Environmental eScience

The Internet has changed not only the way society operates but also how scientists work. There has also been a step change in the quantity of data that scientists routinely amass and need to analyse. These technologies have transformed our working lives as researchers.

The way we can store and retrieve complex and often heterogeneous data makes new types of analysis possible for the first time. The growth in the raw power of computers, as well as in the ways in which this power can be harnessed, allows new problems to be modelled and old issues to be studied in greater detail. But the speed of technological innovation has been so great that the full power of these technologies has yet to be realized across all scientific fields. National research agencies have an important role in supporting scientists as they adapt to this changing landscape.

Sir John Taylor coined the term ‘eScience’ in 1999, when he was the Director General of the UK Research Councils. John presciently recognized the importance of the coming eScience revolution and wanted to ensure that the UK continued to play a leading role in this transformation. I say continued because, as Wendy Hall so vividly describes in this issue, many of the early developments in what we now call eScience came out of British computer science departments.

John began a cross-Research Council programme in eScience; this was subsequently ably led by Tony Hey. The Natural Environment Research Council (NERC) was an enthusiastic partner. Similar initiatives sprung up around this time in other countries, including several ‘cyberinfrastructure’ projects in the USA.

The environmental science community faces complex and often unique challenges. What is more, addressing these challenges will materially affect the livelihood, wealth and happiness of people everywhere in the coming decades. And we need answers sooner rather than later. Modelling future climate change, studying the impacts of extreme events and understanding how biodiversity is generated and maintained are a few of the many hard problems in the environmental sciences that need all the resources of modern eScience.

The papers in this issue arise from a Discussion Meeting with two goals. The first was to bring together some of the best practitioners of modern environmental eScience to share their ideas in a truly interdisciplinary forum. The second was to celebrate the progress made at the end of the NERC eScience programme, our response to John Taylor’s clarion call (which, I stress, is not the end of NERC’s interest in eScience). I am particularly grateful to the Royal Society for supporting this Discussion Meeting.

One contribution of 24 to a Discussion Meeting Issue ‘The environmental eScience revolution’.
The NERC eScience programme was a challenging venture because it tried to bring together two disciplines, computer science and environmental science. We are extremely grateful to Jeff Dozier, who guided the programme as Chair of its Steering Committee. It also tried to support exciting and innovative science in both fields—a real challenge that forced applicants to work outside their comfort zones in truly interdisciplinary teams. This made the programme risky, but also exciting. We funded eight consortia, and there are papers in this issue from all of them. Five of the projects concerned modelling the Earth system, including making underlying models more sophisticated, using computing power and resources more effectively, and producing more policy-relevant predictions.

The projects included climateprediction.net, which used the spare power of personal computers linked to the Web to simulate the climate. Publicized with the assistance of the BBC, it was this project that most engaged the public’s attention. It is currently the second biggest distributed computing project involving the general public after SETI, the search for extraterrestrial life.

Other projects included eMinerals, which addressed how pollution moves through soils and groundwater and helped to identify materials for long-term encapsulation of nuclear waste; a project involving the Natural History Museum, Kew and universities to create a new way of doing taxonomy on the Web; and the development of the NERC DataGrid, which aims to make it easy to find and manipulate environmental datasets online.

The last project proved so successful that it led to the development of global standards for sharing data. For further details on all these projects, I encourage you to read the papers collected in this issue (table 1 in Gurney et al.’s introduction lists the NERC eScience programme and references these papers).

The programme also funded two research centres, the National Institute for Environmental eScience and the Reading e-Science Centre. Both have played a major role in demonstrating the value of eScience.

NERC will continue to support and invest in eScience as it enters the mainstream of environmental science. NERC’s new strategy ‘Next Generation Science for Planet Earth’ includes a focus on the technological requirements of environmental sciences over the next 5 years. One big challenge is more collaboration with colleagues in cognate fields, and in other countries. eScience will make this easier.

I would like to finish on a sad note and remember Prof. Peter Killworth of the National Oceanography Centre, Southampton. Peter was a member of the NERC eScience Steering Committee and made many valuable contributions to the field before his untimely death in January 2008. He was a renowned physical oceanographer, and was recently awarded the Henry Stommel Medal by the American Meteorological Society. He also made major contributions to the study of social networks, and even wrote several computer games. This breadth of interests made him extremely well suited to help in the birth of a new science. He will be greatly missed.

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