and experimental particle physics will reveal whether supersymmetry can bring us nearer to the ultimate laws of nature. ■

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The counting-house called to account

How to Build a Mind
by Igor Aleksander
Weidenfeld & Nicolson: 2000. 181 pp. £14.99

Steve Blinkhorn

Is the brain the organ of the mind? Aristotle thought it was there to cool the blood, a function it performs admirably in cold climates — witness the invention of the hat. But the common view, informed by 400 years of philosophy merging into 150 years of neurology, is that, as a settled matter of fact, the brain is the organ of the mind, with the only real puzzle being how the brain generates consciousness.

What a peculiar and uninformed position to arrive at. It suggests that people are, in a psychological sense, no more than brains on legs. The fact that adrenals, gonads and thyroid profoundly influence our conscious experience, and that sensation without sense organs is wildly discrepant and disruptive (as in the case of phantom limbs), are set aside in the hunt for the rational singularity of mind at the centre of experience.

Descartes started it, but then Locke got carried away with enthusiasm for the camera obscura, one of the original technological metaphors that supply psychologists with models when they have run out of ideas. Since then, we have been stuck with the idea that vision is the primary feedstock of consciousness, and that vision involves an internal observer making sense of what were once called 'sense data'. Anyone who has at some time lost proprioceptive and tactile sensory input over a significant part of their body knows what a loss it is, and what an important part of the sense of self it contributes. We are, as whole organisms, extended in space.

The science fiction notion of a disembodied brain floating in a nutrient solution, connected to artificial sensors by coiled cables (for some reason they are always coiled, even though the brain is immobile), is not futuristic, it is medieval. A serious examination of the functions that a disembodied immortal soul might be able to support suggests a limited range centred on incessant theological contemplation.

A disembodied brain would be little better off. Consider that, in the economy of a whole individual, the brain may be no more than the counting-house. Accountants, the inhabitants of counting-houses, often suffer from the illusion that it is their efforts, and not those of the production-workers, sales staff and designers, that sustain the life of the enterprise. To be sure, few businesses would survive long without an effective finance function, but on its own it is utterly worthless.

Igor Aleksander has made a career out of swimming against fashionable intellectual currents so far as the notion of consciousness is concerned. When artificial intelligence was in fashion (knowledge-based systems, inference engines, 'expert systems', and the like), he was building machines on a shoestring that had emergent properties, and publishing in unfashionable places.

He works on the principle that, to make a conscious machine, you have to make a machine that is complex enough to generate its own kind of consciousness. Its desires and needs will be determined by its physical nature, not a programmer's idea of what consciousness ought to be like. The critical point comes when a machine generates internal representations of the world that are, to use Aleksander's phrase, "egocentred": the machine represents itself to itself as a whole *vis-à-vis* a stable environment. You don't write a program to generate this style of representation: you build multiple, loosely coupled, asynchronously interacting subsystems that converge on it.

But it is appallingly difficult to capture these sorts of ideas in an accessible book and, although *How to Build a Mind* is stuffed with fine ideas, it is not a fine book. Part of the problem is the mix of methods and, in particular, the use of invented dialogues. Plato is to blame for the seductive appeal these have for authors (although, of course, he blamed Socrates); they got Galileo into awful trouble with the pope; and Aleksander isn't quite up to the literary style of Plato or the organizing genius of Galileo. Mostly, Aleksander's dialogues involve historical figures in philosophy, but they are historically unconvincing, and caricature, rather than expound, the distinctive viewpoints of their subjects. I don't know how to do it better, but it isn't done well here.

Aleksander has a point of view that stems from his discipline: engineers are people who make things that work. If he can make a machine that generates self-representations able to distinguish consistently between self and non-self, why should this not constitute a kind of consciousness? Picking up on George Kelly's dictum that "a person's psychological processes are channelised by the ways in which he anticipates events", a cat showing signs of embarrassment is surely to that extent conscious, and might not even a bee, however dimly, be representing to itself, somewhere in its 900,000 neurons, the flight path back from a food source?

Debates on mind, brain and consciousness can suffer from a lack of attention to proper definition. Your notion of consciousness may differ from mine mostly in terms of our contemplation of the opposite. There are many ways of being unconscious, from the comatose to the Freudian, and we lack good distinctive terms to delineate awareness of the world, awareness of self as persistent over time and space, and the ability to exercise critical self-examination.

The overwhelming tendency in the history of philosophy, and now in the blinkered search for the means by which consciousness is generated by the brain, has been to focus on the most abstruse levels of mental functioning, such as doing mathematics, playing chess, understanding complex abstract language. But none of us got where we are without a long period of evolving consciousness and special training in a period called 'childhood', and most people spend absolutely none of their time doing any of these things anyway. Aleksander's machines have barely had the opportunity to get over their birth pangs by comparison.

What lies in the future for them is hinted at in one of the more startling of the insights that pepper *How to Build a Mind*: "if there is no perception in any sensory channel, the inner networks can fall into 'attractors' ... If this occurs during sleep, it is called dreaming."

What price a computer that dreams, or better still, that is a lucid dreamer? ■

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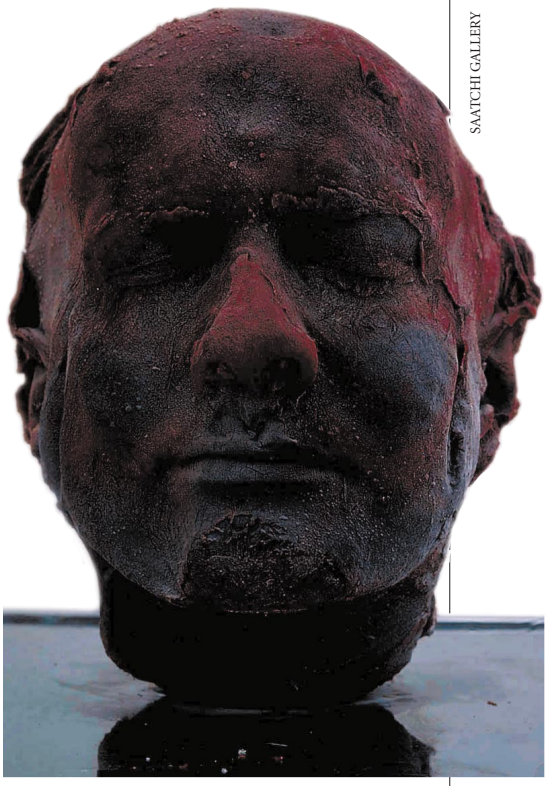

SAATCHI GALLERY

Sanguine contemplation: sculptor Marc Quinn's *Self*, cast in his own blood.