The Future of Science, Technology, and the Cosmos

Introduction:
Reciprocity and Evolution

The Future of Science, Technology, and the Cosmos covers a set of related themes regarding the future of science, technology, the exploration of the cosmos, and the effects of all these developments on the future of nature and humanity. In the next five chapters, I examine in succession theoretical science, physical technology, information technology, biotechnology, ecology, and space exploration. I describe and evaluate different contemporary views and trends for each area.

The future has fascinated me since reading H. G. Wells' *The Time Machine* as a youth. Wells, along with other great science fiction writers, such as Jules Verne, Olaf Stapledon, and Arthur C. Clarke, first exposed me to the infinite scope and incredible possibilities of the future. Since my early years of reading science fiction, I have explored many perspectives on the possibilities of tomorrow, including religious, spiritual, and philosophical views of the future, scientific theories of time, evolution, and cosmology, and numerous futurist predictions of humanity, technology, and human society. I have also continued to read science fiction, one of the richest and most imaginative areas of thinking on the future.

Through my years of study, I have tried to make sense of the future. Even if the topic of the future is vast and limitless and embodies an irreducible dimension of uncertainty, I have worked toward creating a general conceptual framework for understanding the future. This conceptual framework or theory is distilled and synthesized from scientific, philosophical, literary, and spiritual ideas about the future and the nature of reality and time.

Two key ideas, reciprocity and evolution, have emerged in my thinking. These two ideas form the core of the theoretical framework for understanding the future developed in this book. Although the future is fundamentally an adventure, hence the title of this book, to some degree we can intelligently think about it and understand it, and also to some degree we can influence and guide its direction. Reciprocity and evolution provide an informed and constructive framework for making sense of the future and influencing its development. These two ideas explain the main currents of change within our world and the general possibilities of tomorrow. Reciprocity and evolution provide a sense of vision, value, and focus for the creation of the future.

It is one main hypothesis of this book that the history and future of humanity should be seen in an evolutionary context. Evolution provides a scientifically grounded, positive mindset for our future. It supports an attitude and set of values that give us realistic hope and optimism about tomorrow.

Based on my understanding of contemporary science and philosophy, evolution appears to be a fundamental and necessary dimension of reality and nature. Nature has shown a history of change, and there is a pattern to this change – evolution. Nature is not static – nature was not created in an instant. The evolutionary history of nature is well documented and corroborated across all levels of organization within the universe from cosmic, atomic, and molecular evolution to biological evolution and human history.

Further, although the connection between evolution and the human idea of progress can be debated, I believe that the history of evolution does reveal an overall progressive direction to nature and that includes the history of humankind. An evolutionary perspective on the universe supports an "uphill theory of time" for the whole cosmic process. The history of nature beginning with the "Big Bang" and continuing through the formation of atoms, stars, galaxies, complex molecules, planetary ecosystems, life, and human societies exhibits over time increasing complexity, individuation, integration, and intelligence. There is progress in evolution. Understanding this evolutionary direction within nature is essential to understanding human progress. Human progress is embedded within evolutionary progress and an expression of it.

At the onset I should also point out that evolution shows both cumulative growth and creative novelty. Although nature builds upon itself, nature is also creative. The same process of cumulative growth and creativity also applies to human history. Hence the future, to some degree, transcends the past, and in fact, that is why there is a future. Evolution helps us to understand why there is a future.

Finally, I should emphasize at the beginning that we are participants in the evolutionary process of nature – we are evolutionary beings with an evolutionary history in an evolutionary and creative universe. Our future – a future of change, progression, novelty, and transcendence – will reflect (and even contribute to) this general evolutionary pattern of nature.

There are numerous contemporary debates surrounding the idea of evolution. First off, evolution is quite correctly associated with a scientific perspective on reality, and a significant segment of religious thinkers and the general population find the idea of evolution and more generally science as antithetical to the ideas (and ideals) of religion and God. Evolution and God's design, in fact, seem to be the two most popular general theories of the future. As I will argue this presumed dichotomy of science and evolution versus religion and God is both incorrect and destructive to the human spirit, preventing the emergence of a truly comprehensive and integrative vision for the future.

Secondly, the evolutionary perspective is often associated with the Western view of progress, and consequently seen as an ethnocentric vision of reality and the future. Though the theory of evolution, and for that matter modern science, may have first emerged in the West, evolution and science are not simply espoused by Westerners. Science and its principles, practices, and ideals are a global reality; science is a universal language and mental perspective that people around the world share. In fact, science strives to overcome bias and ethnocentric influences in its thinking through self-

criticism, an emphasis on evidence and experimentation, openness of inquiry, and a host of other self-corrective methods and ideas. Based on such principles of investigation and thinking, one of the central ideas to emerge in contemporary science is evolution. Additionally, although the Western concept of human progress has been criticized from various points of view and has its limitations and problems, it is essential to our future that we articulate a viable and comprehensive theory of progress – a more expansive, intercultural, and scientifically grounded vision of progress.

Thirdly, there is significant debate among evolutionary scientists regarding the exact nature of evolution – its causes, mechanisms, and patterns – but in fact, a much deeper and broader notion of evolution is emerging out of these debates. The theory of evolution is evolving and becoming an even more significant idea in science. The evolutionary view developed in this book reflects these newer ideas.

Especially within the last century, our basic scientific mode of thinking about nature, human society, and the human mind has changed dramatically – science has evolved. Aside from the emergence of a more dynamic perspective on nature where increasingly everything is seen as fluid and changing (which includes the idea of evolution), nature appears to be a much more interdependent and interconnected network than previously believed. We cannot understand the world and our future as a set of distinct and separate entities. I propose that the principle of reciprocity captures this new philosophy and science of interconnectedness, providing a new way to understand both reality and our involvement in the creation of the future. Within this book I demonstrate how reciprocity is a central idea within modern scientific theories of open systems, order and chaos, quantum physics, biology, ecology, and the evolution of history and time.

The idea of reciprocity means distinct yet mutually interdependent realities. From the perspective of reciprocity, nature consists of a set of systems and realities that are distinct yet mutually supportive. The elements of nature support each other and feed off of each other. Reciprocity means a logic and ontology of complementarity, in contrast to the dualistic logic and ontology that has dominated Western thought for perhaps thousands of years. Instead of describing reality in terms of distinct dualities, such as mind and matter, the whole versus the parts, or humankind versus machines, each of these fundamental contrasts can be understood as interdependent and interactive.

Interestingly, the ancient Eastern symbol of the Taoist Yin -Yang captures the modern meaning of reciprocity very well. In essence, the symbol integrates the cosmic dimensions of unity and difference. Within Taoist philosophy, Yin is the feminine principle of reality whereas Yang is the masculine principle. In general, Yin and Yang refer to the basic polarities of existence, such as light and darkness, active and passive, etc., but these two principles are mirror images of each other and are united in their complementarity and balance with each other.

One main thesis of this book is that Western thinking is moving toward a philosophy of reciprocity. In fact, this change in thinking is producing a philosophical and social clash across many areas of human life. One significant theme or issue in the battle for the

future is the contemporary conflict between dualistic and reciprocal views of human reality. Reciprocity will help us to understand the relationship between technology and humanity, humanity and nature, and life, intelligence, and the cosmos.

One unique feature of the theory of the future in this book is that I demonstrate how the ideas of reciprocity and evolution are intimately connected. Evolution, growth, and change follow the pattern of reciprocity. Evolution shows new creation through destruction and order emerging out of chaos. Evolution involves a dynamic interplay of competition and cooperation, and of the whole and the parts. Within biology, life and death, and evolution and extinction are intimately tied together.

Based on the ideas of evolution and reciprocity, the theory of the future I develop within this book consists of the following three hypotheses:

- Evolution and reciprocity describe fundamental features of reality, nature, and humanity. These ideas contrast with dualistic and static views that have dominated much of human thinking and behavior in recorded history.
- Evolution and reciprocity describe certain general parameters on how the future will develop. These two ideas help us to understand both history and time.
- Evolution and reciprocity can provide an informed, holistic, and realistically optimistic way to approach, guide, and create the future.