ledge, can have a more fundamental meaning than a concrete, objective reality, and that, ultimately, reality and information are indistinguishable. According to Zeilinger, when a quantum state is taken to represent the knowledge we have of a system rather than the system itself, the paradoxes that appear to lie at the heart of quantum mechanics disappear.

This tendency to philosophize has taken Zeilinger far and wide. He has met the Dalai Lama twice – in India in 1997 and then in his Innsbruck lab a year later. There, he gave the Dalai Lama a crash course in quantum physics, demonstrated the double-slit experiment using a photon counter and exchanged ideas on the similarities between Buddhist and scientific thinking. It emerged that observation plays a key role in both Buddhism and quantum theory, and the Dalai Lama agreed that there are limits to what we can know in principle, rather than merely in practice. But the Buddhist leader refused to accept that we cannot know which path a photon takes in a two-path quantum interference experiment. "Continuity of existence is very important to Buddhists because it leads to reincarnation," notes Zeilinger.

While he is a keen learner, Zeilinger also loves to teach. He was one of the first academics in Austria to actively engage the public's interest in science, for example teaching quantum physics to kindergarten children on television. This has made him something of a "pop star", says his colleague Markus Arndt, but has earned him disapproval from academic peers who are scornful of such media attention.

Neither the stardom nor the criticism seem to have gone to his head, however. Despite having more than two dozen awards to his name, and notwithstanding the excellence that he pushes for in those around him, Zeilinger's students and postdocs speak of how he openly admits to making mistakes. As he explains to his first-year lab students, "You are allowed to break things. You only find out by trying."

This willingness to try things out, even if it proves fruitless, is allied to an open-mindedness summed up by Arndt. "If you have not thought of a counter argument to your scientific ideas, Anton will probably find it," he says. "If you have not yet identified a vision beyond the next decade, Anton will probably ask you for it. And if you believe you have found a truth, Anton will ask you for an alternative truth."

Energy

Nuclear future for China

Flying the flag for fusion
The EAST reactor, which is about to start operating.

Chinese development of nuclear energy is advancing on two fronts. Last month the country announced that it is to build 32 new fission plants over the next 15 years, taking nuclear's share of electricity generation from just over 2% to about 5%. Later this month, meanwhile, Chinese scientists will finish testing a new fusion reactor, known as the Experimental Advanced Superconducting Tokamak (EAST), the world's first fully superconducting tokamak device.

More than 70% of China's electricity currently comes from coal. But as the country's energy demand rises, it is increasingly looking to nuclear as a less-polluting energy source. The new fission reactors, announced by Shen Wenquan of the China National Nuclear Corporation at the end of February, will cost about $50bn and will add to the country's nine existing reactors. The new plants will probably still be based on conventional pressurized water reactors, but China also plans to build a prototype of an advanced "pebble-bed" reactor in the next five years. In common with several other Asian countries, it is also developing the technology for fast reactors.

As China's energy demand rises, it is increasingly looking to nuclear as a less-polluting energy source

But while China is keen to expand its output from fission reactors, in the longer term it is also looking to fusion as an energy source. It is one of seven partners in the €10bn International Thermonuclear Experimental Reactor (ITER) project, which is due to start up in around 2016 (*Physics World* March pp12–13), and this summer is due to begin operating EAST in Hefei in eastern China. At a cost of under $40m, EAST is cheap compared with ITER, but is likely to be the first fusion experiment to confine the plasma in its doughnut-shaped tokamak using just superconducting magnets.

This will make the reactor an important test-bed for ITER, which will also use such magnets, according to EAST project leader Yuanxi Wan. EAST is designed to demonstrate "steady-state" operation by confining its plasma for stretches of up to 1000 s, rather than the roughly 10 s bursts typical of the world's leading fusion devices (although these devices can generate greater power outputs). Steady-state operation is an essential feature of power stations, which must maximize their output to be cost-effective.

Edwin Cartlidge

...but nuclear is not the answer for the UK

Britain should not look to nuclear power to fulfil its future energy needs, says a government advisory body. The Sustainable Development Commission has spent a year analysing the pros and cons of nuclear power as part of a governmental review of energy, and concludes that the UK can tackle climate change and ensure the security of its energy supply without building a new generation of nuclear power stations. The UK currently generates about one-fifth of its electricity from nuclear power, but most of its reactors will have closed down by 2020.

The commission recognizes that nuclear power stations emit very little carbon dioxide, can generate large amounts of electricity and increase the diversity of the UK's energy supply. But it says there are a number of shortcomings. It points out that there is still no long-term solution to the disposal of radioactive waste and believes the public may have to subsidize the construction of new reactors. It also says that the rebirth of nuclear power would prevent the growth of localized electricity generation and undermine efforts to improve energy efficiency. Finally, with an expansion of nuclear power, the UK could not then deny that capability to countries with lower safety standards, the commission adds.

Waste not wanted
A government commission rejects nuclear power.

"There is little point in denying that nuclear power has benefits, but in our view these are outweighed by serious disadvantages," says Jonathon Porritt, the commission chair. The commission concludes that the UK can instead meet its future energy needs through a combination of a "low-carbon innovation strategy" and an "aggressive expansion" of energy efficiency and renewable technology.

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● **www.sd-commission.org.uk**