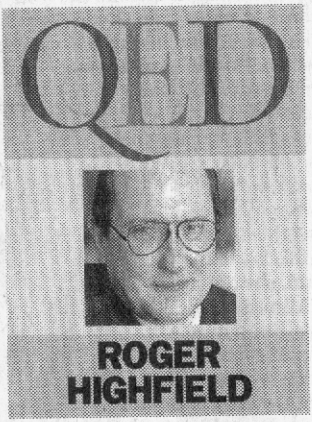
Will 'telekinesis' help people with brain damage?

Focus on an object, say a chair. Now visualise that chair gradually moving across the floor. Nothing happening? I am not surprised. The power of pure thought to move objects – telekinesis – has always been derided as occult nonsense.

Now, however, scientists are beginning to make telekinesis possible, a feat with profound implications for paralysed patients, a feat that may also be harnessed for a vast range of other uses, from enabling fighter pilots to control aircraft, despite huge G-forces, to helping children to immerse themselves more deeply into the virtual worlds of a computer game.

The advance has come from efforts to give more independence to people who have suffered stroke, spinal injuries, motor neuron disease and multiple sclerosis. In earlier research, scientists have interpreted brain waves to control simple programs, and robots have moved under the guidance of brain cells that dictate motion.

But no one has tapped "higher order" brain cells that are involved in planning and motivation. These are the signals that say "I want to pick up a glass" rather than the complex signals used to guide arm and hand muscles.



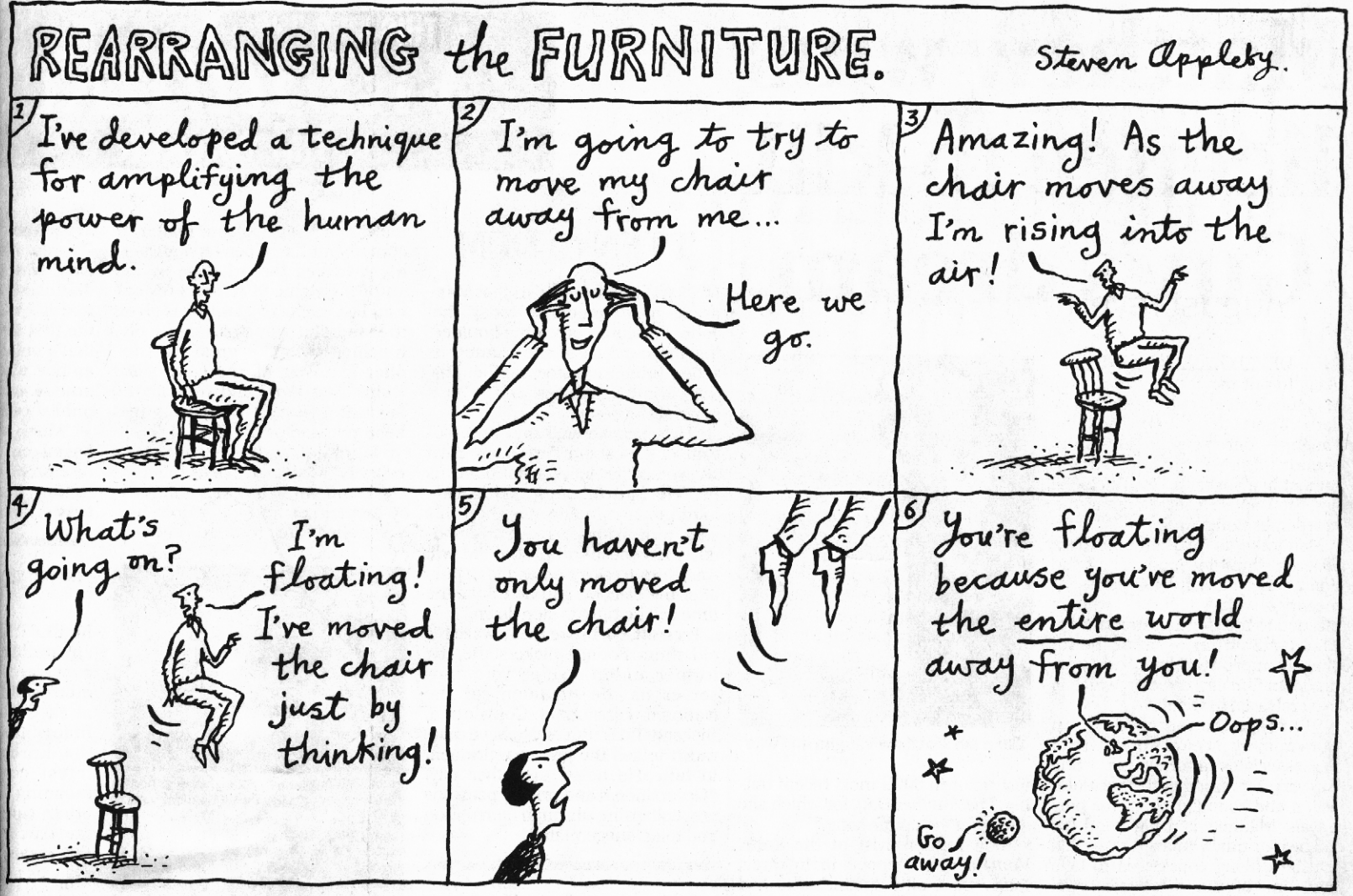
Now, however, a team in the California Institute of Technology has reported in the journal *Science* how it used arrays of electrodes to eavesdrop on the brain signals involved in planning – but not executing – future arm movements by a monkey, then used a computer to predict its intentions.

Prof Richard Andersen, working with Drs Sam Musallam, Brian Corneil, Bradley Greger and Hans Scherberger, took three monkeys and implanted electrodes in the posterior parietal cortex and the high-level premotor cortex, both involved in higher brain functions related to movement planning.

The monkeys were trained to operate a computer cursor by merely thinking about it, said Prof Andersen. "We have him think about positioning a cursor at a particular goal location on a computer screen, and then decode his thoughts. He thinks about reaching there, but doesn't actually reach, and if he thinks about it accurately, he's rewarded." Once they had found a way to mimic what happens in a paralysed person in these healthy monkeys, they honed the use of the monkey's brain signals to work out what the monkey wanted, and rewarded it accordingly.

Two thirds of the time, they could figure out goal signals. When the scientists changed the type or amount of juice given as a reward, to alleviate boredom, they could boost the success rate by up to 21 per cent.

Since this brain signal is high-level and abstract, it is much more versatile than picking up the crackles sent to individual muscles. Using goal signals the brain will permit paralysed patients to operate computers, robots, motorised wheelchairs



and, perhaps someday even cars, said Prof Andersen. Complementing this effort has come research to investigate what is going on in the minds of people who are paralysed after a serious brain injury to distinguish those who are mentally intact from those who are vegetative or comatose. The most famous examples of the former "locked-in syndrome" are the Frenchmen Jean-Dominique Bauby and Philippe Vigand, the authors of respectively *The Diving Bell and Butterfly* and *Only the Eyes Say Yes: A Love Story.* The latter wrote a book, aided by an eye-controlled PC, on the beaches of the Mauritius Isles. The syndrome is caused by damage in the brainstem, between brain and spinal cord, but is often misdiagnosed. "Locked-in victims can initially easily be mistaken for vegetative or comatose – the latter conditions being much more frequent," said Dr Steven Laureys. "For some unfortunate patients, nobody realises that they are mentally alert." At the University Hospitals of Liege and Brussels, a team led by Dr Laureys has studied severely brain injured patients with scanners to reveal how they respond to stimuli.

The scans showed no single brain with an obvious malfunction. Disturbingly, however, they found centres either side of the brain, called the amygdalae, are hyperactive. They are fearful and anxious, as one would expect of someone who is aware of everything but unable to show it. "It emphasises the locked-in victims' ability to feel emotions and pain," he said. "The medical community is not enough aware of the human drama these locked-ins go through." Scans will not replace examination by a doctor but will help to provide an objective way to help doctors and nurses to weigh up if they are making a patient more comfortable. And they can help to select the patients that could benefit from the kind of mind reading technology now under development in Dr Andersen's laboratory.

☐ *Robert Matthews is away*