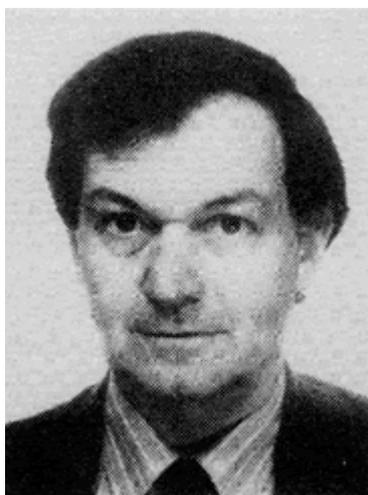


CENTREFOLD

Professor Roger Penrose



A world renowned theoretical physicist seems an unlikely person to be specializing in the study of the human brain and the nature of consciousness. But Oxford-based mathematics professor, Roger Penrose, who arrives in New Zealand in late March, believes there may be an essential link.

Penrose, aged 61, is visiting for five weeks as the 1993 Forder Lecturer. Author of the recent "The Emperor's New Mind", he is best known for the tilings bearing his name, and for his pioneering work with famous Cambridge colleague Stephen Hawking. In the words of Hawking, they have "showed that Einstein's general theory of relativity implied that the universe must have a beginning, and possibly, an end." More precisely, in 1965 Penrose established a mathematical theorem, which showed that when a large object collapses under its own gravity it must, according to Einstein's theory, necessarily end up containing a "singularity" or point of infinite space-time curvature. This has been a fundamental result of the theoretical study of black holes. Hawking's joint contribution with Penrose five years later removed some of the assumptions Penrose had made in his proof, and also showed that the original result could be turned on its head—any large expanding object, such as our universe, must have necessarily begun from a singularity—the "big bang". According to Hawking this result caused some initial resistance, especially from Russian scientists who perceived it as a threat to their Marxist belief in scientific determination.

More recently Penrose has turned from studying top level theoretical physics and the structure of crystals and tilings to the operations of the brain, and the nature of human consciousness. He is currently crusading against a prevailing philosophy which goes under the tag of "strong AI" (AI meaning "Artificial Intelligence"). This position, favoured by certain computer scientists and philosophers, holds that all human mental qualities—our awareness, thoughts, feelings and so on—arise simply from our brains executing very complicated algorithms ("software"), and has essentially nothing to do with the actual biological "hardware", the brain. This position has an interesting corollary; one could, in principle, programme these algorithms on a sufficiently powerful computer, and this

computer would then be truly "conscious", like we are, when operating. Advocates of strong AI believe that the Turing Test—a series of questions (by a person) and answers (by a "being") can be the only gauge of whether that "being" is conscious or not. Opponents, such as Penrose, counter with the "Chinese Room" experiment, originally proposed by John Searle.

But Penrose believes that there's more to it than that. "I believe that conscious minds are *not* algorithmic entities", he says. Penrose speculates that the true nature of human (and animal) consciousness may depend on linking the fine structure of the brain to recent and future discoveries at the fringes of modern physics, in particular quantum theory—the branch of physics which deals subatomic particles and interactions. "I hold also to the hope that it is through science and mathematics that some profound advances in the understanding of mind must eventually come to light," he says.

This controversial position has some support from neurologist Sir John C Eccles who recently also attempted to link quantum theory into brain functioning ("Evolution of consciousness," Proceedings of the National Academy of Sciences, USA, Vol. 89: p. 7320–7324, 1992).

For the last 20 years Penrose has been both Rouse Ball Professor of Mathematics at Oxford, and a Fellow of the (London) Royal Society, and has written dozens of papers, mostly on relativity and quantum theory. He has also authored or co-authored seven books, including, most recently, "The Emperor's New Mind", a 600-page whirlwind tour of physics and mathematics, and technical alternative to his colleague Stephen Hawking's bestseller "A brief history of time." Unlike the latter work, Penrose does not shy away from details, and consequently his book is littered with equations and formulae which must have given the publisher nightmares—one page is devoted entirely to writing out a certain number. Despite this, the book has sold well, though much less than Hawking's (whose sole equation is Einstein's famous $E = mc^2$). Penrose is currently writing a second book, tentatively titled "Shadows of the mind" which continues his analysis of the links between modern physics and the mind.

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