

## Educating future scientists

**Instead of helplessly pondering a new trove of data for guidance on how to improve science education, researchers should better exploit existing mechanisms for helping out at their local schools.**

A quarter of a million 15-year-olds from around the world last year performed hours of special tests on their reading, mathematical and scientific literacy, in a study organized by the Organisation for Economic Co-operation and Development (OECD). The first results of this Programme for International Student Assessment (PISA) have just been released — and make moderately interesting reading.

Korea sits at the top of the science class, closely followed by Japan, Finland and the United Kingdom. Given its wealth, the United States (which has the widest gap between its best and worst students) should certainly do better than its mid-table position. Germany, surprisingly, performs the least impressively of the major scientific nations, with results below the overall international average. The science results closely mirror those in reading and mathematics, and it might be tempting to draw instant conclusions from them: some in Germany have already done so. But caution is appropriate in interpreting such studies, which really provide more questions than answers for policy-makers.

The most noted recent international comparison of school performance was the Third International Mathematics and Science Study (TIMMS), which was completed in 1999. But the questions in TIMMS sought, in the main, to measure students' grasp of the facts contained in school curricula. PISA, in contrast, sought to measure their ability to apply knowledge.

This attempt to measure the evaluation and interpretation skills of children should be welcomed. But it would be a mistake to assume that the scientific futures of countries at the summit of this particular PISA tower are necessarily going to be rosier than those of nations that fared less well. Just because a student is good at a subject, there is no guarantee that he or she will continue to study it. As generations of teachers will confirm, there is often little correlation

between academic ability, which the study sought to measure, and enthusiasm.

Indeed, many of those directly involved in school education speak of an increasing reluctance among students to continue studying science once it ceases to be a compulsory subject. The reasons for this have been well rehearsed. Science faces stiffer competition from other subject areas than previously, both in the struggle for attention and in the promise it offers of assisting a successful career. It is also relatively content-heavy — however it is packaged — and even the most skilful teacher may struggle to make some of its more esoteric aspects relevant to the world of the average 13-year-old.

The scientific community has a stake in these problems, but it is one tinged with paradox. A more accessible — and perhaps less challenging — curriculum might well encourage wider participation and a larger pool of students willing to continue studying science. But such a curriculum will not best help the very brightest students whose interest in science might lead them into a career in it. The argument about which direction to push the curriculum will doubtless continue. As it does so, scientists can do more than grumble from the sidelines about declining standards.

Many scientific organizations already take a strong interest in science education in schools. The US National Science Foundation — whose charter includes supports for education as well as research — now asks all grant applicants to explain what their research proposal will do for education, and this can include school education. In Britain, a programme called the Pupil Researcher Initiative, funded by the research councils, offers school students the chance to regularly hear from active researchers. A wealth of other such schemes operate around the world. Now is the time for researchers — some of whom are reluctant even to engage properly in undergraduate education — to seek these out and participate in them. ■

## Europe must unite to preserve its heritage

**The European Commission should not lose its enthusiasm for supporting research into the preservation of cultural heritage.**

Relatively speaking, it's a discipline that doesn't cost much — and its value is beyond measure. Yet research into the conservation of Europe's vast cultural heritage has few real champions. Its best friend is Italy, the only country in the European Union (EU) that provides serious national funding for research into the preservation of monuments, ancient ruins and archaeological sites.

But even Italians concede that the Leaning Tower of Pisa, for example, is no more representative of Europe's heritage than, say, the historic centre of a village in Norway. Conservation efforts should be truly European in scope, not only to acknowledge Europe's cultural unity — which is supposedly central to the EU charter — but for technical reasons, too. It is widely accepted, for example, that the standardization of procedures for building preservation will save money and help to efficiently share out the limited pool of available expertise.

For 15 years, the European Commission has shown itself sensitive

to these issues. Its approach recognized the fact that national efforts outside Italy tend to be narrowly focused and piecemeal. Unfortunately, however, the commission's proposal for the next Framework research programme, which starts in 2003, makes no mention of the conservation of cultural heritage. National governments, it implies, should handle the problem themselves. This attitude is short-sighted.

The list of research needed for heritage conservation is long, and underlines the need for continued support from the EU. Thresholds for air quality should be set, for example, with building conservation goals in mind. Research is badly needed into the interactions between ancient building materials and the modern alternatives used in restoration. Movement of the water table, which is affected by global warming and controls the destiny of buried archaeological ruins, needs to be better understood. Italy knows it cannot afford to let Venice float away to sea, but the rest of Europe needs to ensure that other aspects of its valuable heritage are preserved for future generations. ■