



Left to right: Mustafa Akyol, Mel Greaves, Niles Eldredge, Per-Edvin Persson, Patricia Adair Gowaty, Masatoshi Nei, Michael Lynch, Ulrich Kutschera, Randolph Nesse, Ismail Serageldin.

## Great expectations

A new path for evolution? A truce in the culture wars? Here's what a selection of readers told *Nature* they expect from Darwin 200.

### Patricia Adair Gowaty

Distinguished professor, Department of Ecology & Evolutionary Biology and Institute of the Environment, University of California, Los Angeles, USA.

One sign of enhanced public understanding of Darwin and the nature of science, will be quicker resolution of continuously re-emerging controversies between the scientifically literate and 'creation scientists'. Other signs will include enhancements of public debate about scientific discovery, about funding for science, and policies that result from scientific discovery. There will be fewer vapid press claims about the implications of scientific studies, and an enhanced awareness of the roles of evidence and the control of bias in decision-making of all kinds.

### Ismail Serageldin

Director, New Library of Alexandria, Alexandria, Egypt.

Copernicus knocked out the centrality of Earth in our view of the Universe, and Darwin knocked out the special status of humans as a species in the diversity of life on this planet. Both were vilified and attacked by bigots. Both played a central part in allowing us to



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understand the reality of where we live and who we are.

Indeed, in the grand scheme of things, Darwin has given us the remarkable means to redefine the role of humans. We are the only species capable of appreciating the diversity of life and the fragility of

our ecosystems, and the only one to recognize our responsibility to change our behaviour in order to safeguard life and the world we live in.

During the Middle Ages, the Muslim world showed remarkable openness to the contrarian view and an appreciation of evidence-backed science. The Muslim world would gain much by reclaiming its legacy of open-minded pursuit of knowledge, and the Darwin celebrations could be just the catalyst to help us rediscover that tradition.

### Per-Edvin Persson

Director, Heureka, the Finnish Science Centre, Vantaa, Finland.

I dream that the majority of the world's population will understand that evolution is the process by which diversity of life is maintained on this planet.

We would know this has happened by witnessing a diminished number of attacks on science, and the theory of evolution in particular, from non-scientific sources. The number

of fundamentalist believers in verbatim creation will have diminished and given way to an understanding that science and religion may coexist but that they should not be mingled. The world would accept that religion is religion and science is science and let both live in peace.

### Niles Eldredge

Division of Paleontology, the American Museum of Natural History, New York, USA.

Biological phenomena that bear on evolution occur at such a mind-boggling spectrum of spatio-temporal scales that communication — hence integration — is harder now than it was in Darwin's day. Darwin himself may have been the last to have had an adequate grasp of the geology, palaeontology, zoology and botany of his day, to be able to frame something of a unifying picture. The rest of us yell at each other from increasingly widening chasms between buildings on campuses.

No one is at fault here for a lack of communication across disciplines. Do I think some of the big meetings planned for 2009 will help bridge this? One can but hope. But I doubt that Darwin's 200th birthday anniversary will manage to spur us collectively on well enough to get the job done that hasn't been successfully addressed for 150 years.

### Michael Lynch

Distinguished professor, Department of Biology, Indiana University, Bloomington, USA.

My primary concern about the Year of Darwin is that the view that evolution is simply natural selection will be perpetuated further. This concern is motivated by increasingly frequent arguments, being made by people outside the field of evolutionary biology, that the entire enterprise needs overthrowing. In fact, a lot has happened in the past 150 years, and the basic theoretical framework of evolutionary biology is rock solid. There is not a single observation in cell, molecular or developmental biology that has caused a ripple in our basic understanding of evolutionary principles. This is not to say that we don't need molecular, cell or developmental biologists to complete our understanding of evolution — we need this more than ever — nor is it to say that there aren't a lot of unsolved problems.

Thus, what I would most like to see happen in the field is a true merging of the above-mentioned fields with evolutionary biology. It has long been clear that much of what we see in biology cannot be explained in terms of natural selection alone, yet we continue to witness an unwarranted proliferation of adaptive stories, in some cases extremely bizarre ones, to explain every aspect of existing and extinct biodiversity. What needs to be accomplished will take more than 12 months. More realistically, it will require the education of a new generation of scientists in the basic principles of evolutionary theory that have emerged since Darwin.

### Masatoshi Nei

Director of the Institute of Molecular Evolutionary Genetics, Pennsylvania State University, University Park, USA.

We need a new evolutionary theory for the evolution of observable characteristics (phenotypes) of organisms. In this theory, mutation will play an important part, because it is mutation that generates innovative characters. The role of natural selection is merely to save beneficial mutations and eliminate deleterious ones. Because a large number of genes are involved in any phenotypic character, and evolution occurs without purpose, there must be large components of neutral or nearly neutral changes in phenotypic evolution. I doubt that this paradigm shift will be accomplished within one year, but the Year of Darwin could prompt the beginning.

### Ulrich Kutschera

Professor of plant physiology and evolutionary biology, Institute of Biology, University of Kassel, Germany.

In 1859, when Darwin published his theory of descent with modification, the emerging evolutionary sciences were still mixed up with the idea of divine creation and William Paley's argument for design. Most of the nineteenth-century books dealing with the origin of life contain this pre-Darwinian biotheology. Darwin was the first to present an entirely naturalistic set of interpretations of the empirical data that provided evidence for evolution. Moreover, he discovered, independent of Alfred Russel Wallace, that natural (and sexual) selection in populations of animals and plants is a major 'driving force' for evolutionary adaptations and diversifications over thousands of subsequent generations. I hope that, by the end of 2009, Darwin's classical theories as well as his philosophical imperative — the strict separation of scientific facts from religion — will be accepted by the general public.

**"I would really like to see the de-ideologization of Darwinism."**

— Mustafa Akyol

The clearest signs as to whether or not this message has reached the target audience of anti-evolutionists will be the acknowledgment that macroevolution is a documented fact and not 'only a theory'.

### Mustafa Akyol

Columnist for the *Turkish Daily News* and blogger for The White Path.

One thing I would really like to see is de-ideologization of Darwinism. By that, I mean the separation of Darwinism and some of the philosophies, atheism in particular, that are advanced by using this theory.

If Richard Dawkins and Daniel Dennett proclaim that their atheism is a matter of philosophical choice, not a direct outcome of 'science', and particularly Darwinian evolution, that would be a major sign that this is happening. But I am not holding my breath. I would rather expect to see more from scientists who think that evolution is compatible with their theistic faith.

A good example would be Simon Conway Morris, who thinks that evolution follows a pattern that points to a meaningful, not a meaningless, Universe. In many countries, including Turkey where I live, such views are hardly known. Neither is Darwin's comment on life on Earth as being "breathed by the Creator". If the Year of Darwin helps in discovering this often neglected side of the great naturalist, it will be a big achievement.

### Randolph Nesse

Professor of psychiatry and psychology, the University of Michigan, Ann Arbor, USA.

Medicine has a blind spot for evolutionary biology. Most doctors graduate thinking that selection works mainly for the benefit of groups, that it cannot occur after menopause, that ageing results from parts inevitably wearing out and that most of the body's vulnerabilities exist simply because selection is too weak. Correcting such misconceptions requires medical curricula reform.

I am just back from a year of work with a group at the Berlin Institute of Advanced Study that considered realistic recommendations. Two are achievable in the Year of Darwin. First, national scientific organizations, such as the US Institute of Medicine, should convene groups to recommend steps that will bring evolutionary biology fully to bear on problems of human health. If they recommend that medical-school certification examinations ask questions about evolutionary biology, curricula will change quickly. Second, all schools of medicine, nursing and public health should adopt policies to ensure that their students and researchers are able to use all the tools and concepts evolutionary biology provides. We have 12 months.

### Mel Greaves

Chairman, Section of Haemato-Oncology, the Institute of Cancer Research, Sutton, UK.

I would like to see both clinicians and epidemiologists recognizing that vulnerability to common diseases of affluent societies, such as diabetes, obesity, cancer and age-linked degenerative conditions, is a bequest of our evolutionary history — as mismatched with our modern life-styles. For epidemiologists, persuasion will not come from continued advocacy or polemics but from irresistible data — perhaps in the form of further genome-wide association studies implicating common allelic variants in susceptibility to common disease.

Moreover, I hope and expect to see the ongoing comprehensive, full genomic scrutiny of cancer providing detailed route maps of the evolutionary trajectories of cancer stem cells from initial emergence through to metastatic dissemination and drug resistance. The power of computational biology will have to be harnessed to manage the rich and dynamic complexity that will emerge. ■

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