THE FRONTIERS COLLECTION

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Jack A. Tuszynski (Ed.)

THE EMERGING PHYSICS OF CONSCIOUSNESS

With 135 Figures and 10 Tables

Springer

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The cover image shows a detail from 'Molecular Dynamics Simulation of Crack Propagation Visualization'. Courtesy of the Scientific Computing and Imaging Institute, University of Utah (www.sci.utah.edu).

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Preface

Consciousness, once a topic alluded to only by philosophers and, occasionally, theologians, has – in the past 20 years or so – migrated into the domain of science and rational analysis. But this does not mean to say that conscious experience is now understood in the way that we understand other phenomena once attributed to otherworldly causes – earthquakes or solar eclipses, for example. On the contrary, consciousness remains one of the major unsolved problems in science. But science and scientists are gradually becoming able and willing to tackle this phenomenon, to ask pertinent questions, and to use the newly available technology to carry out decisive experiments.

Some of the questions that are now being addressed, and which will feature in this volume are: How do the feelings and sensations making up conscious experience arise from the concerted actions of nerve cells and their associated synaptic and molecular processes? How do the operations of the conscious mind emerge out of the specific interactions involving billions of neurons? What physical mechanisms and brain processes lie behind particular conscious experiences? And how can this vital information be collected experimentally? Can conscious awareness really be explained by modern science, or is an entirely different kind of explanation needed after all?

This multi-authored book seeks answers to these questions within a range of physically based frameworks. Thus, the underlying assumption is that consciousness can indeed be understood using the intellectual potential of modern physics and other sciences. There are a number of theories of consciousness in existence, some based on classical physics, whilst others require the use of quantum concepts. The latter have drawn criticism from parts of the scientific establishment, while simultaneously claiming that classical approaches are doomed to failure. This book presents a spectrum of opinions, models and theories as well as some experimental evidence to elucidate the various approaches within this on-going scientific debate. It will enable readers to decide for themselves which hypotheses and which directions of study appear most promising.

We have solicited contributions from a number of eminent scientists in the field, some very original thinkers, several well-known science writers and free thinkers. In their attempts to identify and understand the roots of consciousness, the authors variously exploit experimental, theoretical and even

philosophical approaches. The volume begins with a general overview written jointly by Nancy Woolf and Jack Tuszynski. This includes, in Sect. 1.2, a detailed synopsis of the further contributions, together with a few words about the 'allegiances' of their authors in the ongoing debate.

We believe that this book will help to set the scene for future explorations in this field by new generations of scientists. At the least, it would be gratifying if this volume were to inspire many of its readers think about the concept of consciousness as a journey of scientific discovery. We hope the reader will enjoy these essays as much as the editorial team did.

Edmonton, Canada
March 2006 *Jack Tuzsynski*

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