

To the Reader

When my agent, John Brockman, first saw the manuscript for this book in December 1990, he exclaimed: “Oh, what a chaotic manuscript!”

Indeed, this is not a normal narrative book. If it were, it would run to many volumes, like Toynbee’s or Voegelin’s. I do not have time to write them, and you would not have time to read them. Instead, I have tried to compact a large amount of historical information in such a way that my view of the data is communicated to you by a kind of resonance, like poetry. By means of a chaotic collage of ideas, data, graphics, rhyming sentence fragments, and telepathic communion, I hope to evoke a *metapattern* of history. Furthermore, a book on the Orphic trinity *should* be chaotic, Gaianic, and erotic!

This book collects evidence for a theory. Rather than expand this collage of information into a

pretense of normal narrative, for you to recondense in your own mind, I have kept it in condensed form. The information is not in linear (one-dimensional) order. Its natural order is multidimensional: one-dimensional time, two-dimensional space, plus many-dimensional ideas. Thus the same theme may be traced through time, over space, or through an evolution of ideas or myths. Wittgenstein wrote in the Preface to his *Philosophical Investigations*, “The very nature of the investigation . . . compels us to travel over a wide field of thought criss-cross in every direction. Thus this book is really only an album.”

This project has provided me with many wonderful hours in the library. Its best function may be to lead you to some good books. I have included a large number of pointers to the literature. If you

want to pursue a topic, endnote numbers in the text lead to the Notes section at the back of the book, which refers to books listed in the Bibliography, which leads in turn to your local library or bookstore.

The library has its dark side also. While some of the newer books contain awareness of the urgent issues of bias (of gender, race, and so on) emerging at present, older ones naturally do not. It is impossible to revise all of the older material according to this new awareness. As I have relied heavily on the library for the substance of this book, it contains unwanted biases I am unable to dispel.

Introduction

The Orphic Revival

Since 1960, I've been working in the area of dynamical systems theory, a classical branch of mathematics created by Isaac Newton in the seventeenth century. In the midst of the cultural upheavals of the 1960s, great inroads were made in the field of dynamical systems, due in part to the computer revolution. Dynamical systems theory deals with moving systems, such as the solar system, and the patterns they trace in space and time. Newton discovered mathematical laws that such systems obey, and constructed mathematical models that are abstract analogues of their space-time patterns. His discovery has been credited as one of the greatest intellectual contributions ever made by a single person.

About a century ago, dynamical systems theory was revolutionized by Henri Poincaré, the great French mathematician, when he discovered models for highly complex motions (which later came to be called *strange attractors*).¹ By the late 1960s, numerous examples of strange attractors had been discovered in computer simulations.

In 1972 I traveled to the Institut des Hautes Ludes Scientifiques, in France, to visit with René Thom. In his book on *morphogenesis*, the study of pattern formation, Thom introduced a new language for the application of dynamical systems theory, which included the terms *attractor*, *basin of attraction*, and *catastrophe*. I was interested in pursuing these ideas with him, but when I arrived, Thom was onto something new. He showed me a book of photographs by Hans Jenny, an amateur scientist from Basel. The photographs showed forms created by sound vibrations in sand, powder, and

water. They were suggestive of galaxies, plants, brain waves, memories, hallucinations, and abstract works of art. A theory of morphogenesis, in which the mysteries of creation were seemingly revealed, was projected wordlessly by the book. My mind reeled with new possibilities for the application of dynamical systems theory to nature and society.

That summer I went to India on holiday and soon found myself living in a cave in the jungle of the Himalayas, a mile above sea level. The cave had been inhabited for centuries by jungle yogis, and in it I experienced a number of illuminations on the concepts of vibration in Hindu philosophy, and on harmony and resonance concepts in mathematics, music, and mysticism.

When I returned to California in 1974, I began a program of research and teaching on vibrations, chaos, computation, and computer graphics, delving

One of the main goals of this book is to introduce the concept of dynamical historiography, the application of the mathematical theory of dynamical systems, chaos, and bifurcations to the patterns of history. It is hoped that from the future development of this mode of inquiry we may evolve a better understanding of ourselves and our evolutionary challenges.

deeply into the histories of these subjects, going ever backward—to the Baroque, to the Renaissance, to ancient Greece, and beyond. Soon after my return, I found other people who shared these interests, including Terence McKenna and the late Erich Jantsch. Erich was a missionary of *general evolution theory*, a whole systems theory evolving from the work of a number of twentieth-century scientists interested in conceptualizing a science of the all-and-everything. The theory offered a strategy by which to understand the structure of history through the kind of mathematical model introduced by René Thom. Here, my Himalayan cave illuminations could be abstracted and applied to society, to the history of consciousness (and unconsciousness), and therefore to the future.

I've spent the last twenty years exploring a broad range of applications for these concepts, on which this book is a meditation. It offers a conceptual model for history, constructed from the mathematical tools conceived by René Thom and applied in the style of Erich Jantsch. Such a model may be crucial for understanding our history and as an aid in creating our future.

The Chaos Revolution, Gaia Hypothesis, and Erodynamics

During the 1970s paradigm shifts within the sciences began to emerge into public view. Around 1973 new dynamical models were applied to turbulent fluid motions (for example, boiling water² and a dripping faucet³), but it was not until 1975 that these models were connected with the word *chaos*.⁴ The terms *strange attractor* and *dynamical systems theory* were replaced by *chaotic attractor* and *chaos theory*. The new theory swept through the sciences in a wave of renewal. The Chaos Revolution was underway.

Journalists began calling me to ask: “What is chaos theory? Does it have anything to do with chaos in ordinary life? What is the theory good for? Why are scientists so excited about it?”

These questions, which I could not easily answer, drove me deeply into the literature of myths and cultural history. I found that the word *Chaos* first appeared in a book called *Theogony*, by Hesiod, one of the early Greek poets. His poem is a creation myth telling stories of the origins of the gods. Here the word *chaos* does not

mean disorder. Instead, it represents an abstract cosmic principle referring to the source of all creation. It also appears in connection with the two other fundamental concepts: *Gaia* (the created universe) and *Eros* (the creative impulse).

I was amazed to realize that this same trinity, which preceded the creation of the gods and goddesses of the usual pantheon of early Greek paganism (also called *Orphism*), is also associated with three revolutionary movements underway in the sciences:

- The Chaos Revolution was named in 1975 for a new branch of mathematics that provides models for many intrinsically irregular natural processes.
- The Gaia Hypothesis, named in 1973, proposes a self-regulation capability of the complex system composed of earth, ocean, atmosphere, and the living ecosystems of our planet. According to Gaia theory, which views Earth as a living system, the biosphere acts to create and maintain favorable conditions for life.
- Erodynamics, named in 1989, applies dynamical systems theory to human social phenomena.

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What strange synchronicity, I wondered, led to three different recent innovations in the sciences, in apparently independent developments, sharing a common mathematical basis, bearing names (Chaos, Gaia, Eros) that are associated in Hesiod's trinity almost three thousand years ago?

An Orphic Theory: Three Conjectures

One discovery led to another. As my trail traversed the boundaries of many disciplines, a picture or metapattern gradually emerged. I saw the residue of suppressed themes of great antiquity emerging from the collective unconscious and forcing their way into science, the dominant religion of modern times. I call it an Orphic theory, with three conjectures.

Conjecture 1: Three Phases

The meanderings of human history and prehistory during these past 25, 000 years reveal a persistent pattern of cyclic recurrence in three phases, associated with the three root concepts of the Orphic trinity (Chaos, Gaia, and Eros). This pattern is recognizable today in the context of the new mathematics of space-time patterns called chaos theory.

The importance of this conjecture, if true, is that it enables us to better understand our own place in time and in the natural dynamics of history. With this enhanced understanding of our past and our future, we may better face our evolutionary challenges.

Conjecture 2: The Orphic Tradition

The three concepts of the Orphic trinity (Chaos, Gaia, and Eros) belong to a continuous tradition flowing from the Paleolithic past to the present. Occasionally, one or more has been suppressed, only to surface again. The meanings of these three abstract concepts (and the names, images, genders, and other aspects of their cultural representations) have undergone gradual, and occasionally sudden, changes over the past 25,000 years.

I call this irrepressible theme in our cultural history the *Orphic tradition*, or the *long line of Orphism*. Although the word *Orphism* usually refers to the male-centered religion of ancient Crete, Mycenae, and Greece founded by Orpheus, it has its origins in the worship of a Divine Mother and her Divine Son or Lover. What I call the *Orphic revival* is the spontaneous upwelling of this old current after

its long cultural repression.

The characteristic features of this tradition are the trinity:

- Chaos, the creative void, source of all form
- Gaia, the physical existence and living spirit of the created world
- Eros, the spiritual medium connecting Chaos and Gaia; the creative impulse

Some secondary characteristics of this tradition include:

- a regard for all life as sacred (sometimes manifest as vegetarianism)
- a high priority for peace and security
- the avoidance of violence
- rituals and myths focused on love
- sexual laxity
- a special regard for music and math

The importance of this conjecture, if true, is that it allows us to utilize the upwelling force of this cultural current to help us create a future society that is peaceful, maintainable, and beautiful—in fact, an Orphic utopia. I believe this kind of utopian vision is a

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fundamental human activity essential for our evolution.

Conjecture 3: Our Transformation

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The importance of this conjecture, if it is true, is that it gives us an opportunity to end entirely the harmful repression of chaos, which may be crucial for our understanding of, and harmonious coexistence with, nature and the development of a peaceful global society.

How This Book Is Organized

This book presents the evidence I've uncovered to support my case for the Orphic theory. It's organized into three parts, corresponding to the three conjectures presented above. Each part is divided into two triads, for a total of six chapters per part.

Part 1: The Orphic Trinity in History

Part I presents the case for the first conjecture: that our prehistory and history over the past 25,000 years falls naturally into

three phases, or epochs, associated with the abstract cosmic principles of the Orphic trinity, Chaos, Gaia, and Eros.

I use the word *history* usually in reference to the written records of human affairs. Occasionally, it occurs in place of *prehistory*, for the unwritten record revealed through archaeology. I use the word *myth* for the written records of oral literature, whether religious or secular, ancient or recent. *Metahistory* refers to the overall pattern of prehistory and history as seen by prehistorians and historians.

Chapters 1, 2, and 3 introduce simple concepts from the mathematical theory of dynamical systems—attractors and bifurcations—providing a framework for viewing metahistory. Chapters 4, 5, and 6 develop the idea that history (and prehistory) can be seen in a cycle of three phases, associated with the concepts of the Orphic trinity.

The Gaian Epoch began with agriculture, 12,000 years ago; the Eros phase began with the wheel, six thousand years ago; and the Chaos stage is beginning now. For reasons related to the mathematical concepts, I also call these three phases the *Static*, *Periodic*, and *Chaotic Epochs*, respectively. Their spans:

- Static/Gaia: 10,000–4000 B.C. (agriculture and partnership)
- Periodic/Eros: 4000 B.C.–A.D. 1962 (the wheel, patriarchy, and science)
- Chaotic: after 1962 (neopagan and postmodern).

Transitions between these epochs, which I call *bifurcations* (for reasons that will become clear in the text), are the Neolithic Revolution (ca. 10,000 B.C.); the arrival of the wheel, patriarchal dominance, and science (ca. 4000 B.C.); and the Chaos Revolution (beginning around 1962 and ongoing), with its paradigm shifts associated with the Gaia Hypothesis and erodynamics.

Part 2: The Orphic Trinity in Myth

Part 2 explores the roots of the three dynamical revolutions that arose in the 1960s, digging deep into the matriarchal past. Thanks to the feminist scholarship of the last several decades, in which the maternal roots of our culture have been excavated from patriarchal oblivion, the dynamical pattern of our evolution can be seen emerging from mystery. I present evidence for our second conjecture, tracing the Orphic trinity of

We live today in the midst of a major cultural transformation that echoes similar events throughout our history. Our choices to nurture this historical imperative, rather than pursuing yet another suppression, may determine our future, and even whether our species has a future.

Chaos, Gaia, and Eros backward through time—from Hesiod in ancient Greece, to the dawn of history in Sumer, and on back into prehistory—seeking the ultimate meaning of our current social transformation.

In chapters 7, 8, and 9, we move through time in a fast-forward collage: from Cro-Magnon caves to Anatolian farms to the city-states of Sumer, Babylon, Assyria, Ugarit, Canaan, Egypt, Crete, Mycenae, Greece, and the Roman Empire. Along the way we see the trinity of the goddess passing through the Orphic phase and turning into the patriarchal trinity of Christianity, with Jesus replacing Orpheus as the Shepherd of Being. Most of the fundamental concepts of the original trinity are lost or degraded in the transition.

Chapters 10, 11, and 12 look at the meanings assigned to these concepts in the myths of early cultures. This evolution is an example of a dynamical process I call *mythogenesis*, the process of historical development of the religious fundament in a culture—its rituals, myths, paradigms, social customs, cognitive maps, beliefs, and so on, as seen from an evolutionary perspective. In the process of historical scholarship, we find that most of this information is

encoded for us in the mythology of the culture.

Part 3: The Orphic Trinity in Science

Part 3 is devoted to three scientific revolutions occasioned by the emergence of dynamics concepts, showing that they constitute an Orphic revival. These chapters make a case for the third conjecture of our theory, which interprets current events in the physical, biological, and social sciences (Chaos Revolution, Gaia Hypothesis, and Eroynamics) as an Orphic revival and as an onset of the Chaotic Epoch.

Chapters 13, 14, and 15 set the stage for our consideration of current events by reviewing the repression of the chaos concept within the sciences. This story spans the Eros Epoch, from around 4000 B.C. to 1962. It opens with the overrunning of the partnership (goddess) culture by patriarchal dominators, who portrayed chaos as evil. Their fundamental myths and rituals featured the slaying of the (female) dragon of chaos by a male war god. Subsequent Orphic revivals (such as early Christianity, late paganism, the troubadours, the Cathars, the Renaissance, the hippies) were violently suppressed. Particular

attention is given to the period around 1700, the time of Isaac Newton and the emergence of scientism as the dominator religion.

Chapters 16, 17, and 18 illustrate the three major shifts underway in the sciences today. I've chosen a few of many possible examples to illustrate the impact of the Orphic trinity on science.

- The *Chaos Revolution* began in the physical sciences. Our example is the science of celestial dynamics, the newly acknowledged chaotic motions of the planets and comets in our solar system. The truth is that virtually all areas of the physical sciences have been affected by the Chaos Revolution.
- The *Gaia Hypothesis*, which began in the biological sciences, affirms the intelligence of the whole life system of our planet in creating and regulating the physical conditions optimal for the emergence and maintenance of life. The history of the temperature and climate of Earth, with its regulation by the biosphere and its irregularities (ice ages) caused by chaos in the solar system, is used to illustrate Gaian theory. Biogeography, ocean biology,

the origin of life, and many other areas of biological science have been transformed by the Gaia Hypothesis.

- *Erodynamics*, which began in the social sciences, is the current research frontier of applied chaos theory. It provides the basis for understanding the symbiosis of human populations and the biosphere, and explores dynamic models for the world economy and the global environment in tightly coupled interaction. Psychology, social theory, management science, and anthropology have all been transformed by crodynamics.

Our Choice

We live today in the midst of a major cultural transformation that echoes similar events throughout our history. Our choice to nurture this historical imperative, rather than pursuing yet another suppression, may determine our future, and even whether our species has a future.

We are now at a hinge in history, not an apocalypse. Our own participation in the creation of the future may be improved in quality and power by mathematically illuminated images of space-time patterns in our history that are in harmony and resonance with similar rhythms of the universe and Earth. We can choose to participate optimistically in the present metamorphosis, trying to bias the outcome toward a new social

organization with a healthy future. We may reclaim the best features of the old traditions—pagan, Orphic, and archaic—as well as those of the modern world.

Most especially, we may use mathematics in its sacred role, midway between heaven and earth, to restore our spiritual connection to the divine patterns that have successfully guided our evolution through the challenges and metamorphoses we've met in our long line of genesis.

Here, I rest my case.