Bionic Man

Tim Jacob

The Body Electric

by James Geary

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We increasingly expect extremes from the human body. We want to extend its capacities, cure its dysfunctions, endlessly repair the damage we do to it, keep it looking young and coax it into surviving for longer. And we have multiple technologies at hand to achieve these ends, ranging from genetic manipulation to physical and electronic enhancement. In his book *The Body Electric*, James Geary has compiled a fascinating synthesis of all the current efforts dedicated to repairing and/or enhancing our senses. Bringing all this research and development together in this way makes for rather scary reading. The assumption is that, given enough time and technology, there is nothing we should not attempt and, indeed, be able to accomplish. And, somewhere, somehow, the work is already under way.

What started in most cases as a desire to rectify some pathology, such as blindness, has given way to attempts to interface our sensory systems with external technology, thereby augmenting their capacity. So, while blind people are being given silicon chip implants that transmit electrical signals directly to the retina or the optic

nerve to enable them to 'see', the same technology is being used to project images directly onto the retina of healthy subjects in order to produce what is called an 'augmented vision display'. Low-power laser beams scan images onto the retina and these appear superimposed upon the normal outside world. The possible applications of this technology range from giving fighter pilots head-up displays of flight data, to being able to look into your mobile phone and have information or images projected into your eye. The overriding impression from the book is that more energy, effort and money are channelled into sensory augmentation than into restoration research, with the growth of computer games and virtual reality being major driving forces—although the military contribution, being mostly secret, is difficult to determine.

None of the senses are exempt from attention; while vision has attracted the lion's share, most progress is actually being made in the area of cochlear implants. Hearing, of a kind, can be restored. This is largely due to the amenable physiology of the system. The cochlea responds to different sound frequencies along its length, so-called 'tonotopic mapping', and, by implanting stimulating electrodes throughout this area, people are able to hear again.

The chemical senses—taste and smell—are lagging behind somewhat, due to a lack of understanding of their fundamental mechanisms. Although the cloning of the olfactory and taste receptor genes will give new insights into these senses, there is, at present, no way of artificially replacing or restoring them. Artificial noses are still very primitive devices that have come nowhere near the sensitivity of even that relatively poor performer, the human nose. In fact, the US Ministry of Defense was so dissatisfied with the state of research in artificial noses that it funded research into the possibility of training sniffer rats to hunt out explosives instead.

It is when we get to the sense of touch that things start to get a bit troubling. Rather than just strapping on an artificial

limb, engineers hope to create hybrid prosthetics in which silicon chips are melded with living tissue. Progress has been limited, but humans have been successfully linked to machines by implanting electrodes into their brains. They can then train themselves to produce voluntary changes in their slow cortical potentials, the electrical signals in the brain that precede cognition or action. A Thought Translation Device (TTD) then interprets the signals and transmits them to a computer or a mechanical limb. But thought power could be used to do all sorts of things besides restoring communication to immobilised sufferers of such diseases as multiple sclerosis. For example, it is being used to help fighter pilots control key flight systems simply by looking at or thinking about the appropriate icons on a computer screen. This is actually not a new idea: in his 1975 novel *Firefox*, Craig Thomas invented a Russian fighter plane with thought-controlled weapon systems. Connecting to the internet could take on an entirely new meaning in the future too: communicating with electronic worlds will be made possible by implanting silicon chips into ourselves.

Perversely, these developments are being paralleled by attempts to make machines more 'human'—to have and express feelings, for instance. Are we destined for a future in which man and machine converge? Neurons are already being grown on silicon chips, and hybrid brain-computer interfaces are being debated in academic circles. Indeed, the prospect of infallible memory would be welcomed by some, if not all.

At the end of the book, Geary quotes Norbert Wiener: 'Render unto man the things which are man's and unto the computer the things which are the computer's'. The problem, as Geary points out, is that it is becoming increasingly difficult to tell the difference.

Tim Jacob is at the School of Biosciences, Cardiff University, Cardiff, UK.

E-mail: jacob@cardiff.ac.uk

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