technology must then involve social actions that challenge the social relations and cultures that produce technology.

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The Virgin and the Mousetrap: Essays in Search of the Soul of Science *by Chet Raymo*
(Viking, New York, 1991), pp. xix + 199, $US18.95, ISBN 0-670-83315-0.

What Happens when Science Goes Bad. The Corruption of Science and the Origin of AIDS A Study in Spontaneous Generation *by Louis Pascal with an Introduction by Brian Martin*
(University of Wollongong, Science and Technology Analysis Working Paper No. Technology Studies, University of Wollongong, PO BOX 1144, Wollongong NSW 2500.

The first of these two publications takes its name from one of the essays contained in the volume and which in turn is entitled after a fifteenth century Flemish triptych altar piece depicting the angel Gabriel announcing to the Virgin that she is to become the mother of Christ. The triptych is illustrated on the book's frontispiece (it is the only illustration in the book), and readers are directed to some of the details contained therein, including a supposedly "clever mechanical mousetrap" among tools and various accoutrements on Joseph's bench in a back room. Unfortunately the smallness of the reproduction makes it extremely difficult for the reader to identify this device (I couldn't even with a magnifying glass), so that the author's argument that in this painting the artist "captured the spirit of his time: mechanical, inventive, forward-looking, preoccupied with matter and force" is not easily endorsed. One can nevertheless subscribe to Raymo's main point in this essay, and that is that in the century following the painting of this altar piece, western science and technology "consolidated a new alliance that led to the Scientific and Industrial Revolutions, and to a new era of health and material well-being for a large part of humankind" (p.198).

Raymo, a professor of physics and astronomy at Stonehill College, Massachusetts, and a regular science writer on a wide range of topics in journals such as *The Boston Globe* (the Publisher's information page advises that 'some' of the essays are based on material in these articles, but the reader is not told which ones), wishes to counter what he sees as overly negative perceptions of science and technology. "Knowledge cannot be unknown and the gifts of technology are seldom refused, yet many of us are alienated from the scientific instruments of knowledge, frightened by the darker excesses of technology" *(ibid).* There is much good material in this book, and the author is genuinely seeking a balanced view of science and technology, and the benefits that these human activities can offer. And while Raymo's evident enthusiasm for scientific research shows through in most of the essays, he does have some hard things to say about the misuse of science and technology, and also about their very practice. Raymo quotes, with apparent cautious approval, the octogenarian

biochemist Erwin Chargaff's remark, "Scientific curiosity is not an unbounded good" (p.188), and he goes on to discuss Chargaff's views on the benefits which are supposed to flow from experimentation on human embryos — the correction of genetic defects, helping childless couples to have children, etc. With "lofty defiance", Raymo explains, Chargaff "dismisses the idea that the end might justify the means", and even more disturbingly, suggests that the proffered "justification" for embryonic research frequently masks the real motive — the self-serving interests of researchers.

Raymo will also no doubt irritate some life scientists with his view on experimentation with animals. "The animals rights movement and current practices of scientific research are on a collision course", he writes (p.97); and he proceeds to describe such outrages as cranium-bashing experiments with baboons at a head-injury research laboratory at the University of Pennsylvania which only became known after animal-rights activists broke into the lab and stole videotapes of the experiments. Contrary to this kind of episode, Raymo insists, scientists themselves should be among the first to nurture public awareness of the use and misuse of animals in research. Raymo also opts for caution on such controversial areas of science and technology as nuclear energy and genetic engineering. "Nothing more perfectly exemplifies our ambivalent relationship with technology than atomic energy" he argues, and he cites the well-known accidents of Three Mile Island and Chernobyl, and also such less publicised occurrences as leakages in waterway from American nuclear reactors, something which has been recently confirmed at, for example, the US Department of Energy's 38 year old K-Reactor on the Savannah River (from which some 50,000 downstream South Carolinians draw their water supply).[1]

The author of *The Virgin and the Mousetrap* confesses even greater unease concerning recombinant DNA technology: "Certainly genetic engineering is not the first breakthrough in science that harboured potential for danger as well as good . . . In many ways, the fruitful promise of genetic engineering is greater than that of radioactivity, but so is the potential danger. A gene reproduces. A gene copies itself into the fabric of life. Nuclear waste remains radioactive for thousands of years; a gene is potentially immortal" (p.187).

Raymo writes stylishly (though at times rather self-consciously so), and this makes for lively and entertaining reading. Readers seeking further information on some of the subjects he discusses, however, will be disappointed to find that the author provides no references other than occasional mentions of authors and titles (without dates) of articles in *Science*. One can't help noticing, too, occasional phraseology reminiscent of other writers, presumably unconsciously picked up by the author through evident wide reading. Scientists "wresting from philosophers and theologians the biggest questions of all" (p.133), for example, sounds very like the nineteenth-century physicist John Tyndall's declaration in his famous Belfast Address before the British Association for the Advancement of Science in 1874: "We claim, and we shall wrest from theology, the entire domain of cosmological theory".[2] There are also occasional assertions which don't stand up to scrutiny. Thus Raymo's claim that "plague vanished from Europe when people took note of causal connections (for example, the connection between rats and disease)" simply does not square with the facts: serious outbreaks of bubonic plague returned from time to time in the centuries following the Black Death, including at Marseilles in 1720, when some 50,000 people died, and the mode of transmission of the organism responsible — the

bacterium *Pastreurella pestis* — from rat to human via fleas was not worked out until 1905.[3] Raymo also claims that sleep deprivation experiments demonstrate that "humans show no serious impairments after a week of wakefulness" (p.54). On the contrary, such studies have clearly shown the subjects in these experiments have experienced irritability, inability to sustain attention, disorientation and even psychotic tendencies.[4]

Louis Pascal's *What Happens When Science Goes Bad,* to judge by its title, might appear to be offering a more negative view of science than Raymo's book. In fact, both authors are strong believers in science's *potential* for good, if only scientists would think beyond their own personal concerns. As Pascal puts it at one point (in his somewhat overstated manner): "What we have constructed is . . . a Yuppie society full of Yuppie scientists, pursuing not science, not public welfare, but their Yuppie careers" (p.26). But that the author does have a nobler vision of science seems clear from other quotes that can be taken from his essay, such as: "A science which ignores all evidence in order to believe what it prefers to believe is a science not worthy of the name" (p.25). Essentially Pascal's case is that not only did AIDS originate in a large-scale field-trial of Sabin live oral polio vaccine in the former Belgian Congo and Central African Territories (now Zaire, Rwanda and Burundi) in the late 1950s, but also that his efforts to publish this viewpoint have been subject to intellectual suppression. It is beyond the scope of this review to go into the details of the author's claims, but quite apart from the question of burden of proof (how much scientific theorising is "proven'?), Pascal's argument *viz.* "Each individual editor was faced with the physical fact of a manuscript making claims that were clearly matters of life-and-death urgency for vast numbers of people *if they were true* . . . On matters of such grave importance, one does not have a right to be mistaken" (p.22; author's emphasis) — is cogent, and deserves a hearing. Brian Martin of the University of Wollongong's Department of Science and Technology Studies, who has previously published in the area of intellectual suppression, is to be congratulated for bringing yet another purported case of this worrying phenomenon before the scientific community and the wider public.

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