

Troubled waters

FitzRoy: The Remarkable Story of Darwin's Captain and the Invention of the Weather Forecast
by John and Mary Gribbin
Review: 2003. 336 pp. £18.99

Evolution's Captain: The Tragic Fate of Robert FitzRoy, the Man who Sailed Charles Darwin Around the World
by Peter Nichols
Profile Books: 2003. 352 pp. £16.99
HarperCollins: 2003. 352 pp. \$24.95
Keith Thomson

Robert FitzRoy was one of the most gifted naval officers of his or any generation, a brilliant seaman, surveyor and commander of men, and a technical innovator who in different circumstances might have been a great scientist. Most of the characters who entered our lives through the voyage of the *Beagle*, which FitzRoy captained, went on to become part of a great Victorian success story. FitzRoy did not.

Aristocratic, handsome and wealthy, at times he could be carefree and capable of achieving anything he set his mind to. The few surviving letters between him and Charles Darwin from the voyage of the *Beagle* reveal an almost giddy schoolboy companionship that is hard to connect to his episodes of outrageous behaviour and anger (over slavery, for example). He was also a workaholic, dogged both by his own depressive mental illness and by the knowledge that others in his family had suffered the same way.

His life was full of tragedies, usually generated by his own mercurial temper, sudden black moods and constant brooding unhappiness, compounded by official resistance to his cutting corners and, in his paranoia, the effortless successes of others. After the exciting years on the *Beagle*, he never attained true greatness, whether as an officer (he never had another proper command), as a member of parliament (for two years), as a brave but unappreciated governor of New Zealand (he was recalled for siding with the Maoris), or as a meteorologist. When all of the pressures overcame him, he copied his uncle Lord Castlereagh, and cut his own throat with a razor.

Somewhere, it is to be hoped, there exist the letters and diaries that will show us a fuller version of the life of this strangely brilliant man, beyond the stereotypes — a different FitzRoy from the one who seems always to be in Darwin's shadow. At a critical time, FitzRoy must have known Darwin better than anyone else, but after a hundred or more years of the 'Darwin industry', we still do not know what, if anything, was FitzRoy's contribution to Darwin's



Looking ahead: Robert FitzRoy, the *Beagle's* captain, went on to invent weather forecasting.

intellectual development. For example, it is hard to guess how different Darwin's later career would have been if James Sullivan (mate on the *Beagle*, who was later knighted and made an admiral) had been captain. Nor do we know how the voyage with Darwin influenced FitzRoy's later career. We know only that they shared meals, not a philosophy.

The Gribbins guess that FitzRoy became a religious fundamentalist as a result of spending long, lonely hours studying the Bible during the later parts of the voyage. But all we know for sure about this is that Darwin was not an evolutionist until after the voyage, and that FitzRoy was not a fundamentalist until his marriage to the religious Mary Henrietta O'Brien in 1836.

To the only previous biography of FitzRoy (*FitzRoy of the Beagle* by H. E. L. Mellersh; Hart-Davis, 1968), John and Mary Gribbin have added information from the few new letters to come to light. Peter Nichols' book, which has too many irritating errors, diversions into side issues and purple passages, and an absence of either citations or index, is less useful. Both books devote too much space to rehashing the *Beagle* voyages — something that has been covered so much better elsewhere. It is in FitzRoy's life after the *Beagle* that his contributions to science and modern life are to be found. FitzRoy the unusually enlightened Victorian public servant, or the man who gave us synoptic weather charts and almost single-handedly invented weather forecasting, is at least as interesting as the one who, as Nichols dismissively puts it, "sailed Darwin around the world".

The Gribbins develop the idea that FitzRoy, who was probably always a manic-depressive and who unthinkingly gave more of himself and his fortune than was wise,

committed suicide in part from guilt at having helped the birth of the darwinism 'heresy'. If that's the case, we would need to have evidence of what FitzRoy thought his contribution had been. He was also depressed about the US Civil War and the situation of Matthew Maury, an exile in Paris who also had a claim to have invented weather forecasting. Almost bankrupt himself, FitzRoy still sent his rival money to live on. And the great 'machine' that supported and promoted Darwin — in this case principally in the form of Francis Galton — never hesitated to stick the knife in.

But there must have been much more to FitzRoy than that. As the Gribbins lament, however, when it comes to FitzRoy we know everything in terms of names, dates and places but very little about the man. FitzRoy was one of the most compelling figures of the darwinian era, but his fate has been to remain hidden. We want to know more and we fervently hope that it might include a little more triumph to go with the tragedy. ■

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The universal engineer

Discussion of the Method: Conducting the Engineer's Approach to Problem Solving
by Billy Vaughn Koen
Oxford University Press: 2003. 272 pp. \$60, £45

Julio M. Ottino

This book is about the universal method. "Philosophers have long sought the universal method... They failed to look for it in the most unlikely of places, in the engineering method," says Billy Vaughn Koen, in his book *Discussion of the Method*. An engineer solves problems using heuristics — anything (such as state-of-the-art science, present and past technology, or just plain experience) that provides a plausible aid or direction in the solution of a problem but is, in the final analysis, unjustified, incapable of being justified, and fallible. When faced with a situation that is complex and poorly understood, and with limited resources at your disposal, if you seek a solution that is the best available, then you too are an engineer. "To be human is to be an engineer," as Koen puts it.

In Koen's view, engineering is often confused with its products, be they antiquated irrigation channels, aqueducts, gears and bearings, or the more recent computers, chemical plants and aeroplanes. In this book he argues for a wider unifying view based

on methodology — an “engineering way of thinking”. This provocative book is full of ideas with heuristics as the centrepiece. Heuristics appear in many disciplines, from computer science and artificial intelligence to operations research, but rarely are they elevated to the exalted position they occupy in this book.

In the second part of the book, the author puts the case for expanding the engineering method into a ‘universal method’. The book touches on so many topics that it is hard to imagine philosophers, mathematicians, linguists, physicists and scientists of all stripes not having an opinion about it.

At the centre are heuristics as an incremental and sure-footed driver of change. According to Koen, “the engineering method is the strategy for causing the best change in a poorly understood situation within the available resources”. But clearly not all changes are equal, and some are certainly not sure-footed; some jumps seemingly come out of nowhere. Is this a claim of universality going too far? Is heuristics — from the Greek *heuriskein*, meaning to discover — a path to creation and invention as well? I’m not convinced, but Koen is unequivocal: all is heuristic.

Technology is about invention, making and building, which can be rather haphazard processes. The appearance of the video format VHS was not inevitable — we could have jumped straight to DVDs, or passed from Betamax to DVDs. The process is like playing with an ever-growing Lego set — some pieces are already there, and combinations of these lead to the creation of new pieces, which lead to yet more. There is no going back. But one can see how a growing heuristic may actually guide the process.

But can the processes of creation and discovery be viewed as a part of a heuristic? Immanuel Kant, stating his position on creation and its uniqueness, declared that science is ephemeral, and that art is permanent. The painting *Les Femmes d'Alger* would not exist without Picasso. Not everybody agrees. The art of writing, Jorge Luis Borges argued, is actually discovery, revealing what was already there. Likewise, science can be viewed as discovery, and hence as an inevitable process: Newton’s laws would have been revealed eventually, although possibly in a different form to that obtained by Newton. Parallel universes with the same physics and chemistry will have the same science, but may have different technologies.

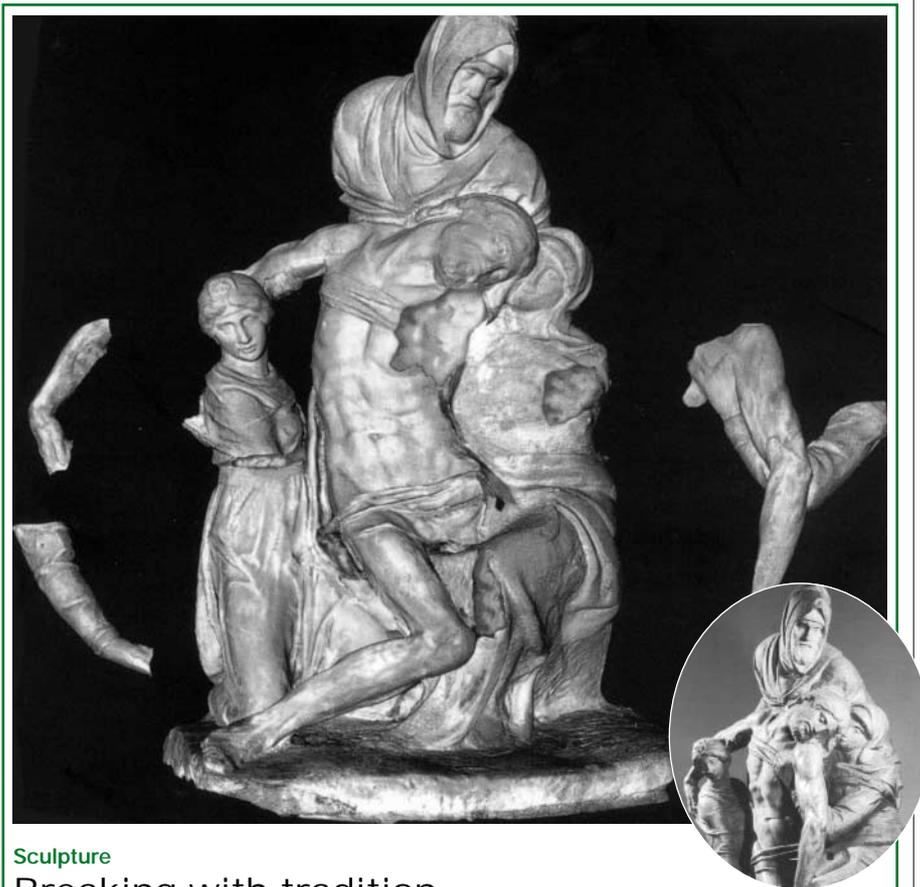
But there is no inevitability in art. The history of modern art appears to be driven by replacing and disavowing heuristics. If any heuristic exists, it is one of replacing heuristics. One cannot help but wonder whether Koen’s claim is simply too big. There are ways out: we are told that a heuristic may contradict other heuristics, and that use may depend on context. And even

though the author takes pains to indicate that science is part of the heuristics, some who read the book superficially will equate engineering with a much narrower definition of heuristics.

Even if one only partly agrees with the main conclusions of the book, many of the arguments are thought-provoking. Break-throughs can be seen as ‘break-withs’ the prevailing state-of-the-art. And the idea that a heuristic-based approach is much older than the scientific method is intriguing to say the least.

Is the method proposed in this book a good way to think about the crucial issues facing us today? One can think of many cases where one wishes that this mode of thinking had been followed. The first part of the book should be required reading in science and engineering departments. It has the potential to create a huge controversy — what it doesn’t deserve is indifference. ■

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Sculpture

Breaking with tradition

Michelangelo's sixteenth-century *Pietà* in the Museo dell'Opera del Duomo in Florence, Italy, incorporates a mystery as deep as its expressive beauty. Having worked for a decade on the carving he intended for his own tomb, Michelangelo apparently attacked his 2.5-metre sculpture in a fit of rage, hacking limbs from the four carved figures. These were later re-attached by his assistant, apart from Christ's left leg, which remains missing.

Why did he do it? Did he fear it fell short of perfection? Was he angered by a flaw emerging in the marble? Had he been afraid that his positioning of the left leg across the Virgin's lap was immodest?

In a collaborative project with art historian Jack Wasserman, scientists have used IBM's most sophisticated three-dimensional imaging

technologies to create a 'virtual *Pietà*'. This has enabled Wasserman to learn more about how the sculpture was physically carved and repaired. It has also allowed him to put forward his theory that Michelangelo was not intending to destroy his work in anger at all. By 'virtually dismembering' the re-attached limbs, and studying the carving from all angles, Wasserman concludes that the limbs had been detached selectively, and with care, perhaps to create a composition where Christ is being lowered from the Virgin's lap, rather than into it.

Wasserman's book *Michelangelo's Florence Pietà*, published by Princeton University Press (\$75), describes the extraordinary technical analysis of one of the most important artworks of post-Renaissance Italy. It also includes a CD of the virtual *Pietà*. **Alison Abbott**