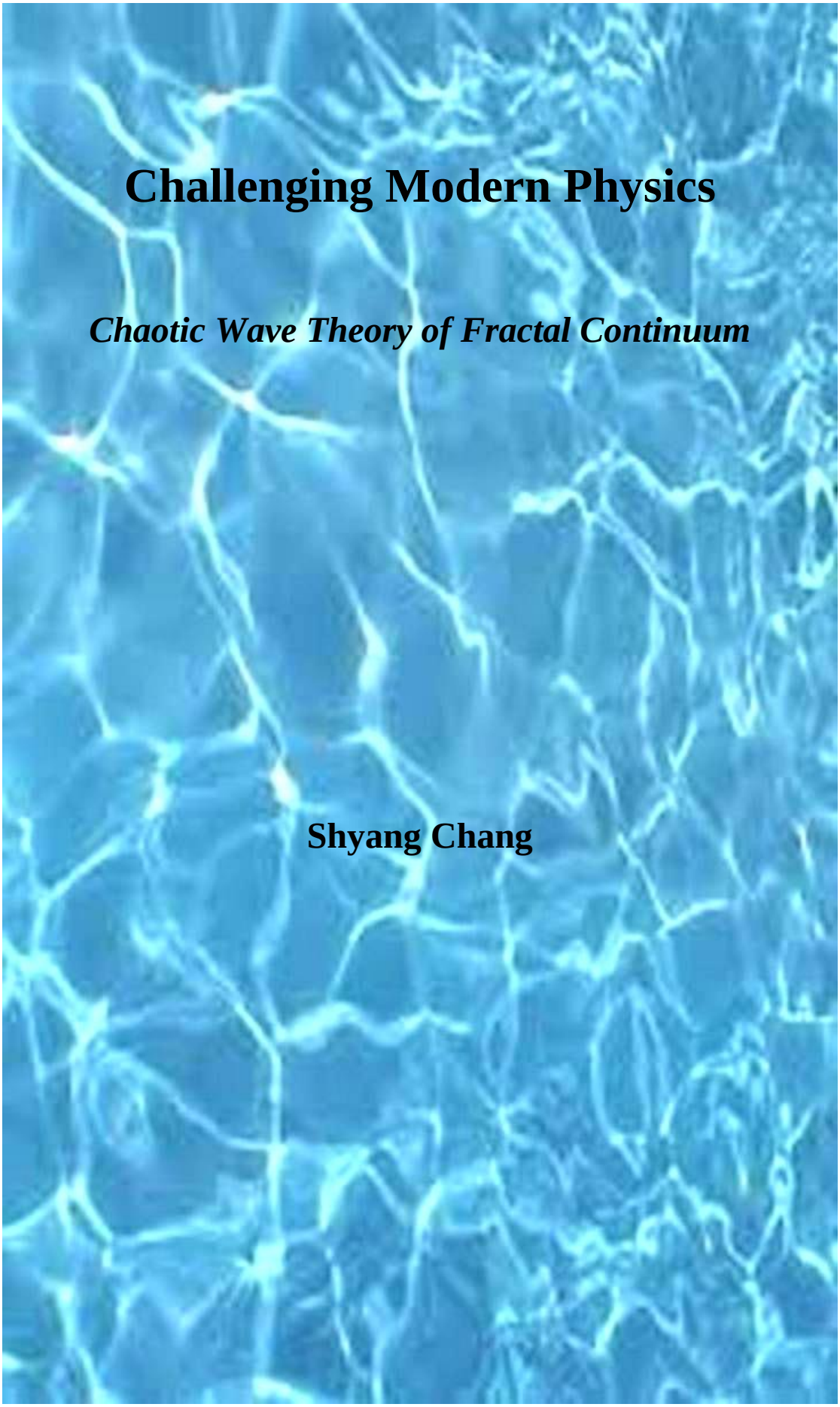

Challenging Modern Physics

Chaotic Wave Theory of Fractal Continuum

Shyang Chang

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To ancient Chinese sages for their insights

Bohr is in the habit of saying: the wave and corpuscular views are complementary. By this he means: if we prove the corpuscular character of an experiment, then it is impossible at the same time to prove its wave character, and conversely.

Max Born: Atomic Physics (1969)

PREACE

One of the most important hallmarks in modern physics is its reductionist thinking. This approach is trying to explain macroscopic properties in terms of microscopic components. Its main focus is on the discrete parts in isolation from the whole. Modern physics, for instance, is based on the so-called *atomic theory*. So far it has been ecumenical for more than one hundred years. However, the drawbacks of this approach become obvious when dealing with the many-body problems or complex interactions of dynamical systems. A more serious problem of such a bottom-up approach in real-life applications is that it has led to the creation of new forms of chemical matter that are not biodegradable and often have a damaging impact on the environment and humans. Needless to say, the mentality of the reductionism is that "the whole is nothing but the sum of its parts."

On the other hand, the traditional Chinese physical worldview is based on "the whole is greater than the sum of its parts". Joseph Needham once said that the Chinese physical worldview is *wave* instead of *atom*, and *continuum* instead of *discontinuity*. As a result, the interactions of matter and radiation in the Western modern sciences need *collision* of particles and the Chinese worldview is more of a *field* approach. In traditional Chinese medicine (TCM), for instance, medicinal herbs are treated as living organisms comprised of thousands of components that may differ between two plants due to the factors of location, weather, and soil. More importantly, the practitioners of TCM do not believe that any one extract or its chemical synthesis of the whole herb can be the *active* ingredient because the *emergent* curative properties have to come from the complex interactions among many of its components.

Joseph Needham, however, had also pointed out that "the conception of *wave* motion that it seems sometimes to have acted in an inhibitory way upon the advance of scientific knowledge". I would like to contend, on the contrary, in this book that emergent properties can only come from the complex interactions of *waves* instead of *atoms.* Hence, the Chinese physical worldview turns out to be much closer to reality than the modern Western view. Due to space limitation, this book will be dedicated to

challenging some of the basic tenets in modern physics. As to the challenges of the basic tenets and important problems in modern neurosciences and cardiology, they will be treated in a separated volume in the sequel.

After a brief introduction to the nature of physical theory and its relationship with culture and philosophy, this book is followed by nine more chapters. The main themes of these chapters are to falsify some of the most basic concepts in the *atomic* and *quantum* theories of modern physics. In the mean time, based on the wave concept of continuum and modern mathematical machinery, I will propose a *chaotic* wave theory of *fractal* continuum as an alternative theory in explaining my physical worldview. It is noteworthy that the two different viewpoints of particles and waves have competed for primacy since ancient time. It is therefore fitting and proper for me to reemphasize here that the *complementary principle* proposed by Niels Bohr was intended to resolve the duality of wave and particle. The original meaning of the principle is, however, often misunderstood and misused. I will invoke the quotation by Max Born in his Atomic Physics (p.101, 8th ed.) to elucidate the original idea of Bohr：

"Bohr is in the habit of saying: the wave and corpuscular views are complementary. By this he means: if we prove the corpuscular character of an experiment, then it is impossible at the same time to prove its wave character, and conversely."

It is well-known that the modern physics has tried to prove the corpuscular character in atomic theory of matter, quantum optics, as well as other disciplines. I will start out, first, with the introduction, problems and drawbacks of atomic theories of matter and electricity in Chapters 2, 3 and 4 and try to falsify them. Then, I will proceed to the problems and drawbacks of quantum theories of blackbody radiation and photo electricity in chapters 5 and 6. The other essential ideas and basic tenets in quantum mechanics, quantum optics and semiconductor physics will also be falsified in chapters 7. 8, and 9 as can be seen from the Table of Contents. The new paradigm of chaotic wave theory of *fractal continuum* that can properly address the aforementioned problems will be proposed and invoked in the last chapter 10. Mathematical tools are also included in the appendices of the book for reference.

Just to give a glimpse on why the proposed *chaotic wave theory of fractal continuum* is a better model for describing the universe is as follows. Nature has provided us with numerous examples of fractal structures ranging from our universe and galaxy down to tiny things at microscopic level. For instance, in a gallium arsenide device, research scientists were hoping to see actual single "electron" flow

patterns. Yet, what they have detected and observed is something like a plume of cloud, i.e., something of a continuum of fractal structure. Hence, from a scale of 10^{24} m to 10^{-8} m, the nature has presented itself as a fractal continuum. It is reasonable to extrapolate downward to even smaller scales like 10^{-10} m that the nature should possess the same statistically self-similar fractal structure rather than fundamental discrete atomic or subatomic particles without interior structure. My proposed theory will be a continuous transition in all scales, not like the modern physics that is discontinuous and abrupt in its description and cannot be self-consistent. Meanwhile, the fractal continuum can be visualized as the manifestation of the complex interactions of waves of infinitely many different frequencies with random amplitudes, i.e., the chaotic wave.

If the attempted unity of mathematical presentations of the physical worldview has produced a vivid picture on the wisdom of our ancient Chinese sages and revitalized the interests of the younger generation on our own traditional culture, the purpose of this book has been achieved. Finally, in a subject so broad, this book is almost impossible to be wholly free from error. The author will welcome criticisms or any comments.

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