Medical physics

Fundamental physics enters the war on cancer

The US is setting up a dozen new research centres to explore novel ways in which physics can be applied to the treatment of cancer. The centres, funded by the National Institutes of Health (NIH), are part of a five-year project worth a total of \$22.7m in its first year. Each centre will bring a non-traditional approach to oncology by considering the physical properties and dynamics of cancerous cells.

"We will aim to inject some radical new thinking into the subject – opening a completely new front on the 'war on cancer'," says Paul Davies, director of the BEYOND Center for Fundamental Concepts in Science. Based at Arizona State University (ASU), BEYOND is one of the 12 centres that will receive NIH funding, getting \$1.7m for each of the first two years. BEYOND will also host a new "cancer forum" to brainstorm ideas inspired by the physical sciences and physics in particular.

"What is new about this initiative is that it is going to be tackling the root causes of cancer on a conceptual level," says Davies. "Orthodox cancer research is in thrall of the mantra 'follow the genes' and conventional therapies focus on chemicals to fight cancer. But cancer cells are physical objects with properties such as elasticity, adhesion forces, electric poten-

Arizona State University

tials that physicists understand. I believe we should not treat cancer as a disease to be cured, but as a manifestation of life's extraordinary exuberance to be managed and controlled. Our approach will be complementary to the gene-centred and chemistry-centred approaches: we need to integrate all three."

The work at the BEYOND centre will also be augmented by an experimental programme at ASU that will focus on 3D imaging of cancer cells, monitoring metabolic changes of single cells using microfluidics and studying physical changes in cancer cells using atomic-force microscopy. Staff at ASU will also carry out computer modelling of tumour growth.

On the front line

Physicists have won funding to research new ways of tackling cancer cells.

Experimental samples, such as cancer cells and tissues, will be provided and characterized by collaborators at the Fred Hutchinson Cancer Research Center and the Mayo Clinic.

Hossam Haick, a chemical engineer from the Israel Institute of Technology who recently helped develop a nanoparticle sensor that can detect lung cancer from patients' breath, is excited by the new US project. He believes that oncology will benefit from a more unified application of the natural sciences, particularly in developing treatments that target cancerous cells with high precision. "The physicists' eyes will require the chemists' hands and biologists' perception," he says. However, Haick thinks that it will take at least 10 years before reliable new technologies emerge.

The other 11 institutions to be funded by the NIH initiative are Cornell University, Johns Hopkins University, H Lee Moffitt Cancer Center and Research Institute, Massachusetts Institute of Technology, the Memorial Sloan-Kettering Cancer Center, Northwestern University, Princeton University, Scripps Research Institute, the Texas Health Science Center, the University of California, Berkeley and the University of Southern California.

James Dacey

Particle physics

Race for the Higgs hots up as Tevatron seeks extension

With researchers at CERN's Large Hadron Collider (LHC) having circulated protons for the first time since last year's accident, the US Department of Energy (DOE) is requesting \$25m so that the Tevatron collider at the Fermi National Accelerator Laboratory in Illinois can run for an extra year until 2011. If the additional funding is granted, it would give physicists in the US an extra 12 months to close in on discovering the elusive Higgs boson. The DOE's request will now be reviewed before being part of President Barack Obama's 2011 budget request, which will be sent to Congress in February.

The 6.28 km Tevatron ring, which collides protons with antiprotons at

Fermilab

On your marks...

A one-year extension to the Tevatron will let it hone in on the Higgs boson.

energies of up to 1 TeV, was due to shut down in 2010 for a year-long upgrade to its proton source – the main injector. Fermilab's injector can currently deliver a beam power of 400 kW but this will be upgraded to 700 kW to refashion it into a new neutrino source, called NOvA. Fermilab's injector will be made to produce muons, which decay into neutrinos that are then detected 810 km away in an underground mine.

The Tevatron extension would allow it to close in on the hunt for the Higgs boson, which is thought to give particles their masses and is the last piece in the jigsaw of the Standard Model. The LHC switch-on in September 2008 would have rendered

the Tevatron obsolete, but the delay in restarting the LHC gave physicists at Fermilab fresh impetus to chase the Higgs. "Certainly the delay makes the government more receptive to running the Tevatron longer," says Fermilab director Pier Oddone. However, he insists that "running the Tevatron for another year would not impact on NoVa".

Dennis Kovar, associate director at the DOE's Office of Science, gave a presentation at a meeting of the office's High Energy Physics Advisory Panel in Washington, DC in late October. "There is an increasingly strong case for running the Tevatron in 2011," he told delegates. Michael Banks