

Chapter 1

The Development of the Relational-Matrix Model

Section 1 The Implicit Structure of Space-Time

We'll begin our journey together by developing a model of reality that will serve throughout this book as the basis for understanding how what exists comes to exist as we experience it to exist.

Our most abundant experiences of reality are so-called physical experiences. What we know about the nature of physical reality is most specifically described by the branch of science known as physics. The deeper physicists are able to delve into the smallest parts of physical reality, the less clear becomes the boundary or dividing line between this part and that part, between here and there. Modern physics is thus moving toward understanding the universe as *an interconnected whole*. Concepts associated with quantum theory, such as relativity, complementarity, and nonlocality, point toward an underlying level of reality at which what we experience as the apparently separate objects of physical reality are really inseparable and thus must be connected or interconnected.

For example, Albert Einstein in his relativity theory was able to demonstrate that what were previously thought of separately as space and time are really different aspects of an inseparable whole now called space-time. He also demonstrated the underlying unity of what's separately observed as matter and energy—hence his famous equation $E = mc^2$. More recently, in quantum physics, the phenomenon of nonlocality has indicated the possible existence of an underlying connection between subatomic particles that transcends spatial distance or physical separation.

Physical reality is currently thought to be the product of the interaction among four fundamental fields or forces: the gravitational, electromagnetic, strong nuclear, and weak nuclear forces. All physical phenomena are thought to arise from the interaction between and among these four fundamental fields or forces. Furthermore, it's commonly believed that these four fundamental fields or forces are themselves manifestations of a single underlying field or force. For this reason, scientists are seeking a physical model of the universe in which these four fundamental fields or forces might be understood in terms of a single

unifying physical principle. Efforts to demonstrate the underlying unity of these four fundamental fields or forces are called unified-field theories, grand unification theories (GUTs), or theories of everything (TOEs).

The four fundamental fields or forces all exist “within” the universal context of what we call space-time. The existence of these four fundamental fields or forces therefore can’t be separated from the existence of what we call space-time. Thus, any effort to unify or demonstrate the connection between these fundamental fields or forces must also account for their connection to space-time.

Since all of the four fundamental fields or forces arise out of, or exist “within,” the singular entity we call space-time, it would seem that space-time itself represents a good candidate to qualify as the underlying unified field, or single unifying physical principle, from which emerge what are at this time considered to be the four fundamental fields or forces.

Such an understanding of space-time is primarily hampered, however, by our conception that matter and energy exist “in” space, i.e., are separable from space, like a ball being separable from the box it’s in. We’ve mentally separated the concept of space-time from the concept of field or force, since we have separate conceptions about what’s in space and the space it’s in.

This conception of physical reality as existing “in” space has persisted because space-time has remained, until now, a nonvisualizable conceptual abstraction, while the material objects of physical reality are, for the most part, visualizable. Our inability to visualize or visually model space-time has left us picturing it as an emptiness, a void, a nothingness “in” which physical reality resides. It’s impossible for us to conceive how the structural somethings of physical reality could arise from the structureless nothingness we see as space-time.

Although perceptually we see space-time as empty or void, *space-time must itself have a structural aspect*. The facts that the speed of light is finite and that nothing we observe as matter can match or surpass that speed indicate a limitation or constraint upon what exists as electromagnetic radiation in particular and upon physical reality in general.

Limitations or constraints imply the existence of barriers or boundaries, and boundaries imply the existence of structure. Therefore, *limitations imply the existence of structure*. The existence of limitations within space-time implies the existence of boundaries within space-time, dividing lines that cannot be crossed. Therefore, the existence of boundaries in space that constrain the behavior of what exists “in” space implies the existence of a *spatial structure*.

If we're in a room surrounded by transparent walls, our movements are limited and constrained by barriers we can't see, yet we can still discern the shape of the room indirectly by encountering its walls. In comprehending the restrictions on our movement within the room, we become aware of the overall shape of the structure that surrounds and contains us.

Likewise, space-time has an imperceptible structure, within which we reside, unable to *directly* see the limitations and barriers which that structure imposes upon physical reality. However, these limitations and barriers have been *indirectly* encountered and described in the form of physical laws and constants. In this way, the existence of a spatial structure can be *inferred* through the limitations and barriers that those physical laws and constants represent.

If we assume space-time to have a structural aspect, then the question is, what's the nature of that structure? What's the spatial structure made of, and how is it shaped? Any structure has two complementary aspects: something that exists, and the arrangement of that existent something into a *pattern* we call its structure. A chair is a structure; it's composed of something, perhaps plastic or wood, and that something is arranged in a way that *defines* the structure which we call a chair.

Therefore, our modeling of the spatial structure must include an analysis and description of these two complementary aspects—i.e., something that exists, and the way that something is arranged into a structure. What space-time is composed of we'll analyze and describe in terms of *spatial content*; how that content is arranged we'll analyze and describe in terms of *spatial construct*.

Most of what will be useful in this book toward reaching an understanding of the underlying unity of reality, as well as of the nature and behavior of physical reality, will be derived from an analysis of how spatial content must exist and function within the constraints of a spatial construct.

In chapter 1 of part I of this book, we'll describe the behavior of spatial content within the context of a defined spatial construct. This description will provide us with a model of space-time as a *dynamic structure*. For reasons that will later become clear, we'll call this model the *relational-matrix model*.

Once the relational-matrix model has been developed, we'll then demonstrate in chapter 2 of part I how the functioning of this dynamic spatial structure can account for certain basic aspects of the nature and behavior of physical reality. Specifically, within the context of the relational-matrix model, we'll account for the following aspects of physical reality: (1) the relationship between space and time, including the basis

of temporal relativity, as well as the precise nature of time as a function of the dynamic aspect of the spatial structure; (2) the basis of the speed-of-light constant, including why the frequency and wavelength of electromagnetic radiation are inversely related as a function of that constant; (3) the basis of Planck's constant, including why the energy associated with electromagnetic radiation exists in discrete amounts, or quanta; (4) the nature of gravitation, including why matter and gravitation are always associated and why gravitation is universally attractive; (5) the equivalence of the gravitational and inertial forces; (6) the relationship between electromagnetic radiation and gravitation; (7) the nature of energy; (8) wave/particle duality; and (9) the uncertainty principle.

Science has been able to tell us a lot about all these things, and we feel that all these things must somehow be related, but we don't really know exactly why or how, because we don't understand the nature of the underlying and unifying structure from which all these things extend and on which they depend. However, after reading this book, you'll be in a position to know how and why all these things are related, because you'll be able to see their relationship, their interconnection, through the visualizable model of space-time presented herein. In addition, by the time you finish reading part I, time itself will no longer be seen (or unseen!) as an intangible conceptual abstraction, as some sort of "fourth dimension," but will instead become as tangible and understandable as the movement of the hands of a clock.

The relational-matrix model of reality will provide a framework that we can use to visualize the relationships between physical phenomena which we know must somehow be related but for which we currently lack the symbolic conceptual abstractions necessary to link them together into a unified whole. By the end of part I, we'll have established a conceptual basis for understanding the universe as *fundamentally interconnected*, wherein we'll see that no perceivable or conceivable part of the universe can be said to exist independent of any other part, or independent of the dynamic structure of space-time itself. We'll see that the interacting fundamental fields and forces which form what we observe as the apparently separate material objects of physical reality exist as do ripples in relation to the otherwise-calm surface of a pond, having a relative form and existence, while being inseparable from the underlying whole.