

Foreword

We are delighted to present this volume which gives a state-of-art overview of neuromorphic memristor theory, its technical aspects, and practical implementations. The book discusses fundamental concepts of memristors and their relevance in various disciplines, including physics, neuroscience, computer science and engineering. It reviews computational models and simulations of memristors with special emphasis on neuromorphic designs. Hardware embodiments with memristive properties and applications are described as well, including nano-technology, intelligent systems, computer vision, large-scale optimization, and robotics. The materials presented here are based on the invited and contributed talks given at the Special Sessions on neuromorphic memristor technology at the IEEE/INNS IJCNN2011 Conference, as well as the workshop on “*Future Perspectives of Neuromorphic Memristor Science & Technology*” at IJCNN2011. The editors of this book are the organizers of these series of memristor-related activities in July/August 2011, in San Jose, CA, USA.

The intended audience of this book includes neuroscientists, computational scientists and engineers interested in learning about the rapidly developing field of memristor science and technology. The book is self-contained and provides a comprehensive description of memristor fundamentals, modeling, and potential applications. This will facilitate classroom adaptations and makes it suitable as a textbook in advanced graduate courses.

It is conceivable that the learning effects so eloquently displayed by memristors are in fact manifestations of memristive behavior in the neural tissue. In this case memristors indeed could be the *Holy Grail* of building brain like computers by exploiting the same mechanisms in computer memories as the ones brains employ. This possibility has enormous long-term consequences, which is difficult even to imagine from our present limited vantage point. We hope that this volume can illuminate some challenging aspects of memristors and give guidance to the road ahead.

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