Historic work

Governments need to strengthen support for scientists who preserve our cultural heritage.

In Ireland, parts of England and other areas of Europe there are thousands of artworks that were fashioned from rocks during the Neolithic period and the Bronze Age. Threatened by degradation, such cultural heritage attracts scientists and volunteer citizens to ensure its preservation.

The tools that researchers have devised to help in this task are themselves creative. In one project, biogeochemists and geomorphologists have developed non-invasive methods that enable researchers and citizens to monitor and mitigate decay. Scientists interested in protecting historic collections are determining how climate change will affect the rates of chemical degradation of paper and silk, pest damage and mould growth. Then there is optical coherence tomography, which uses reflections of laser light to provide three-dimensional analyses of structures that are micrometres beneath opaque surfaces. Extensions in the spectral range of this technique are revealing features that are valuable for the conservation and historical analysis of works of art.

Such research diversity and much more, practised in many countries, is devoted to the preservation and restoration of humankind's historical and cultural heritage. Who could question the value of such research? Who would doubt the impact of studies that help to protect heritage tourism, a major contribution to many economies? Who could underestimate the benefit to young people and their teachers in science and history? No one does. In fact, government ministers in various nations along with research-funding agencies, the European Commission, regional authorities and the United Nations Educational, Scientific and Cultural Organization all support such science in one way or another.

And yet these heritage researchers struggle. Many have been particularly hard hit by cutbacks in national and regional funding. But more important is their lack of visibility and influence for attracting long-term support; in that sense, the diversity of their techniques and subject matter undermines them. They also lack research prestige, as judged by the conventional standards of scientific assessment — their work is published in low-profile journals, in museum reports and in other 'grey' literature. And so bright young researchers see too few career prospects, and leave the field. What a waste.

Last week saw a notable gathering of heritage scientists at a conference in London — notable because of the variety exemplified above, but also because one can speak of them as a community, and one that is much more coherent than in the past. This is thanks to a sequence of events in the United Kingdom that many countries would do well to emulate. A scientific committee of the House of Lords, the upper house of Britain's parliament, recognized in 2006 that such research was important and neglected. As a result of that analysis, the national Science and Heritage Programme was established in 2007, jointly funded by the Arts and Humanities Research Council and the Engineering and Physical Sciences Research Council. The programme has funded nearly 50 projects involving 200 researchers.

"What is most important is to build long-lasting capacity in heritage research."

Yet funding is only half the story. It is also crucial for the community to be coherent in its actions and in improving its visibility. Here progress has been made, but much more needs to be done. There has been too much dependence on championship of the field by highly committed individuals. More collective approaches are being established, such as the National Heritage Science Forum in Britain and a global forum developed by the International Centre for the Study of the Preservation and Restoration of Cultural Property in Rome. An agenda of engagement for increasing the influence of UK heritage research was aptly described at last week's conference by heritage scientist May Cassar of University College London (see go.nature.com/bxndif). And a European Commission project initiated the Heritage Portal website (www.heritageportal.eu), which has the potential to highlight the field's achievements. But such forums have a way to go in establishing themselves as forces of influence, and the Heritage Portal is seriously under strength.

What is most important is to build long-lasting capacity in heritage research: a combination of multidisciplinary centres of excellence and, above all, a need for science ministers and universities to ensure that new permanent academic posts are established. These are essential to strengthen the backbone of heritage science, and so secure the future of our common past. ■

Follow the crowd

The behaviour of millions of minuscule beads reveals some secrets of collective motion.

Their claimed wisdom is disputed, but no one should doubt the ability of crowds to make collective decisions. Flocks of starlings twist in unison like smoke swirls in a summer sky, and shoals of fish tack and veer as if in response to electric shocks. Locusts swarm and herds of humans can head in very unwise directions indeed. Even simple bacteria show collective behaviour.

Individuals in each of these systems have very different abilities to communicate with each other, to actively pass on information about their intended actions, so why does collective behaviour across all scales look so similar? Is there some unknown sensation that allows the individuals that comprise such seemingly intelligent crowds to steer; some distant wisdom? Although such behaviour is easy to observe, it has proved hard to capture in simple physical models. If we could master it, the information that this might yield could help engineers to develop swarming robots and design safer crowd-control measures.

On page 95 of this issue, researchers in France report that they have induced collective motion in millions of tiny plastic beads. The miniature spheres, they say, can sense the orientation of their rolling neighbours and adjust their own actions accordingly. In this way, the scientists can encourage the beads to follow the crowd, simply by pouring more of them into the system.

The scientists — Denis Bartolo and his colleagues — squeezed a conducting liquid suspension of the beads into a miniature racetrack sandwiched between two glass plates, and watched what happened when they applied an electric field. An electrohydrodynamic curiosity called Quincke rotation causes the beads to twitch and then start to roll. At first, they head off at constant speed but in all directions. Then, as more beads are added and their number passes a critical point, the individuals form a crowd and their individual motion coalesces into coherent movement in a unified direction — just like that of a flock of birds. This happens, the scientists say, because the rolling spheres can sense the orientation of their neighbours through simple hydrodynamic and electrostatic interactions.

From plastic balls to intelligent dust: there could be interesting implications here for work that aims to harness self-propelled and swarming microparticles, for example, to diagnose disease or improve communications. The writer Mark Twain said: "Whenever you find yourself on the side of the majority, it is time to pause and reflect." But sometimes, the majority really does rule. ■

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