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The past 20 years of ecology and evolution

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With this issue, *TREE* is 20 years old. When it first appeared, there was considerable discussion about whether the field was big enough to sustain a monthly review journal. Since then, the fields of ecology and evolution have, by any metric, exploded. To mark the 20th birthday of the journal, we asked a range of authors to summarise their fields provocatively, with perspectives on the recent past and the near future. One special issue rapidly became two as most of the promised articles appeared. We are grateful to the authors for doing such a fine job to such strict deadlines.

The progress and transition documented in these two special issues reflect not only scientific and societal needs, but also technology and its ramifications. Twenty years ago, journals were read in libraries, and serious analyses emanated from computer rooms. Graduate students shared word processors to write theses and whole departments shared laser printers. There was no e-mail, no world wide web and nobody had heard of a journal impact factor. Apple™ released the Mac Plus, a personal computer with radical innovations such as a numeric keypad, folders within folders, and enough memory (if maximally expanded) to store a 2006 EU grant application. Most desktop software resided on floppy discs (some of which were in fact floppy), and an unpopular program called Word™ appeared in a version that did not need command keys and produced documents that, miraculously, looked the same on screen as they did on the page.

The Earth has also changed. During the past 20 years, the planet has lost one million km^2 of Arctic ice [1], 2 million km^2 of forest [2] and, by some estimates, more than 20 000 species [3]. The concentration of CO_2 in the atmosphere has increased by 10% [4] and the average temperate by 0.3 °C*. We also added 1.5 billion people†. In 1986, only 38 000 AIDS cases had been reported to the WHO, whereas, last year, there were 40 million [5]. In response to such trends, need-driven science has emerged over the lifetime of *TREE*. In 1986, researchers thought that important ecosystems were only those that were minimally disturbed by humans, or at least on a trajectory to something more 'natural' (e.g. secondary forest succession). There seemed to be a tangible divide between 'applied' and 'basic' science, with most ecology and evolution research being associated with the latter. Now, ecologists are being asked hard questions about why biodiversity matters, how much carbon is fixed by land plants and sequestered in soils, and what the messy process of humanization of landscapes portends for biodiversity and ecosystem function. Evolutionary biologists have been asked about the origin of HIV, what we can do about ageing and other genetic diseases, and how we can manage insecticide resistance. And when UK virologists and clinicians lost control of the 2001 Foot and Mouth epidemic, order was restored by theoretical ecologists (with a little help from the army).

The ecological and evolutionary sciences have also been radically shaped by new technologies. This is obvious now, but it is hard to imagine that the 1986 business plan for *TREE* could have foreseen how important technological advances would be in fuelling the growth of our field. Then, protein electrophoresis dominated evolutionary genetics labs, and a cutting-edge technique for resolving phylogenies involved the melting point of mixtures of DNA from different species. DNA fingerprinting and PCR were just a couple of years old and barely understood in the ecology and evolution communities. *TREE* readers who knew of the radical proposal to sequence the human genome would have considered it a waste of money. Currently, such genome data challenge us with new scientific problems. Likewise, ecologists now routinely exploit technologies such as stable isotopes and remotely sensed information, and wireless networks are on the way. Advances in hardware and software now provide us with the capacity to assimilate knowledge, synthesize, rather than merely 'average'. In 1986, it was possible to sustain the argument that ecology and evolution were essentially concept led. Now the opportunities presented by new tools often lead the charge. As many of these birthday-issue articles show, we can now answer old questions better, and new types of data are asking new questions of us.

The past 20 years have seen the science of natural history become 'Big Science' in every sense. We hope to have captured some of the excitement of the expansion in the field in the articles appearing in this and next month's birthday issues. Given the challenges faced by humanity, the central role of ecology and evolutionary biology in explaining life, why we are here, and how we can stay here, it is hard not to feel that the 21st century is the domain of ecological and evolutionary science in a way so far unprecedented in history.

References

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* http://yosemite.epa.gov/oar/globalwarming.nsf/content/Climate.html.
† http://www.census.gov/.

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