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Roger Penrose

The Large, the Small  
and the Human Mind



WITH ABNER SHIMONY, NANCY CARTWRIGHT  
AND STEPHEN HAWKING

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# The Large, The Small And The Human Mind

Roger Penrose

Roger Penrose's unique and provocative rules in regards to the physics of the Universe, quantum physics and the physics of the brain were the topic of controversy and discussion. They have been set forth in his best-selling books 'The Emperor's New Mind' and 'Shadow of the Mind'. During this book, he summarises and brings brand new his present pondering in those complicated areas. Abner Shimony, Nancy Cartwright and Stephen Hawking scrutinise those principles and current their very own distinct positions. Finally, Roger Penrose responds to their thought-provoking criticisms. This quantity offers an accessible, illuminating The Large, The Small And The Human Mind and stimulating advent to Roger Penrose's imaginative and prescient of theoretical physics for the twenty first Century. His enthusiasm, perception and reliable humour shine via this awesome account of the issues of contemporary physics.

Un pequeño pero denso libro. El autor hace primero un breve repaso de las dos teorías dominantes de los angeles física (la teoría cuántica -- lo pequeño -- y los angeles teoría de l. a. relatividad -- lo grande). En particular, habla sobre los angeles contradicción primary de no poder pasar satisfactoriamente de lo pequeño a lo grande debido a l. a. inexistencia de una teoría que englobe estos dos brazos de l. a. física. De manera más precisa, esta imposibilidad está ligada The Large, The Small And The Human Mind a los angeles necesidad de colapsar o reducir l. a. función de onda -- los angeles que describe los estados de un partícula -- al ser l. a. partícula observada. En otras palabras, cómo, al pasar de lo pequeño (la partícula) a lo grande (la observación), deba aplicarse ese "truco" de colapsar o reducir los angeles función de onda e interpretar los resultados posibles como probabilidades, cuando los angeles teoría cuántica, según The Large, The Small And The Human Mind explica Penrose, es una teoría determinista, no probabilista. Penrose menciona otros desafíos de l. a. teoría cuántica, como el enmarañamiento (entanglement) de las partículas, que hace que dos o más partículas estén relacionadas entre ellas de una manera muy anti-intuitiva, pero demostrable. Pero eso es sólo el aperitivo. Al hablar de l. a. mente humana, el nudo del libro, acude al teorema de Göedel para demostrar que l. a. comprensión matemática no es algo computacional. En otras palabras, que l. a. capacidad de l. a. mente humana para entender las matemáticas no puede ser replicado por un proceso calculable, por un algoritmo y por tanto no puede ser replicado por un computador. Esto no está ligado a los angeles insuficiente potencia de una computadora o a las limitaciones del software, sino que es una limitación intrínseca que hace que esta capacidad humana sea irreplicable, por construcción. En realidad, esta capacidad de comprender no computacional no tiene por qué limitarse a las matemáticas, sino que debiera aplicare a toda l. a. conciencia humana. Así, los angeles mente humana es no-computable y no podría ser replicada por un algoritmo. En paralelo, Penrose argumenta que l. a. gran unión teórica The Large, The Small And The Human Mind entre l. a. teoría cuántica y l. a. relatividad (la gravitación cuántica), podría de The Large, The Small And The Human Mind igual manera ser no-computable. Y, finalmente, uniendo las dos ideas, Penrose propone un posible mecanismo que explica por que los angeles mente humana es no-computable. En efecto, y esta es los angeles propuesta más atrevida del libro, Penrose propone que los angeles mente, The Large, The Small And The Human Mind l. a. conciencia, es el resultado de una función The Large, The

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Small And The Human Mind de onda, agregada a través de partículas enmarañadas (entangled) a todo los angeles ancho del cerebro, función de onda que se decrease a sí misma. Esta reducción de un enmarañamiento a gran escala es l. a. que generaría l. a. conciencia. Y al ser basada en un mecanismo gravitacional-cuántico no computable, sería también no-computable. Propone incluso una muy preliminar explicación biológica de cómo podría funcionar el enmarañamiento de las partículas a lo largo y ancho del cerebro, dentro los angeles crimson The Large, The Small And The Human Mind de microtúbulos que existen y cruzan a lo largo de las neuronas que conforman el cerebro. Esta parte es los angeles menos robusta del libro y suena, por The Large, The Small And The Human Mind el momento, mucho más a especulación. Algo que Penrose mismo admite por lo que propone esta notion como The Large, The Small And The Human Mind una time table de investigación futura, que a él le parece prometedora.

## **The Large The Small And The Human Mind**

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