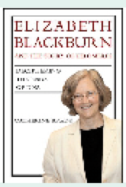
Nothing is all

The Void
by Frank Close, Oxford University Press, £9.99/$19.50, ISBN 9780199225903
Reviewed by Amanda Gefter

DOES thinking about nothing make it something, the philosopher Thales asked. Reading a book about it sure does. Nothing is a fascinating topic, impacting on the structure of matter and the origin of the universe. An atom is almost a perfect void, and the cosmos itself may be a fluctuation in the quantum vacuum. Close offers a concise history of physics, from Aristotle to Higgs, discussing relativity, quantum mechanics and cosmology. It's a nice read for people with little background knowledge, but those more familiar with physics will be left wanting more of nothing.

The wrong headlines

Elizabeth Blackburn and the Story of Telomeres
by Catherine Brady, MIT Press, $29.95/£19.95, ISBN 9780262026222
Reviewed by Georgina Ferry



THE nature of scientific celebrity is such that Elizabeth Blackburn made more headlines for being sacked from the Bush administration's bioethics council than for discovering telomerase, for which she has been tipped for Nobel laurels. She rose to the top in a male-dominated world by adopting "protective coloration" and putting science first. This admiring biography documents her achievements and refusal to compromise her scientific integrity, but Brady has a tough task in bringing to life a woman who shuns self-promotion.

World lines Lawrence Krauss

It pays to push the boundaries

LAST month, the Pierre Auger Cosmic Ray Observatory reported the first data from its study of the highest-energy particles that bombard our planet. The results aren't earth-shattering – literally or metaphorically – but they open a new window on the universe, and on supermassive black holes in particular. Perhaps more importantly, they demonstrate what a combination of bold thinking and technological skill can accomplish.

Cosmic rays – energetic particles travelling through space – were discovered by accident in 1912 by Victor Hess, when he found that an electroscope discharged increasingly rapidly as he ascended in a hot-air balloon, demonstrating that the electric charge it measured was coming not from Earth but from the heavens. This led to the discovery of several new types of particles, including antimatter (positrons), pions and muons. On his Nobel-prizewinning discovery of pions in 1947, British physicist Cecil Powell commented: "It was as if, suddenly, we had broken into a walled orchard, where protected trees flourished and all kinds of exotic fruits had ripened in great profusion." I have rarely read a more eloquent description of the joy of scientific discovery.

As detectors were built to observe ever higher energies, more discoveries followed and the question arose: Is there a limit to the energy that can be imparted to elementary particles by astrophysical processes? By the early 1990s, cosmic ray particles had been detected at energies in excess of 10^{19} electron volts – over 10 million times as energetic as those in the most powerful accelerator on Earth.

The possibility of detecting anything more energetic seemed almost too remote to consider. Cosmic rays at 10^{20} electron volts would be hard to miss – they would pack a punch equivalent to the kinetic energy of a tennis ball travelling at 60 kilometres per hour – but they were estimated to be extremely rare, with an arrival rate of just 1 per square kilometre per century. It would take a detector spanning more than 1000 square kilometres to measure just 10 events in a year.

Even science fiction writers might think twice about the idea of turning a fair fraction of a country into a particle detector, yet that is precisely what the Auger collaboration has done, on the Pampa Amarilla plain in western Argentina. I still remember the day I first heard Jim Cronin of the University of Chicago talk about his dream of what would become Auger. It was 1992, at a meeting in Europe, as I recall. Cronin argued that if we really wanted to understand the physics of the universe at these exotic energies, we would have to build a detector that was up to the task.

I doubted it would happen. In particle physics you decide what questions you want to answer then propose whatever machine is necessary to do it, but it wasn't clear this approach would play in astrophysics. Quite apart from finding a location for such a huge experiment, physicists had to put together a collaboration from scratch that could build and fund it.

Yet 15 years and $50 million later, 280 physicists from 70 institutions in 17 countries have installed 1500 self-contained and isolated detectors, which monitor an area of 3000 square kilometres. What's more, the system works. The success has prompted plans for building a northern Auger observatory, which could cover 10,000 square kilometres.

Whenever we push the limits of what we can see in the universe we are likely to be surprised, so I am optimistic about Auger. But whatever results are to come, to me it will always be a reminder of the spirit of bold enterprise and international collaboration that reflects science at its best. ●

Columnists

New Scientist welcomes Lawrence Krauss and A. C. Grayling as regular columnists. Krauss is a physicist at Case Western Reserve University in Cleveland, Ohio; Grayling is a philosopher at Birkbeck, University of London. Each will give his own take on the latest twists and turns of science, in alternate issues from next week.