directly into the substantia nigra of patients with this disease might similarly halt their deterioration. Coupled with other novel therapies, such as treatment with deprenyl, the use of BDNF could be the first of a series of advances in the treatment of Parkinson's disease, in which little progress has been made since the introduction of L-dopa (L-dihydroxyphenylalanine) in the late 1960s. Indeed, Turski *et al.*¹⁰ showed that antagonists of the excitatory amino acid glutamate, which block the NMDA (N-methyl-D-aspartate) subtype of receptor, protect dopamine neurons in the substantia nigra against destruction by MPP⁺. How might these antagonists act? The toxicity of MPP⁺ for mitochondria in dopamine neurons can lead to an increase in the permeability of ion channels

associated with NMDA receptors, an effect blocked by NMDA antagonists. Conceivably, protection of dopamine neurons may be best provided by therapy with NMDA antagonists, currently being clinically tested for the treatment of stroke, along with deprenyl and BDNF. But regardless of their possible therapeutic applications, the newly discovered neurotrophic factors are already greatly extending the scope of developmental neurobiology. □

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OBITUARY

Lord Penney 1909–1991

WILLIAM Penney, the nuclear scientist, who died on 3 March aged 81, was one of the last of the great men who could truly claim to be a 'back of the envelope' scientist. He had a brilliant mind which reduced all problems to simple essentials. This meant that he could regularly produce a good answer by lucid thinking and simple estimates. Of course he accepted the need for computers and sophisticated calculations, but insisted that everything be understood in simple physical terms. In his business that was a rare gift.

Penney did not invent the concept of the atom bomb, but he led the work for the design, manufacture and testing of the British atom bomb during the late 1940s and early 1950s. Subsequently he designed the warhead for the British hydrogen bomb, and that design was based substantially on the superb physical intuition which Penney possessed. I have heard it said that when the first British hydrogen bomb was exploded, at Christmas Island in the Pacific Ocean in 1957, only Penney was really confident that the device would work. And the computers produced the complicated implosion calculations only after the device was proven.

At an early date Penney saw that nuclear weapons had such awesome destructive power that world wars had become impossible. He worried about nuclear proliferation and worked hard with Harold Macmillan, then the British prime minister, to abolish atmospheric tests. Characteristically, his later work on the detection of underground tests led him to develop the theory of pressure pulses propagating around the Earth's surface. But despite his great scientific abilities, his common sense and integrity enabled him to make a friend of almost everyone. At one time he was chairman of the Atomic Energy Authority and his minister was Frank Cousins,

the well-known trade unionist and anti-nuclear campaigner, with responsibilities, amongst other things, for the development of nuclear weapons. In effect, the minister for nuclear weapons was against them. Nevertheless, Cousins and Penney got on well together and both carried out the collective wishes of the cabinet. That speaks well of both men.

Eventually, in 1967, Penney returned to academic life as rector of Imperial College in London, where he was a great success. Perhaps the only sadness in his professional life was his questioning by the Australian Royal Commission investigating Britain's earlier nuclear test programme on the Monte Bello Islands and at Maralinga. The scientific content of those tests was Penney's responsibility. The administrative arrangements for the tests were the responsibility of the Australian army and civil authorities. Those arrangements, like some of the early tests in the American desert, were not carried out with the same meticulous concern about radiological protection which would be considered essential nowadays. I believe Penney would have given careful and conscientious advice on all these matters, and the fault, if fault there were, over breaches of safety standards lay with the implementation of that advice.

In retirement his brain remained as active and as clear as ever. He was a director of Standard Telephones and Cables and recognized the importance of glass fibre communications at a time when most of us thought that glass fibres were for thermal insulation. Bill Penney was a great scientist and a great man. Those of us who were privileged to have known him have lost a good friend.

Walter Marshall

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Walking on water

SURF-riding seems an ideal way of exploiting wave energy. Simply by 'sliding downhill' on the upslope of an advancing wave, a surfboard can travel effortlessly at wave velocity: even faster, if it runs at an angle. Unfortunately, it only works with the steep waves of a beach. In the open ocean, waves slope much more gently, and several different wave-systems usually combine into a general chopiness that would defeat the most experienced surfer.

But Daedalus recalls his recent invention of an ultimately slippery and non-wettable surface: graphite-fluoride flock. The close-packed fibres of this material reject water and entrap air so efficiently that it presents a practically gaseous surface to the water. A surfboard coated with it would have so little drag that it could slide down a water slope of only a few degrees. Daedalus's novel 'Seasurfer' sea-going platform is supported on a multiplicity of such frictionless surfboards. At any moment, a fraction of them ride on wave-faces which slope in the desired direction. By angling these boards correctly while retracting the others, the craft will surf along the chosen course. As the wave conditions change beneath it, the craft retracts, extends, and positions appropriately just those boards needed to keep it surfing in the right direction. It will appear to be skating or dancing delicately among the waves on innumerable flat feet.

The Seasurfer will interrogate the sea beneath it by means of a grid of microwave sensors. Its on-board computer will continuously work out the disposition of surfboards that will keep the craft going in the chosen direction. If the dominant wave-pattern happens to be going that way as well, its task will be very easy; if not, the craft will have to surf at an angle to the wave-fronts, or even progress by sliding down the back faces of retreating waves. A propeller driven by the craft's progress through the water will generate electricity for the computer and actuators. Even in a very confused and choppy sea there will always be plenty of wave-faces to exploit; but in a dead calm the craft will merely rest on all its boards extended as passive floats.

The first Seasurfer model will be promoted as a sort of sea-going sun-deck for the lazier end of the yachting market. But its ultimate maritime ecological niche is hard to predict. It doesn't have to be relatively long and thin like a normal ship, but can be expanded to any shape or size. It can travel forwards, backwards or sideways with equal ease, can operate in extremely shallow water and can be safely beached in an emergency. Separate Seasurfer platforms can combine into one big craft, which can split off subunits for separate voyages or shore-visits, or even divide completely in case of mutiny. David Jones