particular emphasis on the incorporation of the green manure crops and pulses in the rotation; integrated pest management, and finally improved post-harvest technology. Such ideas generated in the book need to be further pursued by rural communities to researchers to policy makers, particularly focusing on sustainable food and water security, with the ultimate objective of sustainable livelihood opportunities for all. Dr Swaminathan should be complimented for putting so many ideas into one book. Now it is for others to carry forward these ideas.

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The Shattered Self: The end of natural evolution. Pierre Baldi, MIT Press, 5 Cambridge Centre, Cambridge, MA. 02142-1407, USA. 2001/2002. 245 pp. Price not mentioned.

As I sit to write this review, there is an item in today's newspaper about the birth of the world's second cloned baby. The news item occupies a small part of a column on the front page, but its contents will occupy many pages of newspapers worldwide by the end of the week.

The story is blunt and sets out, in the best journalistic style, a number of relevant facts: the child is a girl weighing 2.7 kg; she is born to a couple from the Netherlands; her parents are two lesbians; it was a natural birth. But even the most casual considerations of these statements can raise disturbing questions. Who are the parents of a clone? What is 'natural' about this birth? How loosely, in terms of sexual identity, can one define parentage? These and similar questions predicate a book such as 'The Shattered Self' in which Pierre Baldi sets out to explain (and attempts, I dare say, to understand) a few of the complex issues that surround some of the more daring explorations into biology that we have undertaken in recent times. Some of these are outcomes of the genome era, but some issues have been with us for quite a while.

As a scientific discipline, biology poses the most perplexing problems in modern philosophical thought. In part, this is because of the nature of biological inquiry, which has greatly increased in scope and depth in the past decades, and in part because in many of the traditional areas of philosophy, it does matter, to quote Michael Ruse (*The Philosophy of Biology Today*, SUNY Press, Albany, 1988) that Darwinian evolution is a reality, that 'we are modified monkeys, not the special creations of an all-loving God some six thousand years ago'. This realization is central to any modern discussion of epistemology or ethics, and these issues form the core of the set of questions that Pierre Baldi sets out to investigate in his book.

Why the 'end' of natural evolution, and why has the notion of 'self' been shattered now?

Each of the various scientific revolutions (in the sense of Thomas Kuhn) in biology, the most recent of which is that of genome sequencing, has thrown up a new set of questions that force deeper and deeper levels of self-examination. The theory of evolution by natural selection did much to change the way in which we think of ourselves. By seeing humankind as part of a continuum of ever evolving life (while recognizing the special position we have as a consequence of qualities we possess such as language and abstract thought) the theory of evolution gave a framework within which to understand the origin and diversity of species on this planet. It also provided a phylogeny, the tree of life, that linked all life forms present and extinct, in a single connected graph, underscoring the commonality of origin.

Of course this is not all that straightforward. Indeed, whether evolution is a theory at all is a question on which there are extreme views. For Karl Popper, it was merely a 'metaphysical research programme'. For others, evolution is all post-facto explanation: a series of just-so stories. More fairly, natural evolution (since this is what Baldi sets out to mourn the death of) is simply the most general theory there is in all of biology. Evolution is a fact and the mechanism by which it proceeds is natural selection.

Human intervention can change all this. Again, as I write, there are attempts by Craig Venter and his group, to synthesize the smallest viable genome which would, if successful, 'create' a new organism. In contrast to all other prokaryotic species, this one will not have a true evolutionary precursor. But this is just the most dramatic of the interventions possible today. Gene therapy essays something similar, but on a less grandiose scale, and with the 'obviously beneficial' goal in mind, that of alleviating the effects of genetic disease. Bringing back extinct species like the woolly mammoth or the quagga, in a Jurassic Park scenario is another possibility, though such projects do not need DNA sequencing per se, as also cloning sheep, cows or humans. The post-genomic world and its new technologies just makes all these scenarios seem more, and indeed, more possible.

The buzzwords of these times are all redolent of 'fiction science', which term Baldi introduces early in the book, and by which he means that science which seems more 'fictional' than real, those experiments that start off as if-onlys. Baldi writes for the layman who is interested in such matters. And such matters range from a discussion of the future of sex, to clones, to DNA manipulation right up to the very nature of thought. In a series of appendices, he explains in as simple terms as possible, the internet and the role that this has played in the genomic revolution, stem cell research and the technology of cloning.

The main thesis that Baldi sets out is that the recent biological scientific revolutions necessitate a basic paradigm shift in how we conceive of our selves. Our notion of 'self' is technologically dated: we think, caveman-like, of identities that are defined by bodies; each person is different, and thinks different thoughts; we reproduce in a certain way. Reality, Baldi contends, is very very different. Reality is the internet, cloning, and genomes. Our human identity is about to take a roller-coaster ride.

It is not easy to internalize this. No matter what, an inner voice seems to say, two clones are not the same person, they have different thoughts, different persona. Maybe so, but as Baldi asks, what about a million? Having two, one can theoretically imagine a nightmare world where one can clone any number of an unnaturally selected individual. The very notion of self lies shattered at the feet of this travesty of evolution.

Of course, more is at stake because one cannot afford to say that such things cannot happen. They have already happened.

What the motivations are, are difficult to fathom, but the cause of pure inquiry is something that we can neither stem nor seriously question. The implications are serious, and not just in the legal dimension. These are complex issues of ethics.

How tenable is Baldi's basic contention, that we are now in a position to tamper in any significant way with a process as powerful as evolution? I feel that the case is not made out that strongly after all. It is easy to conjure up scenarios, each more horrific (from today's viewpoint) than the other, but whether these will come to pass is by no means clear. Maybe the problem is that this book is written for a layperson, but the arguments are not clearly presented, and too many threads lie scattered. Baldi has tried to convey some idea of the unleashed potential of many of the current techniques of modern biology and information science, but in the end, there is no apposite instance to convince the reader that what the author fears will happen, could really happen. At least for now.

The gift of being able to look into the future is something that is given to few, and the example of Cassandra is probably appropriate to recall. However, it is the undeniable value of Baldi's book that it raises today several of the questions that will eventually affect our descendants. Some of these will be our children and our grandchildren, but we must admit that there is a very real possibility that some of these will be our clones.

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Analytical Biotechnology. Thomas G. M. Schalkhammer (ed.). Birkhauser Verlag, P.O. Box 133, CH 4010, Basel, Switzerland. 2002. 331 pp. Price not stated.

The book entitled *Analytical Biotechnology* edited by T. G. M. Schalkhammer from The Netherlands is a part of a series dealing with tools of Bioscience and Medicine encompassing a large area from microinjection to DNA fingerprinting, separation techniques, non-aqueous enzymology, evolution, toxins, etc. Thus, this edited volume is well anticipated which mainly covers the area of immobilization techniques, biochips, and certain detection methods at the nanolevel. This book reminded me of a reputed journal *Analytical Biochemistry*, and I am sure another journal with the same name as this book will appear soon if it does not already exist!

One of the most difficult jobs of a series with collected articles is that not all the chapters are written with equal clarity or are of equal importance. The editor has therefore very little scope to do anything. Thus, this book contains several chapters which are very well written and timely and at the same time there are others which do not add anything new. However, it is also interesting to note that out of nine chapters, five are written or co-authored by the editor himself.

Immobilization technique can be traced as far back as chromatographic separation when phase separation was ingeniously used to purify a component from a mixture of many. Activation of sepharose with cyanogen bromide and then its modification with the desired protein was routine protocol for many laboratories from the middle of the last century until the bulk of such material became commercially available. The next milestone obviously was Ni-affinity matrix and histidine-engineered proteins which created a revolution in protein purification. If the gene is known, amenable to cloning and expression, then all one needs to do is to tag the sequence with multiple histidine codes which upon expression would bind Ni, thus remain immobile till they could be eluted out either by change of pH or by a stronger ligand-like imidazole.

However, with the beginning of microarray techniques, which are known as biochips, the challenge became even more difficult as new chemistry was necessary to attach specific biomolecules on a desired surface within an extremely small area in an order which should be predetermined by the experimenter. Several such methods started appearing in literature and several new journals came about like '*Bioconjugate Chemistry*' which are dedicated to these methods. The new chemical science was important but the authors also put a lot of emphasis on the protocols which should be reproducible in different laboratories. This series to which the current book also belongs deals mainly with several such methods. I presume here that each protocol described is well tested and has gone through various hands before publishing; a practice usually followed in a series like *Methods in Enzymology* or *Methods in Cell Biology*.

In the present book, I find the chapter on '*Immobilized Biomolecules in Bioanalysis*' very well written and extremely useful. It mainly deals with different coupling techniques between an immobile surface and a reactant with detailed protocol at each step (which is, however, true for each and every chapter as well).

I earlier mentioned the difficulties authors face in writing a method book from the point of view of both, its timeliness and reproducibility. In the present case, the details are very well documented, but in certain chapters the theoretical background of a measurement is not covered very well. There are fifteen different protocols on 'Biosensor' including surface plasmon resonance. The area is noteworthy for medical doctors although general readers may find it a little esoteric in nature. Looking at the explosion of literature, the authors here have tried to include 'preparation of 40 nm gold nanoclustures' which is very well written and I am sure will be useful. However, there could be other easier methods to reduce Au (lll) to Au (0).

I must add here that any method on generation of 'Biochips', or description of atomic force microscopy, etc. are handicapped to start with, as one can find several detailed protocols from the website. In this respect, this book only serves the purpose of compiling several methods within one cover. However, certain troubleshooting areas and a few comparisions, like the one on DNA chip and protein chip are very well presented and can be used for class-room teaching. The authors did not even fail to include a chapter on media composition like any laboratory manual. But one must emphasize here that this is *not* a manual or method book for undergraduate teaching. Overall, this is a method book, a detailed one for some modern techniques and can serve as a good reference for practising scientists. The book published by Birkhauser containing 330 pages is however a little overpriced for individuals.

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