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Einstein is dead

Until its next revolution, much of the glory of physics will be in engineering. It is a shame that the physicists who do so much of it keep so quiet about it.

Once upon a time there was (and still is) a multinational manufacturer of sheet metal whose researchers realized they could improve the reliability of its production processes. By solving the equations of heat transfer for the company's rolling presses, and testing the solutions on scale models, they significantly reduced the margin of error in the thickness of the rolled sheet. Their prime customer, a manufacturer of metal cans, was delighted. Millions of pounds were saved in materials and rejected products, and (maybe) the reduced costs were passed on to the customer. Maybe, too, the physicists got bonuses.

How very far removed from the special theory of relativity and the world of quantum mechanics — the parallel revolutionary paradigms on which most of twentieth-century physics and related technologies were based. Now, 100 years after Einstein's first pioneering papers in those disciplines, physicists worldwide are rightly going to town, with conferences, artistic commissions and games. (For some of *Nature*'s own partying, see pages 200 and 213.) They are doing their utmost to celebrate in the face of the relentless promotion of biology as the exciting science of the current century and despite declining interest in physics amongst the young.

Einstein is not only the patron saint of physics but also an icon of integrity and scientific pursuit for its own sake — and, for the wider public, an appealing elderly gentleman. Small wonder, then, that UK and Irish physicists opted to call 2005 'Einstein year', rather than the 'Year of physics'. But Einstein is long gone. His ideas, his style and his legacy still inspire, but his rejection of the quantum picture of reality and his dreams of the unification of forces have been replaced by the acceptance and exploration of quantum entanglement and highly esoteric (albeit potentially profound) attempts to derive twentieth-century laws from a deeper paradigm for the structure of space-time.

To hang a 'Year of physics' so centrally on Einstein is to miss the key lessons of the metal manufacturer: that physics is not only central to our understanding of the Universe (just what are dark matter and dark energy?), but is also central to making useful and sometimes inspiring things. Sheet metal is at the more prosaic end of the spectrum. At the other end, Steve Jobs, head of Apple, said at last week's launch of the latest iPod: "Most people make the mistake of thinking design is what it looks like … Design is how it works." In other words, sexy design is also about sexy engineering and the sexy science behind it.

And listen to theoretical physicist Michael Berry of the University of Bristol, UK, launching the competition "Physics for taxi drivers" (*Physics World* December 2004, p. 15; http://physicsweb.org/articles/world/17/12/2). He recalls how a description of a CD player and a satellite navigation receiver convinced a cab driver that physics is interesting. The worry is not so much that people cannot understand the relevance of physics — and credit to the 'World Year of Physics 2005' organizers for a poster competition for 10–16-year-olds to celebrate that. The worry is that in universities, and especially in schools, there is so little emphasis and imagination, either this year or ever, in celebrating physics' relevance and, more importantly, sending the right career signals to young people.

Many young people today are as capable as previous generations of being inspired by the challenge of making things: engineering with unbelievable precision in the face of quantum uncertainties, creating elegance in functional design, and delivering innovative and useful — or even socially transforming — everyday things. *Nature*'s pages have included their share of the foundations of twenty-first-century manufacturing, with advances in the quantum control of atomic and molecular states, quantum information and optoelectronics (see page 292, for example).

Some of the authors of those papers have interesting engineering careers ahead of them. As surveys by learned societies repeatedly show, a large proportion of physics graduates find fulfilling and well paid employment in engineering and information technology. Those same societies, and governments and physicists generally, repeatedly fail to get that message across to the public or to kids in schools. Yet that is surely a more important challenge this year than reiterating in depth, appropriately but ineffectually, that Einstein was great. ■

Tales of the unexpected

Unfettered research sometimes leads to highly serendipitous discoveries.

X-rays, penicillin and the World Wide Web — these are often-cited examples of how unshackled science can lead curious researchers to unforeseeable discoveries. But such discoveries quickly get taken for granted, so it is good occasionally to highlight new examples of the unexpected.

One can be found in research into fitness and exercise. Few if any people could have anticipated the results that poured out of the long-term, US-based HERITAGE Family Study into exercise training. HERITAGE represents research at its most basic: engage large numbers of people, make them do fitness training for 20 weeks, gather diverse physiological, biochemical and genetic data with no hypothesis in mind, and see what you get.

The researchers found an astonishing variability in our individual responses to training (see page 188). Some participants got much fitter, others hardly at all. And the study shook assumptions about the presumed risk factors for common diseases that are particularly prevalent among couch potatoes, such as cardiovascular disease and type 2 diabetes. In some outliers the overall profile of presumed risk factors was dramatically high, for others quite small.

Meanwhile, a UK-based study on athletes has led directly to clinical trials of a drug targeted to a particular 'fitness gene' in highly vulnerable groups of patients — premature babies, for example — whose very life depends on their efficient use of oxygen, just like an athlete's ability to win medals.

Scholars of science, policy-makers and those who simply enjoy the highways and byways of research, take note. ■