

The background of the cover is a light cream color. It is decorated with numerous 3D molecular models, some of which are semi-transparent, showing internal structures. A prominent feature is a large, winding structure made of many small red spheres, resembling a DNA helix or a protein chain, which starts from the bottom left and curves towards the top right. Scattered throughout the space are various other molecular models, including some with green, blue, and purple spheres, and others with more complex, multi-colored arrangements.

NANOBRAIN

The Making of an Artificial Brain
from a Time Crystal

Anirban Bandyopadhyay



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CRC Press

Taylor & Francis Group
Boca Raton London New York

CRC Press is an imprint of the
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CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

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Printed on acid-free paper

International Standard Book Number-13: 978-1-439-87549-0 (Paperback)
978-1-138-30292-1 (Hardback)

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Library of Congress Cataloging-in-Publication Data

Names: Bandyopadhyay, Anirban, author.
Title: Nanobrain : the making of an artificial brain from a time crystal /
by Anirban Bandyopadhyay.
Description: Boca Raton : CRC Press, [2020] | Includes bibliographical
references and index.
Identifiers: LCCN 2019050401 (print) | LCCN 2019050402 (ebook) | ISBN
9781138302921 (hardback) | ISBN 9781439875490 (paperback) | ISBN
9780429107771 (ebook)
Subjects: LCSH: Artificial intelligence. | Nanotechnology. |
Geometrodynamics.
Classification: LCC Q335 .B338 2020 (print) | LCC Q335 (ebook) | DDC
006.3--dc23
LC record available at <https://lcn.loc.gov/2019050401>
LC ebook record available at <https://lcn.loc.gov/2019050402>

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Dedicated to my parents

Ajay Kr Bandyopadhyay (father)

Chhanda Bandyopadhyay (mother)



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Preface

In 2010, an editor at Taylor & Francis asked me to write a book about the human brain. A few days before my father died of a brain hemorrhage at around 1:30 a.m., he came. Standing beside my working table, he said, “Tukun, you must write the book sincerely, giving your knowledge about the brain—your prime love; it is the only route to surviving after your death.” I told him, it would not be a claim exceeding delivery, it would be a classic monograph on artificial brain. Today, after nine years, the mammoth job is finished; tons of manuscript drafts were simply discarded because I was not confident that I understood the human brain. Today, I believe I do, so *Nanobrain: The Making of an Artificial Brain from a Time Crystal* is finally going to see the light of day. This book is dedicated to my father, my friend, guide and teacher, he instructed me with all energy; and to my mother, who sacrificed often to make us smile.

The Western world believes the universe is dead; the Vedic philosophers believe that universe is alive. These two cultures dominate scientific practices. Vedic inquiry explores universe as life inside life inside life, making an infinite chain, called *Virata Purusha*. This book unfolds the ancient tribal concept of information processing (*Kalachakra*, the cycle of time) where instead of “bits” made of truth and falsehood, the concept is an infinite 11-dimensional architecture of clocks. Time crystal and universal chain of rhythms are discussed in the Upanishad as an unfolding of consciousness. Yet, since no one knows how to create a brain, we likely require a new model with accompanying new mechanics and new mathematics. Darwinism and Turingism are both built upon a rejection of choice, but what if no choice is ever rejected? Both schools of thought believe that events in the universe can be described linearly, but what if the universe builds events as geometric shape with dimensions? This book explores the universe of singularity, in which one makes a journey only through singularity, crafts a geometry of singularity, and builds a geometric algebra of dodecanions. The garden of meander flower was a lost concept in the research of time crystal in the 1990s: we rediscover it here. I hope that a new era of nonsense, illogic, and non-argument decision-making takes birth soon. Earlier, for a century, in Western thought, facts were paramount; now we prefer a geometry of confusion and split confusion, with the exploration ending in facts. I hope, though, that an era of nonsense, illogic, and non-argument decision-making takes birth soon. The marriage of geometry and primes helps to create that era with a new theory of everything.

This book avoids black box-based scientific practice and statistical biology as they fit output with functions that has no physical significance, extensively used in the study of the neural network and in several fields of artificial intelligence. The language of primes is conceived here as the language of the universe. Therefore, this book has cited rich breakthroughs, where biological observations are fitted with elementary physical laws. In addition, the majority of quantum biology works

like avian bird magnetic entanglement; a quantum route to auditory signals, quantum coherence in photosynthesis, and force quantum mechanics. *Nanobrain* is based upon the belief that the debate on quantum versus classical physics is irrelevant and a waste of time. The problem, then, is to find how a system runs by itself, using a new system of mechanics utilizing essential experimental evidence, not previously applied to the field of artificial intelligence. This book documents major experimental results aligned with the infinite journey to a singularity network. In that new network, algebraic equations do not work. Long back J. A. Wheeler understood the necessity of geometrodynamics and conceived it in 1920s. Richard Feynman explored it in 1962. By conceiving geometric shapes, complex physical phenomena could be interpreted without reliance upon equations. The followers of that geometrodynamic conception have been honored in this book, starting with Wheeler.

Vedic musical rhythms included the pattern of primes and fused primes and rhythms to the concept of “the breath of Brahma.” Even when a person sings Indian classical music, he or she explores geometric language, which is now used to advance Arthur Winfree’s idea of the “time crystal.” Fractality has been in almost every ancient tribal culture, including African, Mayan, Indian, Persian, and Arabic cultures. This book adds music to those tribal fractals, namely “Brahman,” the key vibration that was believed to organize the universe. This book simplifies philosophy, so as to challenge it, while describing hardcore experimental inventions. *Nanobrain* documents both experimental and theoretical research about a time crystal approach to artificial human brains, mostly reevaluated in the last 14 years (2005–2019) at the National Institute for Materials Science (NIMS), in Ibaraki, Japan. Associated research generated across the globe is documented. This book is written for students; only those concepts are used which could be tested using theoretical simulation and/or hardcore experimentation. This is one of the primary documentation of brain research where mysticism of quantum and deep learning have not been used as a tool to confuse true creativity. *Nanobrain* rejects the absolutist view that neuron firing is the primary catalyst for intelligence. It may be possible that major big brain-building projects will fail by 2024, as have molecular electronics, carbon nanotube technology, cold fusion, quantum computers, and high-temperature superconductivity: all find some unavoidable blocks. The era of magnetic vortex-like particles in an absolute insulating matrix is about to begin, where electronics or the engineering of moving electrons would not be required, with instead artificial atoms made of fields reigning. This book plants the idea.

We prepare the reader for the journey to when a machine will learn by itself, make decisions by itself, and then operate by itself. This class of decision-making machines could be named “invincible rhythm generators”—in Sanskrit, *Ajeya Chhandam*, nested frequency fractal or a fractal of time crystal (a “fractom”). The short version is written as *AjoChhand*,

which also means “Brahman (unit of consciousness).” Eternal vibration that has been propagating through the universe since the Golden Womb (*HiranyaGarva*) exploded, as elaborated in Vedic literature. Hypercomputing models, and an alternative proposal to the Turing machine, namely fractal machines, are discussed in detail in this book.

While visiting the meditation chamber of J. C. Bose, in Kolkata long ago, I could feel how Vedanta’s “communication with rhythm” inspired Bose: more of these communications are evident in the machines he designed, and we wish to trigger industrial and scientific revolution to extend Bose’s philosophy. The mathematics of clocks over multiple imaginary universes described in this book would add to the proponents of quantum mechanics. Schrödinger’s version of quantum mechanics could mathematically be incorporated into only one imaginary world. Here, a generic chain of imaginary worlds is limited to 12, because of complexity, but this would inspire others to explore further—a direction is set. Through a blend of biology, chemistry, computer science, mathematics, and physics, a science has been established purely to learn and understand nature as it is. *Nanobrain* is a humble submission to the legacy of the father of biophysics, J. C. Bose, and his notion of “biorhythmic communication,” as universal time crystal, advances Winfree’s conceptualization.

Many scientists have directly contributed to this book through essential research: Professors Tanusree Dutta, Daisuke Fujita, S. Daya Krishnanda, Ranjit Pati, Ferdinand Peper, Chi-Sang Poon, and Kanad Ray; postdoctoral researchers Dr. Subrata Ghosh, Dr. Jhimli Manna, Dr. Pathik Sahoo, and Dr. Satyajit Sahu, as well as students Lokesh Agrawal, Krishna Aswani, Greg Beams, Rishi Bhartiya, Djamel Eddine ChafaiNeha Chauhan, Rutuja Chhajed, Pelgrim Chharaud, Arnaud Degreeze, Mrinal Dutta, Batu Ghosh, Indrani Ghosh, Ami Ishiguro, Karthik KV, Cameron Keys, Suryakant Kumar, Aninda Pattanayak, Piyush Pranjal, Ashutosh Rana, Shruthi Reddy, Surabhi Singh, Dheeraj Sonker, Samanyu Tiwari, and Yu Yan; and doctoral students Komal Saxena and Pushpendra Singh (both of whose PhD theses are part of this book). I also acknowledge extensive discussions with Betsy Bigbee, Noam Chomsky, Deepak Chopra, Leon O. Chua, Stuart Hameroff, Sekhar Kapur, Roger Penrose, Jiri Pokorny, Dave Sonntag, Martin Timms and Jack Tuszynski. *Nanobrain* was extensively reviewed by Dr. Conrad Schneiker prior to his recent death from pancreatic cancer. Most art in this book, including the cover art, were created by Anirban Bandyopadhyay and Bhupender Singh from the International Institute of Invincible Rhythm (IIoIR, iioir.org).

Author

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Summary of the Chapters

Chapter 1 For the last century, three concepts dominated the information science and technology. First, whatever be the complexity of events, all could be melded and then rewritten linearly, executed in a sequence. What if the events in the universe are instead geometric, with dimension? One finds a topology of events. What if facts are biased and one has to find geometry of confusion to understand the true reality of nature? Second, why must electrons flow, collide, and reveal properties for making useful devices? What if we instead consider the ripples of field waves and build an architecture of clocks, or time, to express everything that happens? Third, the universe and the human brain each have their own language, and if we do not know the language, we can never understand how either works, so could never replicate them. The language of primes is fundamental, because it assumes nothing, but rather fuses events to predict the future. These three ideas are introduced in [Chapter 1](#).

Chapter 2 The universe has so many different forms of signals but we have no idea how they are connected to each other. Imagine that all signals are connected, and when we try to regard them in isolation, we misinterpret and misunderstand them. Can we build a protocol to map intricately connected signals of varying wide ranges of time scales in a singular architecture of time? Here we universalize time crystal and transform the abandoned concept of garden of meander flowers, which contributed to the quest of finding natural intelligence in living systems for 30 years (from 1970 to 2000). Once scientists used time crystal to explain how a virus-like life form runs by itself. Since a time crystal could operate in different forms that looks like meander flowers, the concept of a garden of meander flowers was used to explain how one simple system of time crystals could have so many expressions. Here, a journey is made from a single clock-based time crystal to a large number of clock-based systems, spanning over an 11-dimension universe. We redefine dimension as two parallel yet distinct ideas: one adding a new dynamic on a new axis and the other adding a new imaginary world into a host world.

Chapter 3 Every single interaction follows a language. A language is built to operate a computer, including the artificial language of algorithms. Does the universe have its own language? If one takes only the first 15 primes, 99.99% of all integers could be created. Why not use primes like letters of a language and build astrophysics as a comprehensive metric of all possible choices? One would input random events as choices, and that metric would link them, find the pattern, and thus understand how events unfold. Since primes are original to this universe and do not repeat, in an infinite series, events occur without any repetition of symmetries. A pattern of input events could change its architecture following the metric forever, continuing to predict the future. In [Chapter 3](#), several classes of these metrics are discussed.

Chapter 4 This chapter has two parts—a discussion of fractal mechanics and the presentation of a new kind of geometric algebra. As explained in [Chapters 2](#) and [3](#), one could write all laws and formulations of quantum mechanics using geometric shapes. While explaining basic quantum mechanics using universal time crystal, one would find—instead of one imaginary world—that there are 12, so one would see something more unique than conventional quantum mechanical events. This is fractal mechanics, from which classical and quantum mechanics derive. Then comes geometric algebra, whereby all basic and complex mathematics are done by taking a pen and drawing circles on a piece of paper to learn what is the projection from infinity that paves non-computable decision-making. However, creating manifold geometric shapes as conscious thoughts, when the universe is comprised of 12 imaginary worlds, is explored in this chapter using dodecanion algebra.

Chapter 5 The journey from a sequential worldview to a metric of primes worldview means changing our thoughts about the decisions human brain makes about nature significantly. This chapter is dedicated to discussing how a new world of decision-making would be born if we simply convert from an assumption of linear, side-by-side assembly of events to the metric of primes worldview. How the new technology would advance is described in [Chapter 5](#).

Chapter 6 Historic experimental evidence about proteins and their complexes, as organic analogs, led to the change in biophysics, neuroscience, and natural intelligence, which is discussed in this chapter. Starting from advanced quantum cellular automaton, advancing from a single molecular layer to the neural network it is shown that actual decision-making by a neuron happens deep inside it, in the microtubule strings. From molecular electronics to total organic synthesis, several systems were built replicating bio-systems to understand what the governing principle of a real human brain would be.

Chapter 7 Starting from the secondary structures of proteins and moving to the complete neural network model of a human brain-body system, even as many as 20 prime experiences of consciousness could be represented using time crystals. In the 1970s, only a virus was totally mapped with clocks; now, not just the biological rhythms of a human brain, but every single system deep down to the atomic scale are represented as an architecture of clocks or periodic signaling devices. [Chapter 7](#) attempts to describe how a complete clock-based architecture (similar to connectome, or complete gene mapping of human DNA) of a human brain could be built.

Chapter 8 The simplest device that can make decisions like a human brain would be a fourth circuit element—not memristor, but a very different class, we named it here, Hinductor, its short form is H. Using three concentric coaxial springs, a new device is conceived that builds magnetic vortex-like particles as a function of memorized charge that is immobile. The device generates time crystals, communicates wirelessly, and self-assembles

to emulate complex time crystal inputs. The physics of artificial atoms or molecules made of fields or vortices (knots of lights and darkness), a new Hamiltonian, and finally generic expression for the flux charge relation of H are described in [Chapter 8](#).

Chapter 9 The synthesis of a hybrid humanoid avatar is described in the chapter. The synthesis of a brain jelly that is primarily made of a new kind of fourth-circuit element, H , and mixture of several other organically synthesized components would perform mathematics in a chemical beaker. In the same chemical beaker, the metric of primes described in [Chapter 3](#) would unfold, as the physical structure grows into a new supramolecule, with a time crystal generated. Using such a jelly, 17 brain-morphic components were made to eventually self-assemble into a humanoid avatar.

Chapter 10 The idea to describe the way the universe defines and unfolds events as changing geometric shapes sheds lights on different paradoxes in scientific research. The philosophical perspective completes basic requirements of a scientific proposal when mathematically the metric of prime model is extrapolated to engineer powerful machines with greater consciousness than humans. We outline how multiple proposals made by various researchers on consciousness could be invalidated. If there exists a model for human-like conscious machines, then that model should lead to unconscious entities and series of machines with capabilities exceeding humanity's, mapping the higher conscious thought of all possible living systems. The incredible potential that could unfold in the future is discussed in [Chapter 10](#).