wise alignment requires only a 'simple word processor program', and that it is only for multiple sequence alignment that dynamic programming is used. This is not just unsatisfactory; it is wrong. Dynamic programming was introduced for pair-wise alignment and plays a crucial role in popular programs used for this purpose, such as BLAST and FASTA. On the other hand, multi-dimensional dynamic programming is so computationally expensive that it is not part of the most commonly used multiple alignment programs. Similar obscurity and mistakes are found throughout the section. The discussion on hidden Markov models errs by falling between the two stools of complete exposition and brief mention. It uses a small example, attributed to another author, to explain how to construct a HMM. But, with insufficient introduction to the rather complex topic, the reader is left a little disoriented at the end of the explanation. The section also talks about molecular modelling, structure prediction and drug discovery, albeit at an even more superficial level. There is a final, brief chapter on the Perl language, which does not quite succeed in being a tutorial.

This is followed by bibliography that consists almost exclusively of journal articles. There are several mistakes, perhaps just typographical ones. One, I found particularly galling was the reference to the discovery of 'Tridosan' as a possible drug against TB by 'Surolina'. (The correct compound is Triclosan, and the name is Surolia). A list of general bioinformatics books, more accessible to the readers at whom the book is aimed, is unfortunately missing. Finally, a useful glossary and an index round off the book.

To sum up, my third and final impression of the book is that it is a curate's egg, good in parts, though these are too small to interest a mature reader. All the same, maybe it is the best Indian book on the subject at its level. As yet.

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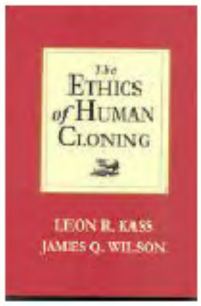

The Ethics of Human Cloning. Leon R. Cass and James Q. Wilson. Centre for Philosophy and Foundations of Science, New Delhi. ISBN 81-88155-02-0. Rs 125.

Creation of one cloned sheep, the Dolly, made as big and exciting event, if not bigger and more exciting, for the media as the news of the first man on moon. It is interesting to note, however, that nearly four decades prior to the announcement of the birth of Dolly, frogs were successfully cloned in much large numbers and on more than one occasion. But that important biological event did not create tidal waves in the media, the kind that were experienced with the arrival of Dolly. Perhaps, frogs are too lowly organisms to take note of or to threaten the ethical values that mankind claims to worry about!

Dolly demonstrated that as highly evolved an organism as a mammal can also be reproduced asexually. This immediately raised the real possibility of cloning of the so-called most evolved mammal, the human species. The excitement of this possibility and the fear of its possible outcome resulted in innumerable debates. The book under review is one of the examples of this debate. Kass and Wilson published their views on the prospects of human cloning following the 'Dolly' in two independent newspaper articles in 1997. This book reproduces these articles together with introductory remarks by C. Long and C. DeMuth. In addition, it contains two small essays which Kass and Wilson have added as postscripts in response to each other's original 1997 essays. This small book was originally published in 1998 while the present paperback edition is published (reprinted) in 2002.

Other than a brief flurry of activity in media following a claim a few months ago for cloning of human embryos, the issue of human cloning does not currently appear to be a 'hot' topic. Nevertheless, it remains an important issue, and awareness about the principles and consequences of cloning in scientific community and in general public is necessary. From this point of view, the present book is useful. It provides, in layman's language, the basics of what is involved in cloning of organisms (or humans) and the two authors discuss the various consequences that may follow if the technique is applied to human species.

Kass and Wilson do not favour human cloning from ethical considerations, although the 'ethical' reasons for each are different. While Kass argues that the various assisted reproduction techniques have already demystified 'sexuality and human renewal', human cloning would replace procreation by manufacturing. On the other hand for Wilson, human cloning does not present any special risk if the society ensures that the clone is born to a married couple and remains their joint responsibility. Both the authors present their viewpoints in rather elaborate essays, which at places tend to border on repetition. This repetition is accentuated by their mutual replies in part two of the book.

The original essays were written in a particular social context (the 'liberated American' society) and thus the sentiments and issues discussed may not appear relevant to other social groups. This remains an inherent limitation of reproducing newspaper articles in the form of a book, which in this case is