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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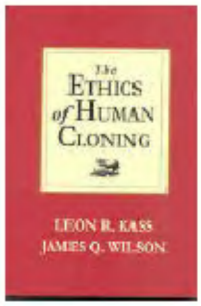

The Ethics of Human Cloning. Leon R. Cass and James Q. Wilson. Centre for Philosophy and Foundations of Science, New Delhi. ISBN 81-88155-02-0. Rs 125.

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

further aggravated by their antiquity (at least 5 years old in 2002).

I must confess that I did not find this small book gripping enough to finish in one go, which should have been possible in view of its small size. Nevertheless, the essays and the accompanying commentaries are useful to the scientific community as well as to others in understanding what human cloning is and what it may imply for the human society, if it ever becomes feasible.

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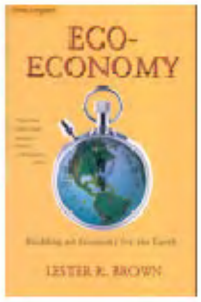

Eco-Economy. Lester R. Brown. Orient Longman Private Limited, Hyderabad. 2001. 333 pp.

Following World War II, the nuclear peril was considered to be the most serious threat to human security. This prompted Bertrand Russel and Albert Einstein to issue in 1955 their now-famous manifesto, where they described the options before humankind in the following words:

'There lies before us, if we choose, continual progress in happiness, knowledge and wisdom. Shall we, instead, choose death, because we cannot forget our quarrels? We appeal, as human beings, to human beings: Remember your humanity, and forget the rest. If you can do so, the way lies open to a new Paradise; if you cannot, there lies before you the risk of universal death.'

The above words are even more relevant today. Although the nuclear peril still persists, anthropogenic damage to the environment leading to shrinking forests, eroding soils, deteriorating rangelands, expanding deserts, rising carbon dioxide levels, falling water-tables, increasing temperatures, collapsing fisheries, rising sea level, melting glaciers, dying coral reefs and vanishing species, is now clearly the greatest threat to a sustainable human future. The central message of this book is the following:

'Just as recognition that the earth was not the Centre of the solar system set the stage for advances in astronomy, physics and related sciences, so will recognition that the economy is not the centre of our world create the conditions to sustain economic progress and improve the human condition. Citing numerous examples, Lester Brown brings out clearly that the rise and fall of civilizations is related to the management of environmental capital stocks. He then poses the question, 'how do we achieve sustainable economic transformation, when all decision makers – whether political leaders, corporate planners, investment bankers or individual consumers – are guided by market signals, not the principles of ecological sustainability?' The answer to this challenge lies in achieving a paradigm shift to an eco-economy.

If we do not change course, the prospects for the future are alarming. The world population will increase by another 3.2 billion by 2050 and most of this addition will take place in countries already facing acute water scarcity. Compounding this dangerous situation is the prospect for adverse changes in precipitation and temperature as a result of growing imbalance between carbon emissions and absorption. The severest impact of the damage to basic life-support systems will be on poor nations and the poor in all nations. For example, a 1-metre rise in sea level will reduce rice production in Bangladesh by half. A temperature rise of less than 1 degree Celsius in sea surface water can lead to the death of coral reefs and associated fisheries. The book provides extensive data to show that if current trends in environmental damage continue, the future of human security is really bleak.

What should we do to reverse the trend and launch our spaceship earth on the path of security and sustainability? Lester Brown outlines an agenda for ensuring that the concept of sustainable development gets translated into practice. If the first part of this book is in the nature of 'doom ecology', the second part indicates the components of a 'do ecology'.

The opportunities now available for adopting environment-friendly technologies in the area of energy, transportation, water conservation and use, agriculture and industry are described in detail. Many of the eco-friendly technologies lend themselves for decentralized adoption. The merits of eco-friendly animal husbandry are shown, taking the Indian Dairy Industry as an example. India is now the world leader in milk production. However, India's dairy industry is largely based on the use of agricultural residues as feed and not grains. This is because of the ability of ruminating animals to digest cellulose. Also, over 50 million women owning 1 or 2 cows or buffaloes are able to provide over 80 million tonnes of milk. This is an example of the technology of production by masses, in contrast to the mass production technologies adopted in industrialized countries.

The book indicates the uncommon opportunities now available for eco-jobs and eco-entrepreneurship. Hereafter, good ecology will be good business and it is hence in the long-term interests of industry that they adopt environmentally benign technologies. Ecotechnologies provide a win-win situation for all.

To summarize, this is a timely book in the context of the 'doom' atmosphere now prevailing in the environmental horizon, partly due to the attitude of the present US administration towards internationally agreed agreements like the climate and biodiversity conventions. This book should be read widely, particularly by scientists and policy makers. It will be appropriate to conclude with the final paragraph of the book. 'There is no middle path. Do we join together to build an economy that is sustainable? Or do we stay with our environmentally unsustainable economy until it declines? It is not a goal that can be compromised. One way or another, the choice will be made by our generation. But it will affect life on earth for all generations to come'.

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