

(relating to the circumstances under which wave functions are deemed to collapse), but it might very well resolve the apparent discrepancy between the time-reversibility of the laws of dynamics and the manifest irreversibility of the second law of thermodynamics and the subjective arrow of time. Central to the latter problem is Penrose's 'Weyl Curvature Hypothesis', which distinguishes sharply between initial and final singularities in cosmic space-time. As for the collapse of wave functions, he speculates that this happens whenever a "significant" amount of space-time curvature causes quantum superposition to fail. The latter is perhaps the most TENTATIVE suggestion in the book, and the author is duly cautious in advancing it.

Having journeyed to the ends of the Universe in search of possible enlightenment, Penrose wistfully bids farewell to big bangs and black holes, and resumes his reflections on the mind — or rather, on the brain as seen through the eyes of his Oxford colleagues in psychology and neurophysiology:

The picture of a superb computing device seems to be presented to us. The supporters of strong AI would hold that here we have a supreme example of an algorithmic computer . . .

Will our hero succumb to this persuasive image? Not he. There is an ace up his sleeve — "the phenomenon of consciousness". But the philosophical problems surrounding this concept prove so bewildering that Penrose abandons logical argument for rumination upon the nature of free will, the anthropic principle, creative inspiration and the sensing of necessary truths. There is just one cat he refrains from putting among the neuroscientific pigeons, namely the suggestion that the brain is actually a 'quantum computer' of the kind recently defined by David Deutsch. He raises this possibility, but concludes that the brain is too "hot" an object to preserve quantum coherence for any length of time.

The Emperor's New Mind might have been merely an attack on a particular group of philosophers or computer scientists, or on some of the wilder claims of the artificial intelligentsia. It might, with more profit, have examined in detail some of the honest hard work that has been done, by theoretical linguists and cognitive psychologists, in attempting to describe as accurately, as elegantly and in as much detail as possible how the human mind actually *does* work; Penrose must know that it is the details in which the soul of a work of art largely resides. As it is, his book is the testament of a brilliant man wrestling desperately — and unashamedly — with the deepest problems of metaphysics. He does not solve any of them, but his questions are greatly preferable to

most people's answers. His book aptly illustrates his own thesis that philosophically inexpert scientists may have at least as much to contribute to human thought as scientifically ignorant philosophers. □

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In the dock

Robert Temple

The Galileo Affair: A Documentary History. By Maurice A. Finocchiaro. *University of California Press: 1989. Pp.382. Hbk \$50, £31.25; pbk \$12.95, £8.*

Sidereus Nuncius or the Sidereal Messenger. By Galileo Galilei. Translated with introduction, conclusion and notes by Albert Van Helden. *University of Chicago Press: 1989. Pp.127. Hbk \$29.95, £19.25; pbk \$7.95, £6.25.*

THE trial and condemnation of Galileo by the Roman Catholic Inquisition in 1633 is the classic example of the triumph of mediocrity over genius, and the suppression of the truth in the interests of the Great Lie. The central issue was quite clear. In Galileo's own words, it was this: "who wants the human mind put to death?"

Much has been written about Galileo's trial. But it is only now that we can step ourselves in the atmosphere of the incident and read the very words of the main protagonists, often from their own secret correspondence or from private Inquisition papers. For the first time, all the relevant documents are made available in English in Maurice Finocchiaro's marvellous translation.

There is a pernicious trend amongst historians today which discourages the publication of original source material. Only tedious and opinionated 'discussion and analysis' by self-styled 'experts' is held to be interesting or worthwhile. The reason, of course, is that many historians want to set themselves up as the clergy who will mediate between historical truth and the public. So strong is this trend that some of those who have dared to publish original documents are ostracized and attacked in the way that Cranmer was savaged in the sixteenth century for daring to suggest that ordinary people should be allowed to read the Bible for themselves. Finocchiaro has braved fashion to enable us to step inside the Inquisition proceedings. For this we cannot be too grateful.

Reading through the actual documents for the 20-year period of 'the Galileo Affair', one is struck by the honesty and genius of Galileo and we can see clearly that he could not possibly have done other

than recant. The Medicis of Florence were so deeply in political jeopardy over their passionate support of him against the Pope that if he had been awkward, and made himself a martyr, it would have brought incalculable disaster upon his patrons.

As for the hypocritical and mindless attitude of the Catholic thought police, whose only interest was the relentless imposition of uniformity and destruction of any trace of independent thought, we have the Pope himself as an example. In his secret diplomatic correspondence, the Florentine Ambassador describes this encounter:

I humbly begged His Holiness to agree to give Galileo the opportunity to justify himself. Then His Holiness answered that in these matters of the Holy Office the procedure was simply to arrive at a censure and then call the defendant to recant. I replied: Does it thus not seem to Your Holiness that Galileo should know in advance the difficulties and the objections or the censures which are being raised against his work. . . ? He answered violently: I say to Your Lordship that the Holy Office does not do these things and does not proceed in this way. . . the Holy Office is not in the habit of hearing defenses. . . .

As we all know, the grey men won and Galileo's *Dialogue on the Two Chief World Systems* was not removed from the Catholic Index of Prohibited Books until 1835. Its principles of putting scientific truth over the words of Scripture was not accepted until 1893, and it was not until 1979 that the Church, in a speech by Pope John Paul II, acknowledged that it had erred in condemning Galileo.

For the proper appreciation of Galileo's genius there is no substitute for reading his *Sidereal Messenger*, a short work charged with the electric excitement of discovery. Published in 1610, it is essentially a scientific newsletter announcing fundamental astronomical discoveries that had been made by means of telescopes of unusually high power for the time. Among the revelations were that the Moon's surface is covered in mountains and valleys rather than being smooth, and the existence of the four principal satellites of Jupiter. The sense of euphoria and joy at discovering such things for the first time in mankind's history is fresh and tangible.

The work has never before been made available in its entirety in a continuous form, with full notes and comment. The introduction, translation and notes by Van Helden are a splendid example of the best scholarship and fullest accessibility. With this *Messenger* and Finocchiaro's magnificent book, we can now truly get to grips with the phenomenon of Galileo and what his life and work should mean to us today. □

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