

Reductive megalomania

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WHILE watching Hollywood go through its annual exercise in narcissism recently, the circus more commonly known as the Academy Awards, I couldn't help thinking how much more entertaining a cinematic rendition of this volume would be than watching a bunch of rednecks torment a simpleton like Forrest Gump. All the components of a long-running blockbuster are here in abundance: an eternal storyline filled with tension and conflict; heroes and heroines valiantly arguing completely contradictory points of view, a mild-mannered director who keeps the story moving along but never intrudes, an almost mediaeval setting amidst the cloistered halls of academe and even a few good one-liners to leaven the sombre tone of much of the dialogue. How could it fail? Happily, it can't. This book is the outgrowth of a meeting held in Cambridge, England, in September 1992, at which 15 scholars from widely varying disciplines took up the question of the adequacy of scientific reductionism as a general strategy for attacking questions about the natural and human worlds. The end result is a collection of intellectual vignettes welded together into a drama that anyone interested in complex systems and the philosophy of science will want to read and savour.

The leitmotif of the stories told here is the age-old problem of reductionism: can we always understand a given system by decomposing it into simpler parts? A large part of the theatre in this book revolves about the fact that the question seems to be understood quite differently depending on who is telling the tale. Physicists, by and large, tend to see the question as asking whether all biological and mental events are ultimately reducible to the properties of matter and energy. Just about everyone else (this reviewer included) sees the problem of reductionism in more algorithmic terms, revolving about whether a given system can always be 'reduced' to basic 'atoms' whose properties can then be used to re-assemble the behaviour of the original system.

One of the good guys in the white hats in this drama is the mathematical physicist Roger Penrose, who argues eloquently for an anti-reductionistic view of both mathematics and mathematical physics. Addressing his well-known view that the brain — or at least the mind — can never be duplicated by a simple rule-following machine,

Penrose employs everything from the global topological properties of impossible figures to the nonlocality of quantum theory to buttress this claim. Further ammunition, at least for belief that mathematics is not reducible to a set of deductive rules, is provided by Gregory J. Chaitin, who demonstrates the existence of perfectly sensible mathematical propositions whose truth or falsity we will never be able to prove. As Chaitin has termed the situation, "sometimes things are true [or false] for just no reason whatsoever".

The ultimate reductionistic fantasy is undoubtedly the so-called 'theory of everything' (TOE) that physicists have for centuries been claiming is just around the corner. The cosmologist John Barrow out-



lines the reasons why such a theory may be necessary — but far from sufficient — for a description of the Universe and its contents, emphasizing the important point that we never observe a law of nature but only its consequences. Moreover, any law of nature, including a TOE, is simply a compression of what we can see. But Chaitin's work shows that it is impossible to know if any compression is really the best possible. So it would never be possible to know if any TOE really was what it claimed to be. Barrow also provides a bit of much-needed, although probably unplanned, comic relief when he states that "the greatest discovery of twentieth-century science is that the Universe is expanding". I wonder if there is anyone other than a cosmologist who could make such a remarkable claim with a straight face.

The leader of the gang of hardcore, dyed-in-the-wool reductionists in the black hats is the chemist P. W. Atkins, who, in a ten-page outburst that is simultaneously a paean to reductionistic science and a no-holds-barred frontal assault on all religions, tries to convince us that science is capable of answering every question about the world, the flesh and the devil that could ever arise in any enquiry. His method? Reductionism, what else? In the second most hilarious line of this saga, Atkins

describes his position thus: "Science has never encountered a barrier that it has not surmounted". He terms this the "omni-competence of science".

One of the volume's twin heroines is the philosopher Mary Midgley, who quite correctly captures the tone of this Atkinsesque-style of thinking in the title of her presentation, "Reductive Megalomania". Levelling her guns at the reductive approach as a general attitude, Midgley blasts the view that reduction is value-neutral; rather, she claims, it is always part of some positive propaganda campaign. Generally speaking, this propaganda is directed at showing how something (usually physics) is more 'fundamental' than something else (usually everything). She counters this brand of megalomania by asking the reader to try translating a factual sentence such as "George was allowed home from prison at last on Sunday" into the deeper truths of physics that the Atkinses of the world believe underlie it. Midgley's assertion is that for such a translation, all the social concepts such as 'Sunday', 'home', 'allowed' and 'prison' would have to vanish and be replaced by terms involving the interactions of groups of elementary particles (or, if you're a TOE man or woman, strings).

The other heroine of the piece is the philosopher and computer scientist Margaret Boden. She takes as her theme the brand of reductionism that sees humans as being 'reduced' to mere machines, first by the steam engines of the Industrial Revolution and more recently by the possible emergence of intelligent computing machines. In a passionately and cogently argued assessment of this view, Boden concludes that the spectre of artificial intelligence does not reduce our respect for human minds. Quite the contrary in fact: it increases our respect for human qualities and helps us to understand how the mind is at all possible.

A number of supporting players — Gerald Edelman, Hao Wang, Oliver Sacks, W. F. Clocksin and Paul and Patricia Churchland — make their appearance in this drama, somewhere between the alpha of a holistic Universe and the omega of strong reductionism à la Atkins. In one way or another, these players contribute not only to the all-star character of the cast but also to the overwhelming impression that reductionism as a sole-source supplier of scientific methodology is now all but buried in the avalanche of evidence pouring in from aardvarkology to zymurgology. As the wise old sage Freeman Dyson states in the introductory chapter, "Science is an art form and not a philosophical method". This book is one of the strongest testaments to that belief. Read and enjoy. □

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