Unified Reality Theory

The Evolution of Existence into Experience

Steven Kaufman

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To those who came before, making this effort possible, and to those who will come after, making it worthwhile.

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INTRODUCTION

In 1859, Charles Darwin published a book titled *On the Origin of Species*. In that book, Darwin proposed a theory of natural selection or "survival of the fittest" to explain how organisms evolve into different species. The book you're now reading is a sort of cosmic version of Darwin's treatise and could have been titled *On the Origin of Reality*, inasmuch as *its purpose is to present a theory that explains how existence evolves into reality*. In Darwin's theory of natural selection, the mechanism underlying organic evolution is *mutation*. In the theory presented in this book, the mechanism underlying existential evolution is *self-relation*.

Some people are curious about the nature of their surroundings, while others aren't. One attitude is ultimately no better or worse than the other; each just leads to different activities. Darwin was no doubt a curious person. I, too, am one of the curious people. Among other things, I'd like to know where I am and how I got here. It would also be nice to know just what "I" really is!

Through the efforts of modern science, it has become apparent that we reside on a planet in a solar system which resides in a galaxy, which itself resides in a universe full of such galaxies. Science tells us that the stuff which is found in this universe—e.g., the planets, the stars, our own bodies—is composed of energy in the form of matter. Together, all of this energy and matter is called, collectively, *physical reality*.

For the past hundred years or so, physicists have been trying to develop a *unified-field theory*, a theory that would show how all the different types of energy are manifestations of a single underlying field or force. In this way, physicists are seeking to account for the whole of physical reality within the context of a single unifying physical principle. So far, they haven't been successful, and even if they were, such a theory wouldn't account for everything that's known to exist in the universe, for the universe also contains the *nonphysical realities* we call awareness and consciousness.

In order to satisfy my curiosity, what I wanted was not a unified-field theory, not a way of explaining only the physical aspects of existence,

but a *unified reality theory*, a way of explaining both the physical and nonphysical aspects of existence within a unifying context, as the manifestations of a single underlying reality. Being a do-it-yourselfer, I took it upon myself to develop such a theory. This book is the result of that effort.

The context within which this unified reality theory is developed here is *existence* in the largest possible sense. In our day-to-day lives, while we encounter countless realities, both physical and nonphysical, all of these realities occur within the unifying context of existence. That is, there exist different realities, but *what all realities share in common is that they exist*. Existence is the common denominator of all realities, and so it's the starting point from which the unified reality theory is developed here.

Thus, this book is titled *Unified Reality Theory* because within it I present a unified model of reality that explains reality as *the manifestation of a singular or unitary absolute existence which has consciousness as an attribute that's intrinsic to its nature*. It's subtitled *The Evolution of Existence into Experience* because this unified model of reality is developed by describing how that absolute existence *evolves* from an undifferentiated state of consciousness into a differentiated state of awareness of experience—a differentiated state that's not other than what we, in this moment, are aware of as *experiential reality*.

The puzzle

Constructing a unified model of reality is to some degree analogous to assembling a picture puzzle. The first thing we generally do when beginning to work on a puzzle is get all the pieces out of the box and laid on the table. We then orient all the pieces face up so that we can use the bit of image appearing on each piece to help connect it with all the others. Next, we usually put together the outer rim of the puzzle first, so as to define the boundaries and provide context for the inner construction. We can then begin to build from the rim inward, or some inner portions may be fitted together easily because their connecting pattern is quite distinct. Eventually, a unified and cohesive picture emerges as we join the individual pieces together into an interconnected whole.

The sequence of events in assembling a picture puzzle may vary

from person to person, yet there remain basic steps we must take if we're to eventually come to the point where we've completed the picture. Thus, in order to complete the picture, we must first accept that the disconnected pieces in the box represent different somethings which have the *potential* to come together as an interconnected whole. We recognize this potential because we understand that at one time all the pieces existed as an undivided whole which was then cut up, thereby creating the now-separate pieces. Recognizing that all the pieces existed previously in a state of unity allows us to feel comfortable that our effort of reconnecting the pieces will eventually result in their assembly into a completed picture.

Likewise, if we're to undertake the task of constructing a unified model of reality, we must begin with an assumption and an acceptance that the different pieces of reality we have to work with did at one time, in some way, exist in a state of undivided wholeness. Unless we make this assumption at the outset—namely, that what we experience as the apparently separate pieces of reality have the potential to come together in the form of an interconnected, unified whole—then there's really no point in our taking the pieces out of the box in the first place.

The process of existential self-relation

According to the unified model of reality presented in this book, the fundamental underlying process by which existence has evolved into what we experience as the seemingly separate pieces of reality is really quite simple. That process involves *existence repetitively and progressively forming relationships with itself*, analogous in a limited way to the repeated and progressive twisting of a rubber band upon itself.

A rubber band, as it exists whole and untwisted, represents *absolute existence*—i.e., existence prior to having formed any relationships with itself. Now, if we take a rubber band and twist it once upon itself, we cause it to form a relationship with itself, and in so doing, we've created a level of rubber-band reality. Likewise, when existence forms relationships with itself, what's created are *levels of reality*. Thus, reality equals existential self-relation—i.e., reality equals existence coming to exist in relation to itself.

The first twist of the rubber band creates the first relationship of the

rubber band to itself by causing the rubber band to form two relative halves or poles. This first twist is analogous to the first relationship existence forms with itself, creating the *first level of reality*, or the *first stage of existential self-relation*, as depicted in **figure I–1**. This first stage of existential self-relation contains the fundamental relationship that's the basis of all other relationships existence forms with itself. This fundamental relationship, this duality, is implicit in all the existential relationships and levels of reality that follow.

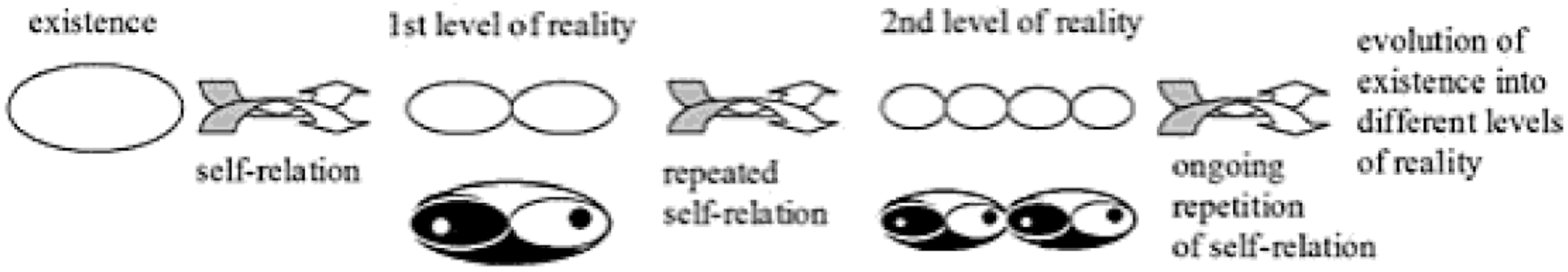


Figure I–1 The fundamental relationship that existence forms with itself to create reality is represented by the T'ai-chi T'u symbol (or yin/yang diagram). Existence evolves into what we eventually experience as reality as this fundamental relationship is repeated endlessly, creating different levels of reality composed of progressive stages of existential self-relation.

The rubber band, no matter how twisted it becomes, always remains whole, always remains what it is, while simultaneously becoming something else in relation to itself, something different that emerges, extends, and evolves from the whole, composed of relationships that the whole forms with itself. The twisted rubber band is still just what it is, still just a rubber band; but once it's twisted, it's that and something else as well. Likewise, existence, having formed a relationship with itself, is still just existence, but it's that and something else as well, the "something else" being reality.

The more the rubber band is twisted, the more relationships it forms with itself; and the more relationships it forms with itself, the more *differentiated* it becomes. Yet no matter how twisted the rubber band becomes, it always remains whole, always remains just what it is. When existence forms relationships with itself to become reality, the outcome is the same: The more relationships existence forms with itself, the more differentiated it becomes, creating different levels of reality. Yet no matter how differentiated it becomes, existence always remains whole, always remains just what it is.

What needs to be made clear at this point is that absolute existence isn't actually a physical reality that can be twisted upon itself like a

rubber band. The twisting of a rubber band is used here as an *analogy* to illustrate the abstract concept of existential self-relation. However, absolute existence is intrinsically able to form relationships with itself, and one result of those relationships is the creation of our experience of physical reality. That is, physical reality *is* existence, for there's nothing else; however, physical reality is existence that has *evolved* into what we are able to experience as reality, by forming relationships with itself.

Thus, *existence becomes reality through a process of self-relation*. What we're experiencing now as reality is a *relational level of existence*, a particular type of existential relationship built and resting upon several prior stages of existential self-relation. As we exist now, we're like a rubber band that has become very twisted upon itself. This in itself isn't a bad thing, nor is it a good thing; it's just what is. More specifically, it's what is, as it is, in relation to itself.

The stages of existential self-relation

This process of existential evolution through repetitive and progressive self-relation will be described in this book as occurring through four different stages, steps, or levels, as depicted in **figure I–2**.

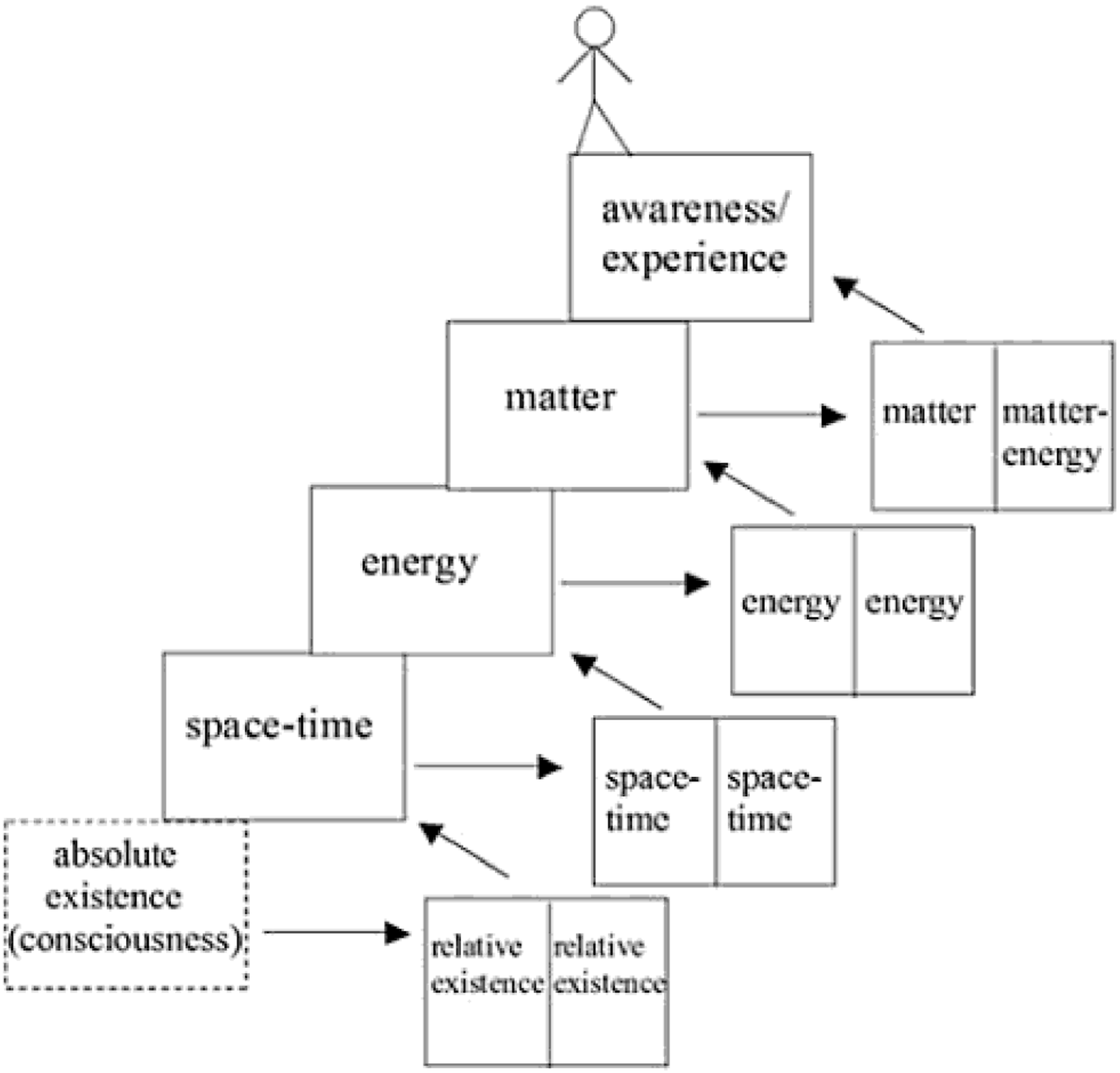


Figure I–2 The basic outline of the stages, steps, or levels through which existence evolves to eventually reach an experience of itself. Each set of relationships that existence forms with itself (boxes on right) becomes the next step (boxes on left) in this evolutionary process. Existence in this way evolves by picking itself up by its own bootstraps. When consciousness-existence reaches the top of this evolutionary staircase, it functions as awareness and is able to interact with, and so experience as reality, the stages of existential self-relation through which it has evolved and which now support it.

As will be described in detail in part I of this book, the first set of relationships that existence forms with itself creates the underlying framework or *structure* of reality. We experience this structure of reality as *space-time*. Using this first set of relationships as a foundation, existence then forms a second set of relationships with itself. This second set of relationships, occurring within the context of the first set of relationships, results in differentiation of the structure of reality. We experience this differentiation of the structure of reality as different forms of *energy*. Then, using this second set of relationships

as a foundation, existence forms a third set of relationships with itself. This third set of relationships, occurring within the context of the first and second sets of relationships, results in further differentiation of the structure of reality. We experience this further differentiation of the structure of reality as different forms of *matter*.

As will be described in detail in part II of this book, the first, second, and third sets of relationships that existence forms with itself allow existence to form a fourth set of relationships with itself. This fourth set of relationships that existence forms with itself consists of the relationships that are responsible for *experience* itself. It's at this fourth stage of existential self-relation that there comes to exist an awareness of the other three stages of existential self-relation as experiential realities. As existence evolves by forming these different sets of relationships with itself, existence differentiates, but it never actually becomes divided or separated from itself. As will be described in this book, what we experience as the apparent separability of existence from itself at the physical level of reality is simply an unavoidable by-product of the process by which experience itself comes to exist—i.e., it's an artifact created by the way in which existence forms relationships with itself at the fourth stage of existential self-relation.

Hidden simplicity

Although reality may thus be the result of a very simple process, explaining that simplicity to individual beings who experience reality as we do necessarily involves some complexity. It's one thing to make a statement, and another thing to provide evidence that the statement is true. If all we needed was to state the essential nature of reality, this book would be exactly one sentence long: "Reality is the result of a process whereby existence repetitively and progressively forms relationships with itself." But what does such a statement mean? By itself, not much. For that statement to have meaning, it needs *context*. For any model of reality to be meaningful, that model must be *relevant* to the reader's experience of reality.

Our goal in this book is to examine the simple process of self-relation that underlies the evolution of existence into experience, and thereby allow the reader to see beyond the complexity apparent in experiential reality into the underlying simplicity and unity of existence

that's the foundation of all levels of reality.

If the essential nature of reality is truly as simple as it's here being described, as simple as repetitive and progressive self-relation, as simple as twisting a rubber band upon itself, then why has this simple truth remained hidden? Well, just because something is simple doesn't mean that it's obvious! Underlying simplicity is often obscured by a superficial complexity, or a perspective that introduces complexity. A tree is a relatively simple structure, but if we have only a perspective from above, through the leaves, then that unifying simplicity is hidden from us by the apparent complexity of all the different leaves. Conversely, if we look at the tree from below, from a position of "standing under," the complexity of the different leaves is then seen within the context of the underlying and unifying simplicity of the trunk, and can then be literally "understood."

Experiential reality is itself the leaves that obscure from view the underlying simplicity and unity of existence. On the one hand, humanity's approach to understanding the tree of reality through *science* has generally been from above—i.e., from a position of standing over rather than standing under—viewing and describing reality as seen through the leaves of experience and experiment. As a consequence, scientific descriptions of reality have tended to grow more and more complex, even though science has uncovered many of the branches that connect the different aspects of physical reality. On the other hand, humanity's approach to understanding the tree of reality through *spirituality* has generally been from below—i.e., from a position of standing under—viewing and describing the leaves and branches of reality as they extend from the unity of the trunk. However, in our modern world, dominated as it is by the advancements of science, the approach to reality through spirituality has become unpalatable and unacceptable to many people because it lacks the tangibility and verifiability of scientific experience and experiment and also fails, in most cases, to account for what we understand about physical reality.

This book has been designed to appeal to both the scientist and the spiritualist, because it integrates the perspective of each approach into a coherent and consistent model of reality. The tree of reality has grown out of existence and is composed of existence coming to exist in relation to itself. The unified model of reality presented in this book merges the perspectives of science and spirituality and thereby demonstrates that the descriptions of reality presented by science and

spirituality are not mutually exclusive or opposed, but rather are complementary, because each description arises from a different, yet valid, perspective upon the same tree of reality.

The relational-matrix model of reality

The idea that the universe consists of existence forming relationships with itself isn't exactly new; Taoists have understood this idea for at least a couple of thousand years. What's new here is that this idea of the universe being constructed through a process of repetitive and progressive self-relation is presented in this book in the form of a detailed and defined structural model which, once developed, will be correlated with our current understanding of physical reality, as described by science in general and physics in particular.

That detailed and defined structural model, called the *relational-matrix model*, will be shown to be especially useful in explaining some of the more interesting and perplexing aspects of what we experience as physical reality, such as the nature and relativity of time, wave-particle duality, and the speed-of-light constant. In addition to using the relational-matrix model to explain the basis and nature of our physical experience, we'll use this model to explain the basis and nature of our mental and emotional experiences as well.

On the basis of our individual experiences, we each have our own ideas about the nature of reality, about the way things seem to be ordered in the universe and, possibly, beyond. In presenting this unified model of reality, my goal is to take the reader on a journey from wherever they are with regard to their own ideas about the nature of reality, toward a final destination—to a point where everything that we experience as reality can be seen to be inseparable parts of an indivisible, interconnected whole.

If we're to undertake this journey together, we first need to establish common ground, a conceptual base camp, from which the reader can then feel safe in venturing forth into new conceptual territory. Part I of this book, wherein the relational-matrix model of reality is developed and then related to space-time and physical reality, represents the establishment of such a base camp.

Following that, in chapter 1 of part II, and using the relational-matrix model developed in part I, we'll examine the relationships that are

responsible for experience itself. Once the basis and nature of experience have been explained, we'll then, in chapter 2 of part II, examine the more nebulous concepts of consciousness and awareness, again using the relational-matrix model developed in part I as the basis for our analysis. *Thus, the relational-matrix model of reality developed in part I will serve as the conceptual framework for the construction of the unified model of reality presented in this book as a whole*. This is appropriate, for as will be shown, it's existence in the form of a relational matrix that functions as the framework upon which reality itself is constructed.

In chapter 2 of part II, we'll also examine mental and emotional experiences, including their relationship to consciousness, awareness, and the relational-matrix model of reality developed in part I. In this way, we'll seek to account for the existence of the three fundamental *experiential realities*—i.e., physical, mental, and emotional—within an interconnected, unifying framework that shows the relationship of each experiential reality to the other, and of all three to the underlying whole.

Ultimately, what we'll show is that reality as a whole can be coherently and consistently accounted for only if we understand that the singular existence from which all levels of reality extend through the process of repetitive and progressive self-relation isn't other than consciousness itself. Thus, we'll demonstrate that consciousness doesn't somehow arise at some later stage in the evolution of existence, but rather *that the evolution of existence into experience isn't other than the evolution of consciousness into awareness* and that experiential reality itself is what's created at a certain stage in the evolution of consciousness-existence. In other words, what we'll show is that consciousness isn't a product of the machinations of physical reality but, on the contrary, that *physical reality, as we experience it to exist, is itself a product of consciousness*, albeit consciousness existing in relation to itself.

Following certain sections throughout the book, there'll be *conceptual checkpoints* where the most important points made in the preceding sections are reviewed, so that the simplicity of the various concepts presented regarding the unified model of reality isn't lost in the complexity of the statements necessary for their proof. These conceptual checkpoints review the essential concepts that the reader needs to keep with them in order to make it to the next clearing, the next level of understanding, regarding the unified model of reality

being developed in this book. There's one indispensable instrument that you, the reader, must carry with you at all times when undertaking such a journey. Please take with you an open mind. Without one of these handy, it's doubtful whether you'll make it very far. However, if you're reading these words, it's more likely than not that you already have one. In that case, take care not to lose it along the way, for the path to our final destination involves many small journeys, and parts of the path may at times seem treacherous and thick with confusion before each new clearing is reached.

With that said, let's press on.

PART I
THE RELATIONAL-MATRIX MODEL OF REALITY

"The most fundamental phenomenon in the universe is relationship."

— Jonas Salk, *Anatomy of Reality*[1]

matrix… 2. that within which, or within and from which, something originates, takes form, or develops.
Webster's Unabridged Dictionary[2]

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.

Section 2 Structure as Relationship

Structure is relationship, or a set of relationships. Pieces of wood can be arranged into a relationship that exists as a chair. The pieces of wood themselves are structures composed of the relationships between plant cells. The plant cells are structures composed of the relationships between molecules. The molecules are structures composed of the relationships between atoms, and so on.

Likewise, if space-time functions as a structure, then that structure must represent a set of relationships. We can then ask, relationships between *what*? The answer is, well, relationships between whatever space-time itself is composed of. So, the question then becomes, what's space-time composed of? At first, this may seem to be a most difficult and perhaps unanswerable question. Yet, if we approach this question from the broadest possible perspective, it becomes answerable—and the answer is the beginning of our approach to, and understanding of, the underlying unity of reality.

If space-time actually exists as such (and we'll assume that it does), then, in the most general sense, we can say that space-time is composed of existence, no more, no less. What else could it be composed of? What else is there?

As stated previously, the structure of space-time must represent a set of relationships between the parts of whatever space-time is composed of. Therefore, if space-time is composed of existence itself, then, in the most general sense, we can say that *space-time, as a structure, must be composed of the relationships between different aspects of existence*.

At this point, it's necessary to hypothesize that *existence is fundamentally a singular, nonseparate whole*. In order to prove

something, we must start with some assumption or hypothesis. The proof, then, is in the pudding—i.e., in whether we find the results derived from that hypothesis to be tasty or unpalatable. In this case, the proof will be whether or not the unified model of reality ultimately derived from this hypothesis is in harmony with what we experience as reality, as well as in harmony with itself—i.e., whether or not it's internally consistent.

In any case, if existence is fundamentally a singular, nonseparate whole, then we can say that *any relationships which exist must be relationships of existence with itself—i.e., relationships between different aspects of existence—since there's nothing else*. Therefore, the structure of space-time in particular and of reality in general must represent relationships that existence has formed with itself—or, in other words, existence coming to exist in relation to itself.

2.1 *Relative existence*

This section of the book will serve as an introduction to the concept of relative existence. Relative existence refers to existence that's what it is owing to the involvement of one aspect of existence in a relationship with some other aspect of existence. In relative existence, any aspect of existence exists as such only in relation to some other aspect of existence, in dependence on some other aspect of existence, rather than independent of any other aspect of existence.

To some readers, relative existence may be a familiar concept, whereas to others it may be completely new. To most readers, whether it's familiar or not, relative existence may be a difficult concept to grasp, since it runs counter to how we normally experience reality, which is in the form of apparently separate, independently existent objects. That is, whatever we experience as reality seems to exist by, in, and of itself, without the support of other aspects of existence.

For example, we experience up as up, and so we think that up is independently up, unaware that up can exist as such only in relation to a coexistent down. Likewise, we experience hot as hot, and so we think that hot is independently hot, unaware that hot can exist as such only in relation to a coexistent cold. As another example, we experience hard as hard, and so we think that hard is independently hard, unaware that hard can exist as such only in relation to a coexistent soft. The same is true for everything else that we

experience, in that whatever we experience something to be, it can be that only in relation to and in dependence on some other aspect of existence that's not that.[3]

Likewise, in the universe, whatever something is, it exists as such only in relation to and in dependence on something else that it's not. As we'll describe in detail in this book, everything that's happening in the universe represents some relationship that existence has formed with itself, some form of relative existence. The structure of space is a relationship, the dynamic of energy is a relationship, the form of matter is a relationship, and the awareness of experience is a relationship. The unified model of reality presented herein primarily involves descriptions of those relationships. For this reason, the concepts presented in this section are central to the unified model of reality being developed in this book. It would therefore be advisable to return to this section on occasion if you, as the reader, find yourself confused with regard to what relative existence means, or the type of relationship that's being discussed.

So, if existence is fundamentally a singular, nonseparate whole, then how does it create structure by forming a relationship with itself? A relationship requires a plurality or parts. Since existence begins as a singular, nonseparate whole with no separate parts, there's no way for existence in this state to form a relationship with itself. For this reason, existence, in order to form a relationship with itself, in order to create structure, must first either polarize or dualize into opposite or complementary aspects of existence, i.e., into realities, as depicted in **figure 1**.

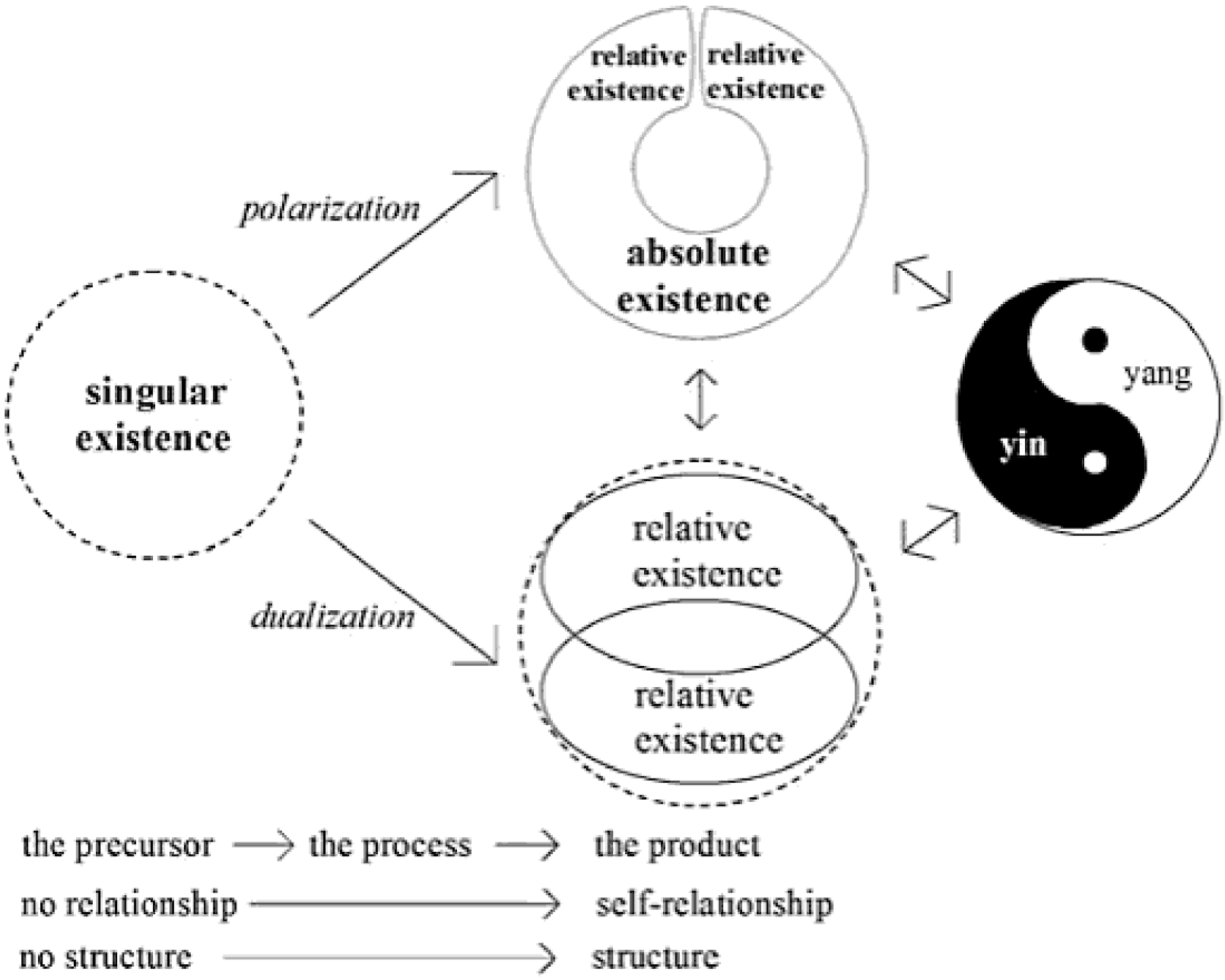


Figure 1 How singular or absolute existence can form a relationship with itself through the process of polarization or dualization into relative existence. Polarization and dualization are both equivalent processes, for each process results in the creation of two relative aspects of existence, or complementary realities, out of a single underlying whole. Neither are these relative existences or realities separable from the underlying whole from which they arise, nor are they separable from each other. Furthermore, each of these relative existences or realities exists as such only in relation to its opposite or complementary relative existence or reality. Thus, they're called relative existences or realities because their existence is dependent on, rather than independent of, some other aspect of existence. The underlying whole from which all polarity and all duality arise can be called "absolute" existence, because it's nonrelative—i.e., its existence isn't dependent on any other aspect of existence, as is the case with relative existence. The polarization or dualization of absolute existence into relative existence is the basic process by which the structure of space-time is created. On the right, the well-known Taoist symbol of relative existence, the T'ai-chi T'u, which is translated as the Diagram of the Supreme Ultimate, is depicted to show that the complementary realities *yin* and *yang* are equivalent to the two relative aspects of existence—i.e., the two realities—created by the process of polarization or dualization of absolute existence.

Once complementary realities exist, there then exists a level of

structure within existence, albeit a relational structure. The existence of this relational structure allows existence to form other relationships with itself. Each set of relationships that existence forms with itself sets the stage for another way in which existence can form a relationship with itself. *In terms of structure as relationship, what we experience as the structure of reality is the result of existence undergoing this process of repetitive and progressive self-relation.* The different levels of relationship that existence forms with itself are depicted in **figure 2**, which is a slightly less abstract representation of the four basic stages of existential self-relation that were originally depicted in the "Introduction" (figure I–2).

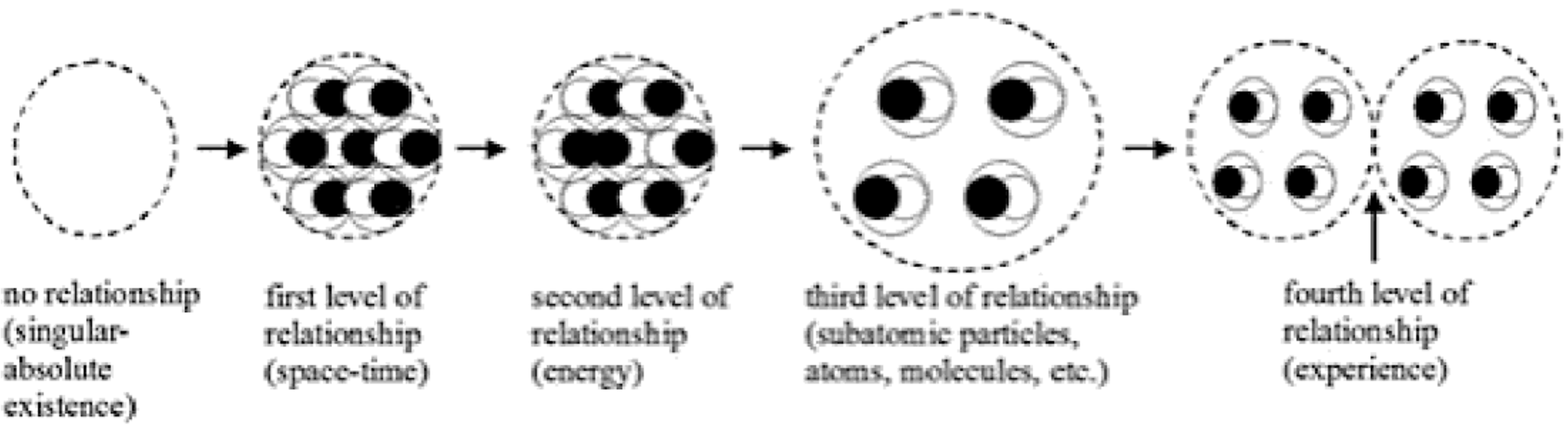


Figure 2 An outline of how existence evolves into experience through a process of repetitive and progressive self-relation, wherein each level of relationship provides the basis for another level of relationship, culminating in the relationship that's existence's experience of itself in this relational or structured form. Each *stage of existential self-relation* is experienced as a different *level of reality*. The first level of relationship, wherein existence polarizes or dualizes into complementary pairs, creates the first stage of existential self-relation, or what we experience as *space-time*. The second level of relationship involves the structure of space-time forming relationships with itself, within itself, depicted by the central sphere having a polarity of spatial content that's oriented differently from the six surrounding spheres. At this second level of relationship, all the spheres exist as such in relation to each other, but one sphere also exists in relation to all the rest, creating the second stage of existential self-relation, or what we experience as *energy*. The third level of relationship involves the energies derived from the second stage of existential self-relation forming relationships with each other to create the third stage of existential self-relation, or what we experience as *matter*. The fourth level of relationship involves the matter derived from the third stage of existential self-relation forming relationships with both other matter and energies to create the fourth stage of existential self-relation, or *experiential reality*. Because these are all relationships that existence is forming with itself, at no relational level of existence are the relative parts or products of these relationships actually separable from each other. Thus, what we experience as the different aspects of reality are ultimately unified, or actually inseparable from each other,

> because they all exist as different aspects of an underlying singular, nonseparate whole that has simply formed relationships with itself.

The first three stages of existential self-relation depicted in figure 2 will be described in detail in upcoming sections as we develop the relational-matrix model; the fourth stage of existential self-relation will be described in part II of this book.

2.2 *Necessary terminology*

Before we begin developing the relational-matrix model, we must first make sure that all the terms we'll use have been clearly defined. Let's begin with the term "existence." We could say that existence is just what is, but this wouldn't provide much in the way of enlightenment regarding the topic. We won't try to define existence in one sentence or in one paragraph, for this book, as a whole, is a self-definition of existence. At this time, we'll simply create a context for understanding the coherent and consistent model of reality that's presented throughout this book.

Existence, while it can't actually be *defined* in totality, can be *described* in terms of *reality*, i.e., in terms that relate the undefinable concept of existence to the definable concept of reality. Most fundamentally, *reality is a state of existence.* Being in a "state" implies the presence of boundaries or borders that define what's in one state versus what's in another state. So, reality as a state of existence implies that reality is existence which is in some way bounded or bordered. That is, reality is existence, but reality is existence with boundaries or borders.

If reality is existence in a state, existence with boundaries or borders, then what's existence with no boundaries or borders? That would be *absolute existence*. Thus, existence can be relative or absolute—i.e., existence can be in a state or not in a state, bounded or unbounded, bordered or borderless. Absolute existence isn't itself a state of existence; rather, absolute existence is simply existence that's not in any definite state, that's not defined by any border or boundary, whereas relative existence is existence that's in some definite state, that's defined by some boundary or border, and thus is in a definite state of *reality*. "Relative existence" is therefore another term for "reality."

The *source* of relative existence—i.e., of reality—is absolute

existence. The source of existence that's in a definite state is existence that's not in any definite state; the source of bounded existence is unbounded existence. There isn't much that can be said about absolute existence, since it defies the boundaries that words themselves are. Instead, this book deals with relative existence, or, in other words, reality. Specifically, this book describes how relative existence (reality) *evolves* from absolute existence—i.e., how existence that's not in any state *becomes* existence in many different states.

What's demonstrated throughout this book is that *reality is existence that's in a definite state because it has formed a relationship with itself*. In other words, *reality is existential self-relation*. That is, all realities represent relationships that existence has formed with itself, and therefore all realities are *relative*—i.e., they exist as such only as the result of a relationship.

Realities exist only within the context of a *relationship* with their complementary reality-existence, i.e., the aspect of existence they exist in relation to and in dependence on. For example, "here" is a reality. "Here" is real and exists, but only in relation to and in dependence on a coexistent "there," or what's "not here." Thus, the reality and existence of both "here" and "there" is *relational* or, as some might say, *conditional*, each requiring, as a condition of its own reality and existence, the coexistence of another, complementary reality. Whenever we discuss a reality, the *mutual coexistence* of its counterpart is always implied and cannot be avoided.

To better understand the relationship between absolute existence and reality, we can use the example of a stick. Let's say the stick as it exists unbroken, lying on the ground, is absolute existence. It's whole, not yet having formed any relationship with itself. Now, we break the stick into two halves and lean the two halves against one another, analogous to the process of polarization or dualization. Each half of the stick now exists in the particular state that it does—i.e., in a state of leaning—only in relation to the other half of what was previously an inseparable part of its whole stick-self. In other words, the state of existence of each half of the stick is now dependent on the state of existence of the other half. This relationship is one of *mutual coexistence*. Each half of the stick supports the other; each's state of existence, each's reality, depends on the other's. Thus, each half of the stick exists as such only in relation to the other, and so each half is a reality.

A *relational matrix* is the overall relational structure that exists as a result of the *process of successive dualization* of an absolute existence. A relational matrix, then, is composed of interdependent, mutually coexistent realities. The formation of a relational matrix is, in a very limited way, analogous to breaking a stick into increasingly smaller pieces and then leaning all those pieces against each other, so that no single piece can be removed without the whole structure tumbling down. The terms that we have been and will be using to define and describe the basic structure of a relational matrix are depicted in **figure 3**.

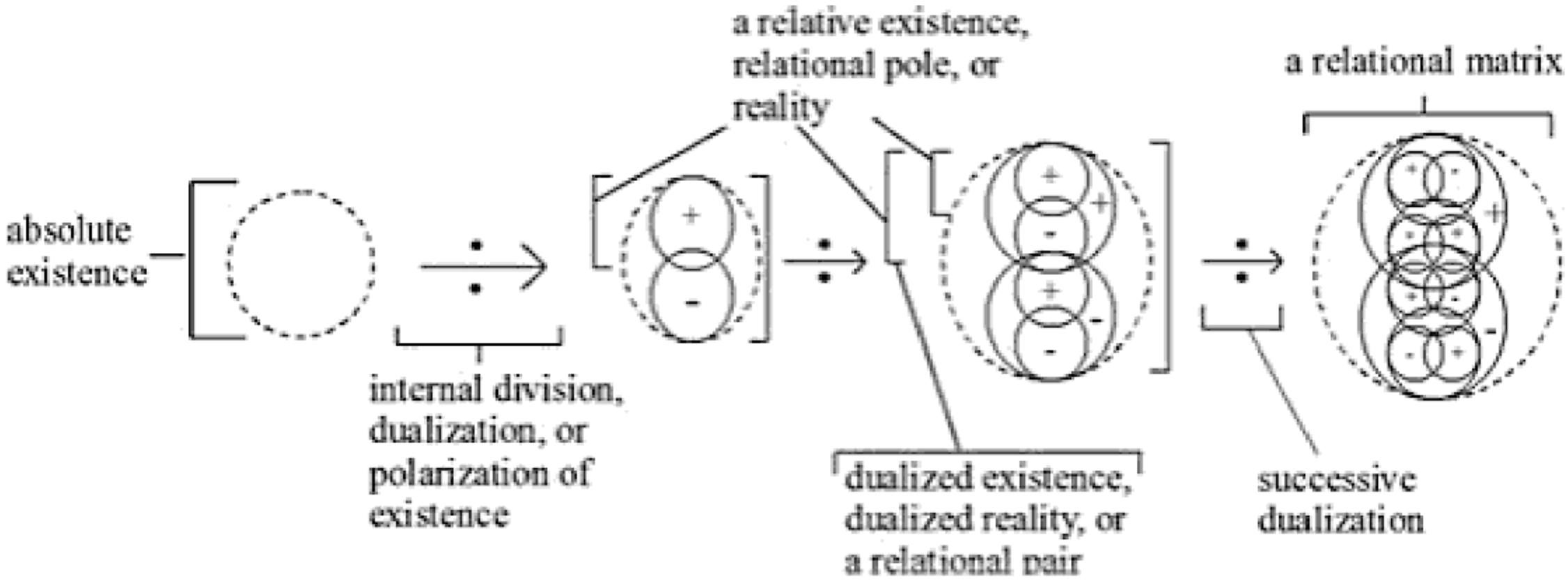


Figure 3 The terminology used in the description of a relational matrix. In summary, from left to right, absolute existence successively dualizes, or repetitively and progressively forms relationships with itself, creating a relational matrix of relative existences or realities. This process of successive dualization is denoted by the division arrows between figures. The plus and minus symbols are used to denote the relational nature of each reality. As depicted here, as absolute existence successively dualizes, what exists as a relative existence or reality at one relational level of existence itself dualizes into realities that exist at another relational level of existence.

As used in figure 3, the term "reality" refers to only one *complementary* or *relational pole* of a dualized existence or dualized reality. As an example of this usage, a stick that's been broken in two and leaned against itself is a dualized existence or dualized reality. Each half of the stick is then one relational pole or reality. Together, the two complementary or relational poles compose a *relational pair* and represent the dualization of a more fundamental existence or reality. Thus, as existence dualizes or internally divides, each individual relational pole resulting from that process of dualization is called a *reality*. However, when all these individual relational poles are

considered as a whole, they're also referred to as a "reality." For example, the relational matrix, as a whole, is a reality—i.e., a product of existential self-relation—that's composed of countless other realities. Thus, the term "reality" can be used to refer to the *individual components*—i.e., realities—that are produced as a result of the process of successive dualization of existence, as depicted in figure 3; or, alternatively, it can be used to refer to the *relational whole* that's produced as a result of the process of successive dualization of existence, as is the case in the following two paragraphs.

Each new relationship that existence forms with itself represents another *relational level of existence*. A group of relational levels of existence that all share a common relational framework represent a *stage of existential self-relation*. Each stage of existential self-relation corresponds to what can be defined as a *level of reality*. That is, many relational levels of existence together represent a stage of existential self-relation, and each stage of existential self-relation can be defined as a different level of reality. For example, many different relational levels of existence together represent the stage of existential self-relation that composes the level of reality we call space-time. For another example, what we experience as electromagnetic radiation consists of many different relational levels of existence that, as a whole, represent a stage of existential self-relation which can be defined as the energic level of reality. The same is true of the material and experiential levels of reality, in that they each represent a definite stage of existential self-relation composed of many different relational levels of existence.

Together, all these relational levels of existence, stages of existential self-relation, and levels of reality make up what we call *reality as a whole,* or, simply, *reality*. Thus, the term "reality," depending on the context within which it's being used, can refer to an individual relational pole or "reality"; or, alternatively, it can refer to a whole set of relational poles that together form a larger "reality" or set of existential relationships. In other words, the term "reality" can be used within a context where it refers to the singular product of the process of successive dualization of existence, as in "a reality"; or, alternatively, it can be used within a context where it refers to a sum of the products of the process of successive dualization of existence, as in "level of reality" or "reality as a whole," where the phrase "as a whole" may be either expressed or implied.

Having defined the necessary terms and concepts, we're now

ready to develop a unified model of reality (as a whole!) wherein the structure of space-time, energy, matter, and experience can be shown to be derived from existence evolving through a process of repetitive and progressive self-relation.

Section 3 Before the Beginning (of the Universe) There Was…Absolute Existence

In order to begin, it's generally necessary to start at the beginning, and so that's where we'll start. If we're ever to understand reality in terms of its undivided unity, its inseparable singularity, we must begin from a position and postulate of wholeness. In that sense, to return to the picture-puzzle analogy presented in the "Introduction," we'll begin to put the puzzle of reality together by starting out with an uncut picture, by assuming that what we experience as the different pieces of reality were at some point undivided, existing not as separate parts but simply as a more fundamental unified whole.

In the previous section, we hypothesized that existence is fundamentally a singular, nonseparate whole. That hypothesis assumed the foundation of an absolute existence. We'll describe this absolute existence as *the undivided whole from which the different pieces of reality eventually emerge, extend, and evolve*.

Absolute existence is undefinable and borderless existence. Absolute existence can be considered an existent nothingness, an emptiness, a void. "Nothing" or "no-thing" doesn't mean nonexistence; rather, "nothing" or "no-thing" means simply that what ultimately exists is undefinable as a this or a that, and is thus no "thing." Absolute existence is structureless, for it exists beyond relationship, without condition, limitation, or constraint, and thus contains no barriers or boundaries, no dividing lines that would define a here from a there. Absolute existence is therefore dimensionless, for dimensions require structural constraints. Absolute existence is even beyond unity, because unification requires that there be parts which can be connected together or unified. Absolute existence as such contains no definable parts; absolute existence is the foundation from which and within which all experience of partness extends and on which it depends.

We've now laid the groundwork that will allow a detailed description of how absolute existence can evolve into relative existence and,

specifically, into a relational matrix through a process of successive dualization, i.e., through a process of repetitive and progressive self-relation. To get to this point, it was paradoxically necessary to define the undefinable—i.e., to define absolute existence itself as undefinable. This paradox is unavoidable because absolute existence is everything and nothing, simultaneously. Absolute existence is the source of all relative existences, of all realities, of all somethings, and yet, as such, it's itself nonrelative, or *no-thing*.

As we'll describe in this book, the reality that we experience to exist, or what we experience as reality, is composed of absolute existence, i.e., of nothing or *no-thing*. However, the reality that we experience to exist is composed of absolute existence in the process of forming a relationship with itself, and so existing at the experiential level of reality as relative existence, as something. Essentially, what we're about describe is how existence picks itself up by its own bootstraps by creating something out of nothing.

3.1 *The evolution of absolute existence into relative existence*

Relative existence always exists within the context of absolute existence. Whereas absolute existence is structureless, relative existence is structured. In order to get from the nonstructure of absolute existence to the structure of relative existence, something has to happen—i.e., absolute existence must undergo some transformation or process. That process has already been described in terms of existence forming a relationship with itself. The process by which absolute existence forms a relationship with itself to become relative existence has already been explained as the process of *dualization.* The relationship between absolute existence, relative existences, structure, and the process of dualization is depicted in **figure 4**.

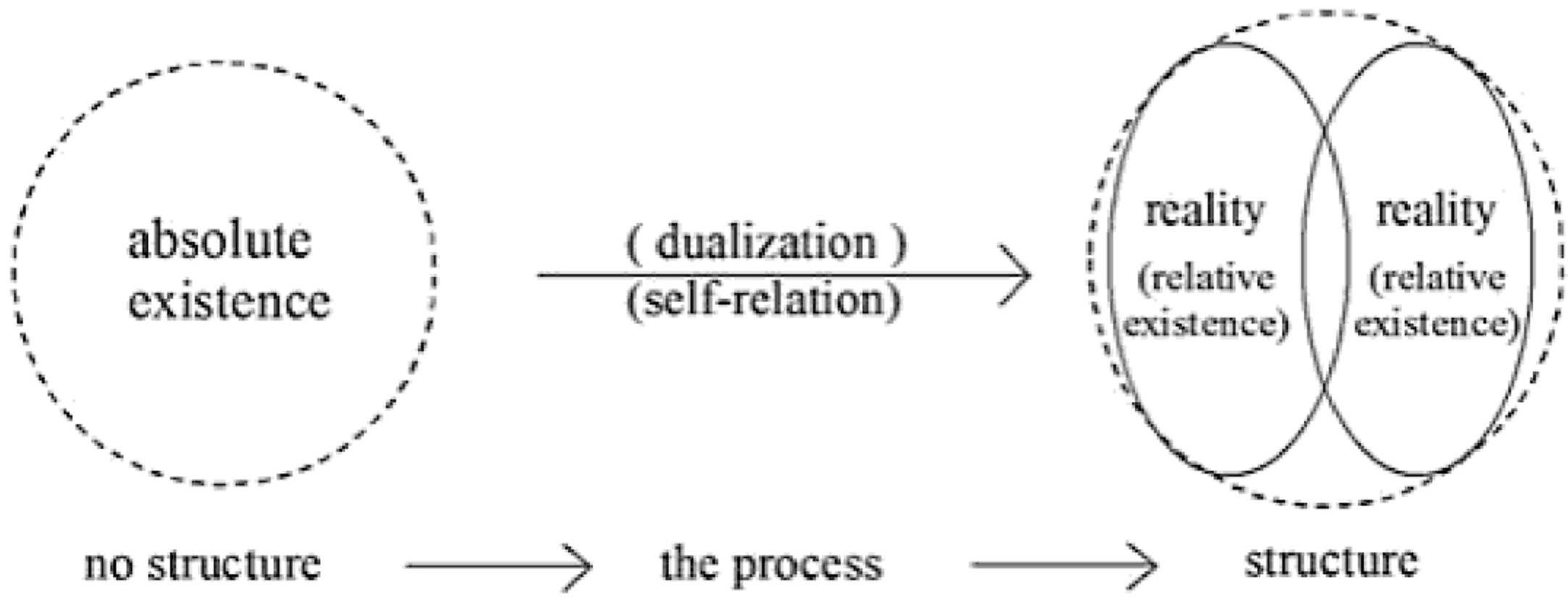


Figure 4 Absolute existence becomes within itself relative existence through a process of dualization into complementary realities. The existence of each reality is dependent on the existence of its complementary reality. The dashed line around absolute existence denotes the undefinable nature of absolute existence, while the solid lines defining the complementary realities denote their definability in relation to each other. Alone, each reality is nothing, but together, in a relationship, they function as a structure. The synergy of each relative existence supporting the other is what creates the structural aspect of reality as a whole. The relative whole, the relationship, the structure, is thus greater than or more than the sum of its relative parts, each of which alone isn't a structure, each of which alone doesn't even exist, because the relative parts are derived from a more fundamental whole that has formed a relationship with itself. Also, note that the realities don't extend *outside* of absolute existence but rather exist *inside* absolute existence, as a level of reality extending within absolute existence.

In order for absolute existence to form the structure of reality—i.e., to become a relational matrix—absolute existence must dualize not just once but over and over again, successively. What this means is that the realities produced at each successive level of dualization themselves undergo a process of dualization, resulting in another level of dualization, another *relational level of existence*. This process of successive dualization, of repetitive and progressive self-relation, is what forms the structure of an interconnected, interrelated, mutually coexistent set of relational levels of existence that we've termed a "relational matrix," as depicted in **figure 5**.

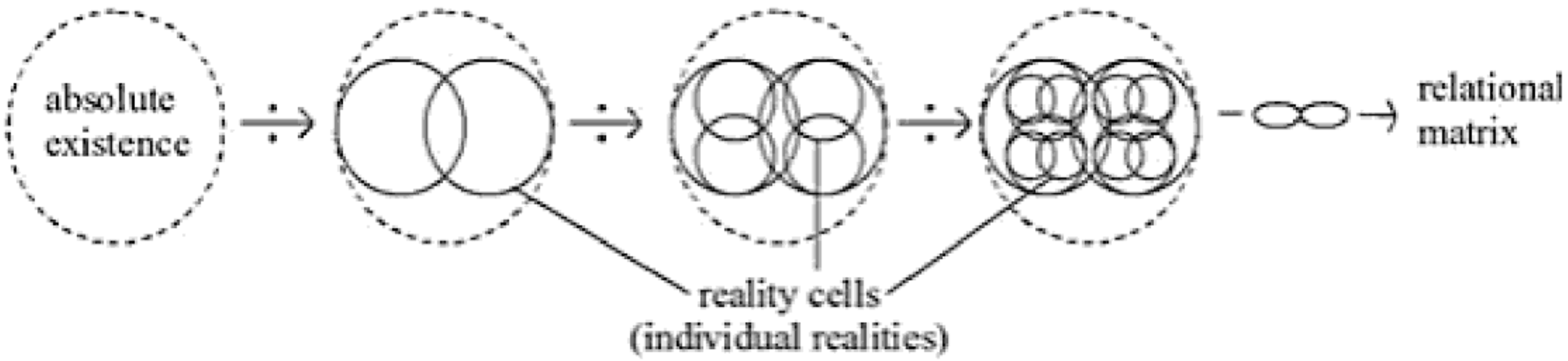


Figure 5 The process of successive dualization of existence, whereby the realities produced at one level of dualization then become the precursors for the next level of dualization, eventually resulting in the formation of a relational structure composed of realities of different sizes. The individual units of relative existence composing this relational structure (i.e., the relational matrix), which are depicted here as circles or spheres, are called *reality cells*. The interconnected, interrelated, mutually coexistent nature of the reality cells is denoted by their interlocking or overlap. (Note that the term "individual" doesn't mean "divided" but rather denotes what's one pole of an "indivisible duality.")

The process of successive dualization of existence is somewhat analogous to the process of cell division that occurs in the growth and development of what we call life forms. Organic development begins with an individual unit of life, a single cell. This cell then divides, creating two cells, and these two cells then each divide, creating two more cells, for a total of four cells, and so on, eventually forming the cellular structure of an organism.

In terms of the evolution of absolute existence into relative existence, the process begins with absolute existence as basically a single cell. This "absolute" cell then dualizes (divides) into two relative cells, each of which we'll call a *reality cell*. "Reality cell" is simply the term we'll use for an individual unit of relative existence. These two reality cells each then dualize into two more reality cells, and so on, eventually forming the interconnected, interrelated, mutually coexistent cellular structure of reality that we've termed a "relational matrix."

In a very real way, the process of our organic growth and development through cell division is a reflection or *fractal extension* of the process of successive dualization by which the universe itself has evolved. Fractals are geometric patterns created by the iteration or progressive repetition of an equation, whereby the result of the equation is fed back into the equation to generate another result, which is then fed back in, and so on. The numeric results can be plotted as points to generate a fractal image. One feature of these

fractal images is that, although at one level they're finite, at another level they seem to go on forever. A related feature of these fractal images is that the geometric patterns which result are repeated at all levels of the fractal image, as depicted in **figure 6**.

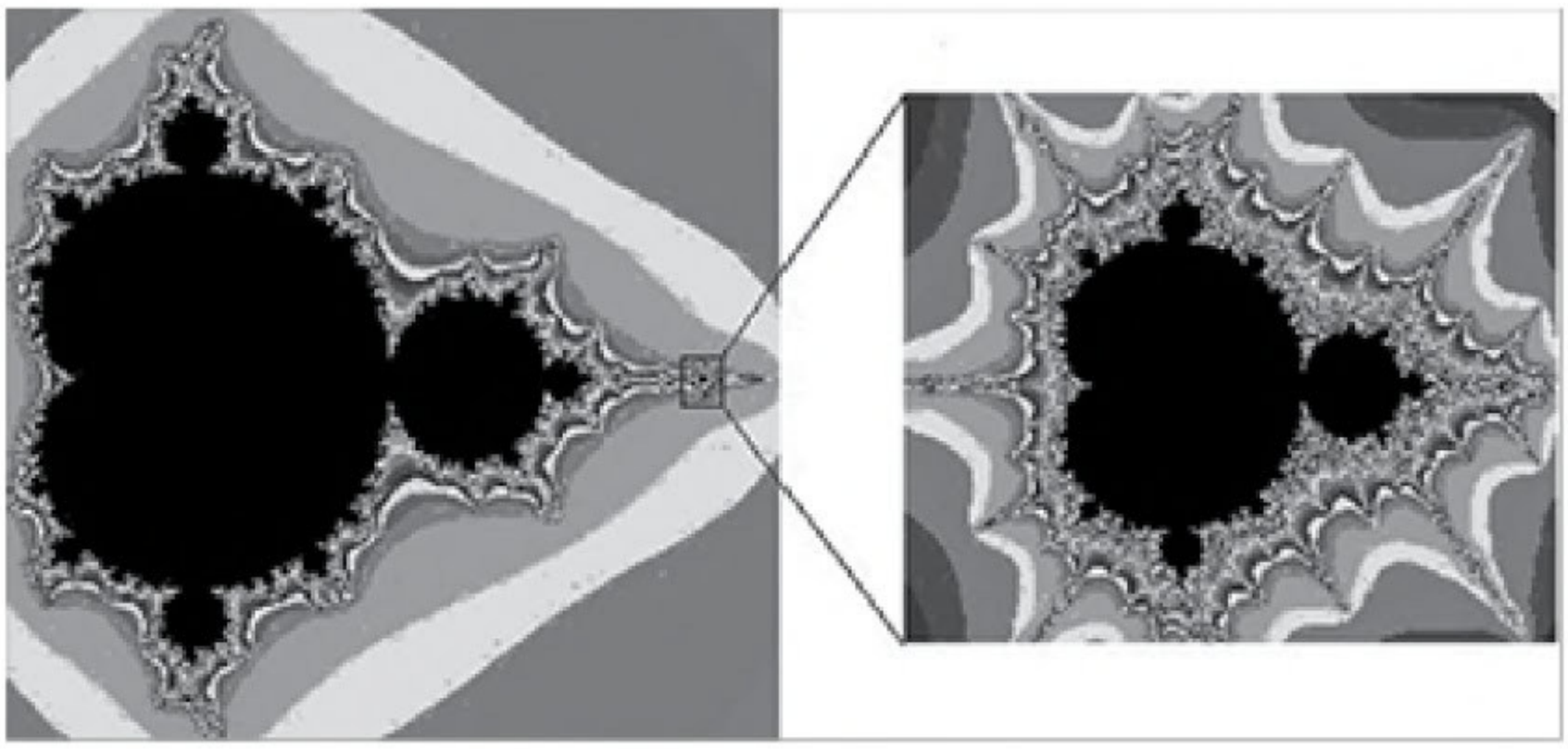


Figure 6 (Left) The fractal image known as the Mandelbrot set. (Right) An enlargement of an area of the image on the left. Fractals are finite, inasmuch as the interior border can be considered a sphere, or a closed loop. However, fractals also are seemingly infinite, in that upon closer inspection, that internal border reveals endless convolutions and patterns. These images show how patterns are repeated throughout different levels of the fractal structure. Such a repetition of pattern within pattern, of structure within structure, of form within form, occurs as the result of *iterant processing*. Reality itself evolves through an iterant, or repetitive and progressive, process (i.e., dualization or self-relation), causing patterns, structures, and forms to repeat themselves at different relational levels of existence. For example, organic cellular structure is a fractal repetition of the underlying cellular structure of reality itself.

The process by which absolute existence evolves into relative existence, as described here, is analogous to the process by which fractal images are generated—i.e., through an iterant, or repetitive and progressive, process. In the case of existence, the "equation" is the process of successive dualization, of repetitive and progressive self-relation, and what's always fed back into that equation is existence itself, albeit relative existence.

We, as organic beings, are a process, pattern, and structure that exists within the larger process, pattern, and structure which is the universe. So, it's not unreasonable that the cellular pattern and structure of organic existence would itself be a repetition of a larger, universal cellular pattern and structure which is the framework and context for all organic existence.

However, there's a very important distinction between organic cell

division and the process of successive dualization of existence that produces reality cells. This distinction is as follows. In organic cell division, once a cell divides, two new cells appear, and the original cell is no more, having become two cells. In contrast, in the process of successive dualization of existence, when absolute existence dualizes into complementary realities, or two reality cells, the original or precursor existence still remains unchanged and unbroken, as depicted in figure 5. *What is created through the process of successive dualization is simply another relational level of existence within the preceding relational level of existence.* Since the process of successive dualization that occurs within each relational level of existence creates another level of reality that's actually a relationship between aspects of the preceding relational level of existence, the preceding relational level of existence must remain as the foundation for the realities that develop within it. Were the preceding relational level of existence to cease to exist once it had dualized, then there would no longer exist any underlying basis for the realities that develop within it. This situation would be as if, when you broke a stick in two, on some other level the stick remained whole to form a basis for the pieces that now exist. The mother doesn't cease to exist when the child is born. The mother, absolute existence, continues to exist and so provides the child, relative existence, with its very basis for existing. This is simply the nature of relative existence.

This existential cellular structure, this relational matrix, that evolves as a result of the process of successive dualization of existence, of repetitive and progressive self-relation, isn't static. The relational matrix is composed of interconnected, interrelated, mutually coexistent reality cells. As we'll explain in the next section, this mutual coexistence creates an *ongoing dynamic* between the reality cells that's inseparable from the structure their relationships form. In order to understand how a relational matrix functions and, eventually, how and why space-time exists and functions as it does, we must understand not only the structure but also the dynamic of relative existence.

Before we proceed, let's briefly review the essential concepts presented thus far.

CONCEPTUAL CHECKPOINT I–1

Space-time has a structural aspect, as evidenced by the constraints present in physical reality.

Structure is relationship.

The structure of space-time must therefore be made up of relationships between whatever it is that composes space-time.

Space-time exists and can most generally be said to be composed of existence.

The relationships that make up the structure of space-time must therefore be relationships existence has formed with itself, since there's nothing else.

The structure of space-time can therefore be modeled in terms of relationships existence has formed with itself.

Existence can form a relationship with itself by dualizing into a pair of complementary realities.

Complementary realities are each opposite and mutually coexistent.

Existence can form multiple levels of reality by successively dualizing, i.e., by repetitively and progressively forming relationships with itself.

The process of successive dualization of existence creates a relational structure, called a relational matrix, which is composed of individual units of relative existence called reality cells.

Section 4 The Structural and Dynamic Aspects of the Relational Matrix

4.1 *The structural aspect*

A *reality cell* is defined as an individual unit of relative existence. We will consider reality cells to be theoretically perfect spheres. Why are spheres an appropriate way of describing the form of these fundamental realities, the form that existence takes on when it comes to exist in relation to itself? Because the sphere is a structure wherein the relationship of any part of that structure to its center is equivalent. All realities have an equivalent relationship to their source, their center —i.e., absolute existence—since all realities are nothing more than absolute existence having formed a relationship with itself. Thus, the structure of these most basic of realities is itself an expression of that equivalence of relationship to center or source.

This isn't to say that reality cells are physical structures, for they're not. Reality cells are *relational structures* that together form the basis of what we experience as physical structure. *Structure is relationship*. The structure of a circle (or sphere) has both a nonlinear and a linear aspect, called the circumference and diameter, respectively. The relationship between the circumference and diameter that defines the geometric structure of a circle can be expressed as a *ratio*. The relationship (ratio) of a circle or sphere to itself—i.e., its circumference divided by its diameter—always generates the irrational number π (Greek letter pi), which cannot be represented as a ratio between any two whole numbers. For this reason, it can be said that the perfect circle or sphere is an *irrational structure*.[4]

This irrationality of the perfect circle or sphere is consistent with the nature of reality cells as relative existences. The relative existence and relational structure of a reality cell aren't derived from within the reality cell itself but exist only within the context of an existential relationship with other reality cells. Thus, the spherical structure of any reality cell is by itself not existent, not rational, not real. A reality cell is a structure that's no structure. It seems to be there, but if you try to grab it, it won't be there, because what it is, it is "in relation to." Likewise, a rainbow is a structure that's no structure. It seems to be there, but if you chase after it, it won't be there, because what it is, it is "in relation to." You can't grab hold of a reality cell any more than you can reach the end of a rainbow, because no reality cell exists independently. Rather, each reality cell exists only in relation to and in dependence on other reality cells.

Structure is relationship. So, the structure formed by two reality cells existing in relation to each other could be expressed by the *ratio* between those two *irrational* structures. Since the irrational structure of each reality cell is expressed as π, the *rational structure* created by two reality cells existing in relation to each other would be expressed as the ratio π/π, which equals 1. What this example illustrates is that two reality cells, each of which by itself is an irrational structure, together, as a relational whole, form the basic unit of rational structural, i.e., 1. What this example also illustrates is how two things that are individually irrational, ungraspable, and unreal become rational, graspable, and real by forming a whole structure that's composed of each thing existing in relation to the other. Thus, whereas a reality cell is the individual unit of relative existence, it

takes two reality cells existing in relation to each other to form the basic unit of rational structure.

The relational matrix is a grand rational structure whose basic components don't exist independently, don't individually provide a structural reality. However, when those same components are considered as a relational whole, they do exist, and together they make up the framework of reality. A single stick won't stand on its own, won't form a structure. To form a structure, the stick must be broken in two, and the two halves leaned against each other. This is how existence, by repetitively and progressively forming relationships with itself, lays the foundation that eventually allows something to be created out of nothing.

In any case, since we've defined the reality cells as spherical, the structural differences between reality cells can represent only differences in size or scale rather than differences in shape, and thus represent differences in volume. For this reason, we'll address the structural aspect of the relational matrix through what we'll term the *volumetric existence* (VE) of the reality cells. The volumetric existence of a reality cell is simply a *relative measure* of reality-cell size that provides a means of quantifying the structural aspect, or *spatial construct*, of a reality cell.

We must say a relative measure, because the quantitative attributes that we'll assign to reality cells have meaning only in relation to how they apply to other reality cells. Thus, the VEs of two reality cells can be either equal, or larger or smaller. For example, the VE of a reality cell will always be smaller than the VE of the reality cell that dualized to create it.

We'll term any given level of dualization of the relational matrix, wherein all the reality cells are the same size—i.e., have the same VE—a *relational level of existence*. The use of these terms is summarized in **figure 7**.

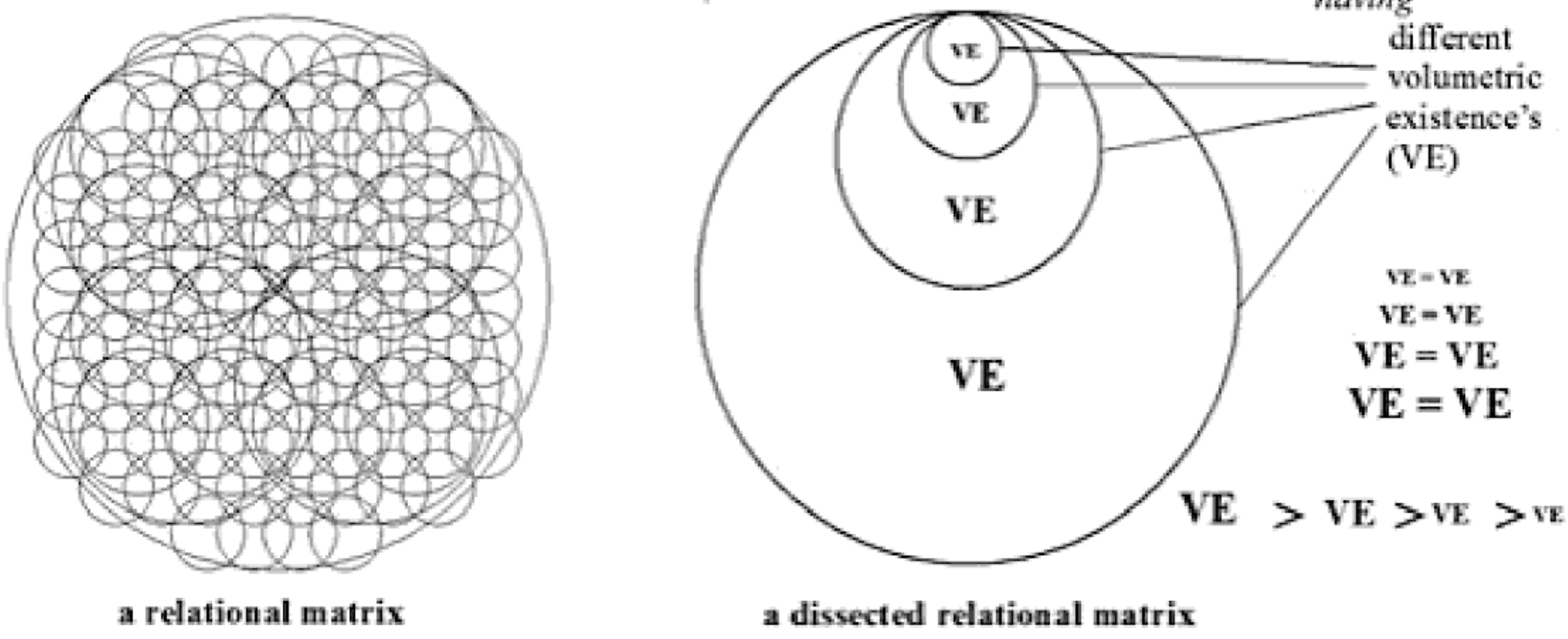


Figure 7 (Left) A relational matrix composed of four relational levels of existence. (Right) The equivalence of volumetric existence (VE) for all reality cells that exist at the same relational level of existence, and the relationship between the VEs of reality cells that exist at different relational levels of existence. The pyramid at the top shows that each relational level of existence is built upon the foundation of all previous relational levels of existence.

4.2 The dynamic aspect

Again, *structure is relationship*. The structural aspect of the relational matrix is represented by the relationship between two reality cells, and that relationship is always dynamic. For this reason, the relational matrix is a *dynamic structure*, and so the relational structure of space-time is also dynamic.

As alluded to previously, the dynamic that exists between reality cells is the result of their mutual coexistence. Although reality cells are defined in relation to each other, because they aren't separately existent, they have no absolutely real boundaries or dividing lines where one reality cell ends and another begins. Because of this mutual coexistence, the structure that defines each reality cell isn't static but dynamic, because each reality cell, each individual unit of relative existence, continuously penetrates the reality cells adjacent to it. This *continuous interpenetration* of the reality cells creates an ongoing stable and definable dynamic within the relational matrix, the specifics of which we'll discuss shortly.

Although we've discussed the structural aspect of the relational

matrix first, note that the structural and dynamic aspects of the relational matrix, and of the reality cells which compose it, are themselves mutually coexistent, neither aspect being primary or secondary, but rather each aspect existing as such only in relation to the other. Without the dynamic, there'd be no structure; and without the structure, there'd be no dynamic.

This coexistence of structure and dynamic between the reality cells that compose the relational matrix is analogous to the coexistence of structure and dynamic between two sticks leaned against each other. In each case, the stable structure is maintained by an *ongoing dynamic* between the relational poles. The stick structure is maintained by the sticks' pushing against and attempting to penetrate each other, whereas the cellular structure of the relational matrix is maintained by the reality cells' continuously penetrating each other.

This dynamic aspect of the process of successive dualization of existence, wherein relational structure is sustained by the relational poles resulting from that process of dualization continuously penetrating each other, is represented by the T'ai-chi T'u symbol, as depicted in **figure 8.** We'll use this diagram to exemplify the nature of the ongoing dynamic between complementary realities and, thus, between the reality cells of the relational matrix.

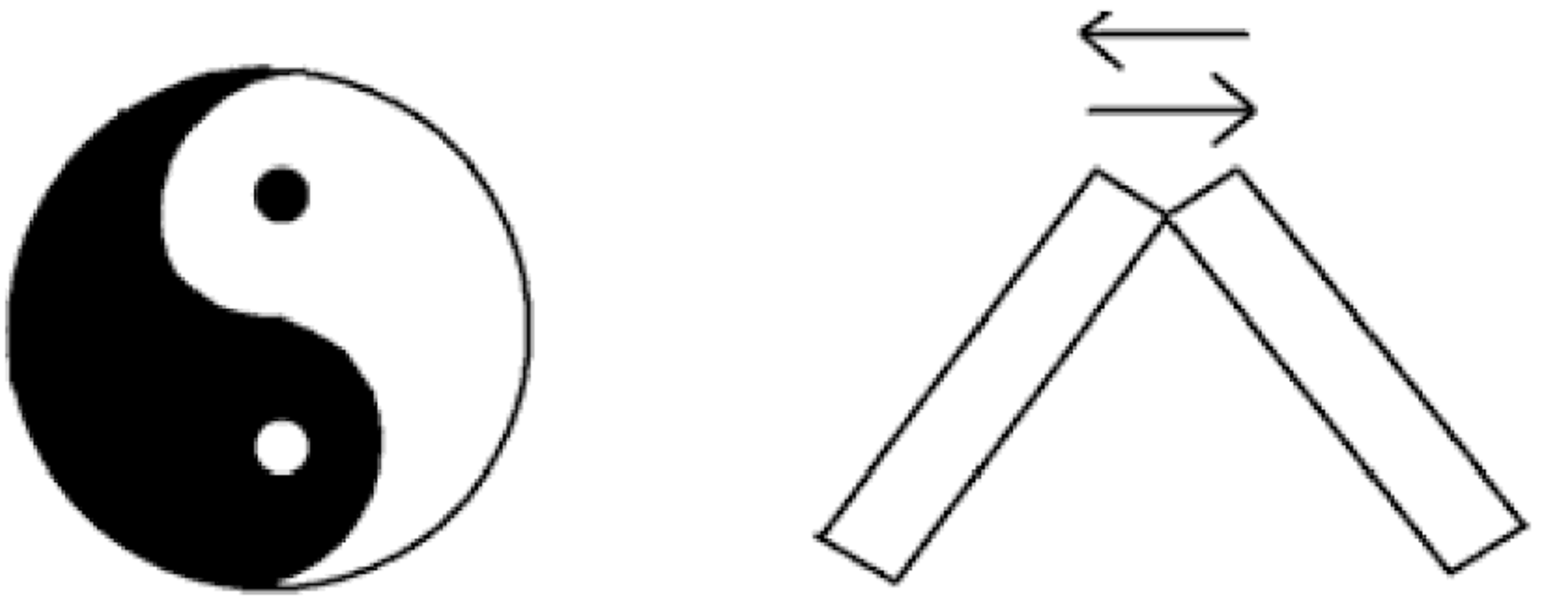


Figure 8 The T'ai-chi T'u symbol (or yin/yang diagram) as a representation of the dynamic that exists both within relative existence and between relative existences. The structure formed by relative existences isn't static; rather, that structure is sustained by each relational pole continuously penetrating its complementary pole. On the right, the structure created by two sticks is maintained as each stick pushes against the other. On the left, the dynamic structure of relative existence is maintained as each relational pole opposes, through continuous interpenetration, its complementary pole.

In the yin/yang diagram, we have an existent reality dualizing or dualized into a *relational pair* called yin and yang. The mutual

coexistence and interdependence of each oppositely aspected *relational pole* is symbolized by the inclusion of the opposite aspect within each pole. The *structural aspect* of relative existence is symbolized by the equivalent size of each relational pole; the *dynamic aspect* of relative existence is symbolized by the implied cyclic motion of each relational pole around the other.

These relational poles of yin and yang, however, don't have a separate or independent existence as if they were two balls (or tadpoles) orbiting each other. This implied cyclic motion of each relational pole around the other is what *appears* as each relational pole continuously penetrates the other. In this way, a *dynamic equilibrium* is established, which appears as the stable cycling of each relational pole around the other. What's "this" becomes "that," and what's "that" becomes "this." As we'll demonstrate in chapter 2 of part I of this book, this dynamic equilibrium is the basis of what we experience as the dynamic aspects of physical reality—i.e., time and energy.

Within the relational matrix, the continuous interpenetration of the reality cells results in a *relational structure* wherein each reality cell is expanding into all the reality cells adjacent to it. This continuous interpenetration and interexpansion creates a *stable dynamic structure* wherein the reality cells continuously change places, and so *exchange content*, with adjacent reality cells, as depicted in **figure 9**.

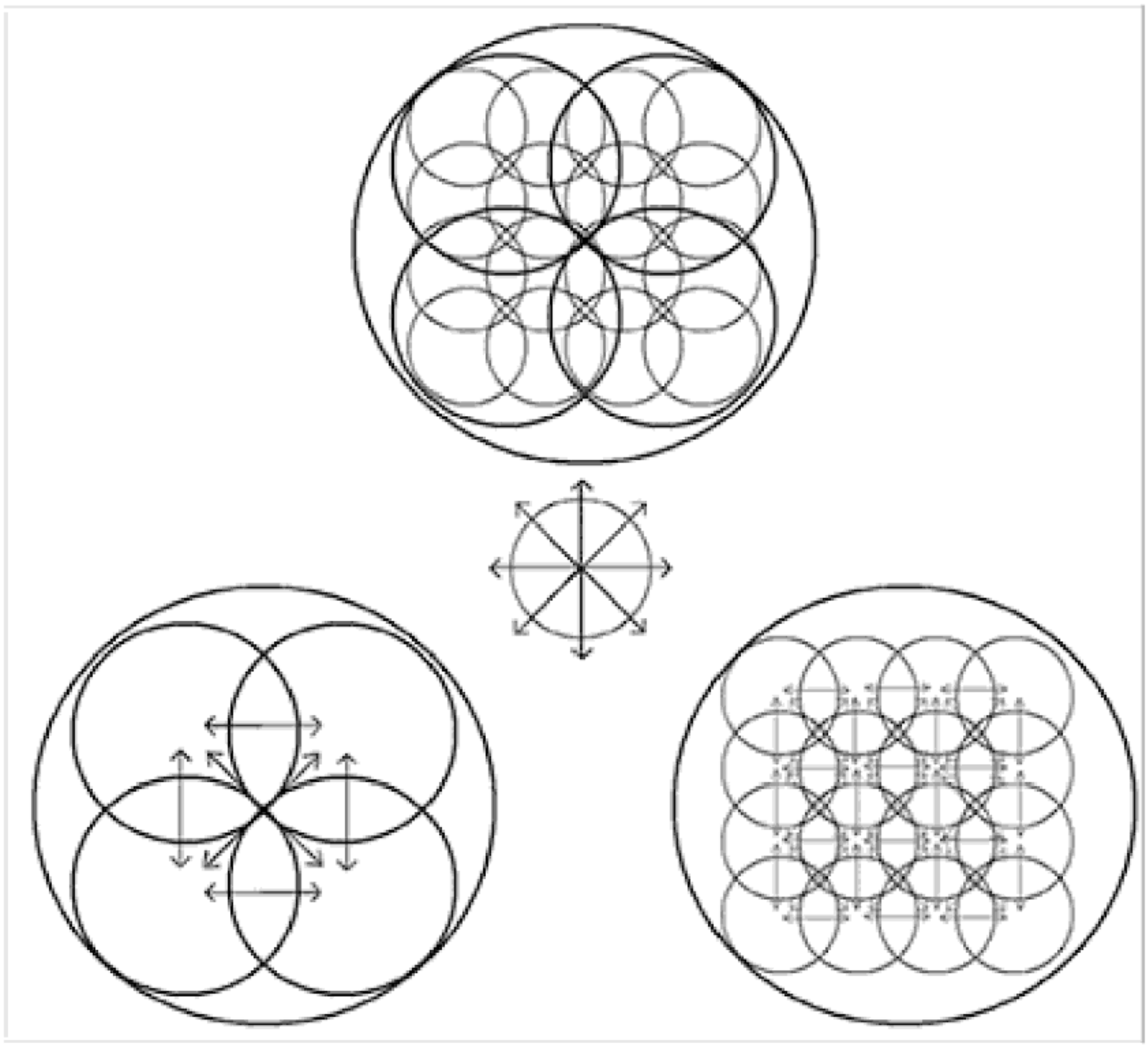


Figure 9 (Left) At the top, a relational matrix with three relational levels of existence. The two internal levels of relational existence are depicted separately below so that the arrows which represent the continuous interpenetration and interexpansion of the reality cells are visible. The main point here is that what exists as spatial content in one area of the relational matrix continuously moves into adjacent areas, establishing a stable dynamic structure. All of the arrows can be considered expansion vectors of equivalent magnitude, regardless of the size of the reality cell that's expanding. (Right) The continuous interpenetration of the reality cells at different relational levels of existence is represented by a compound yin/yang diagram.

Note that, although the exchange of spatial content *between* reality cells is ongoing and dynamic, that same dynamic also supports the pattern of relational structure, or spatial construct, which is the stable set of relationships *within* the relational matrix. That is, although each reality cell is defined as continuously penetrating adjacent reality cells, since all the reality cells are doing the same thing, the net effect is the creation of a *stable structure or spatial construct that has intrinsically dynamic content*.

To better understand how a stable structure can be maintained within the context of an ongoing dynamic, imagine two balloons in a closed space. Now, each balloon is blown up, attempting to expand. Neither balloon can actually expand, since it has nowhere to go

except into the space occupied by the other balloon. Thus, each balloon, in its attempt to expand, moves into the space occupied by the other balloon. What actually happens is that the balloons just end up changing places. So, we're left with what appears to be the same *spatial construct* of two balloons in a closed space, but the *spatial content* which composes that structure has moved, or changed places.

The effect of this continuous interpenetration and interexpansion of the reality cells is to create a continuous exchange of spatial content *between* reality cells, which, in effect, creates a stable dynamic structure *within* the relational matrix. The nature of this content exchange between reality cells is cyclic or periodic, allowing us to define the dynamic aspect of the reality cells in terms of their cyclic or periodic activity.

A full cycle, or period, of reality-cell interpenetration consists of a pair of oscillations. We'll define one half of the cycle, or one oscillation, as the expansion of one reality cell into an adjacent reality cell. We'll then define the other half of the cycle, or the other oscillation, as the adjacent reality cell expanding back into the one reality cell.

Classically, a full cycle of an oscillation is called its *period*. Therefore, the period wherein a complete exchange of spatial content occurs between two reality cells we'll call the reality-cell *period of content exchange* (POCE), as depicted in **figure 10**. The reality-cell POCE will be useful as a relative measure of the movement of spatial content through the relational matrix.

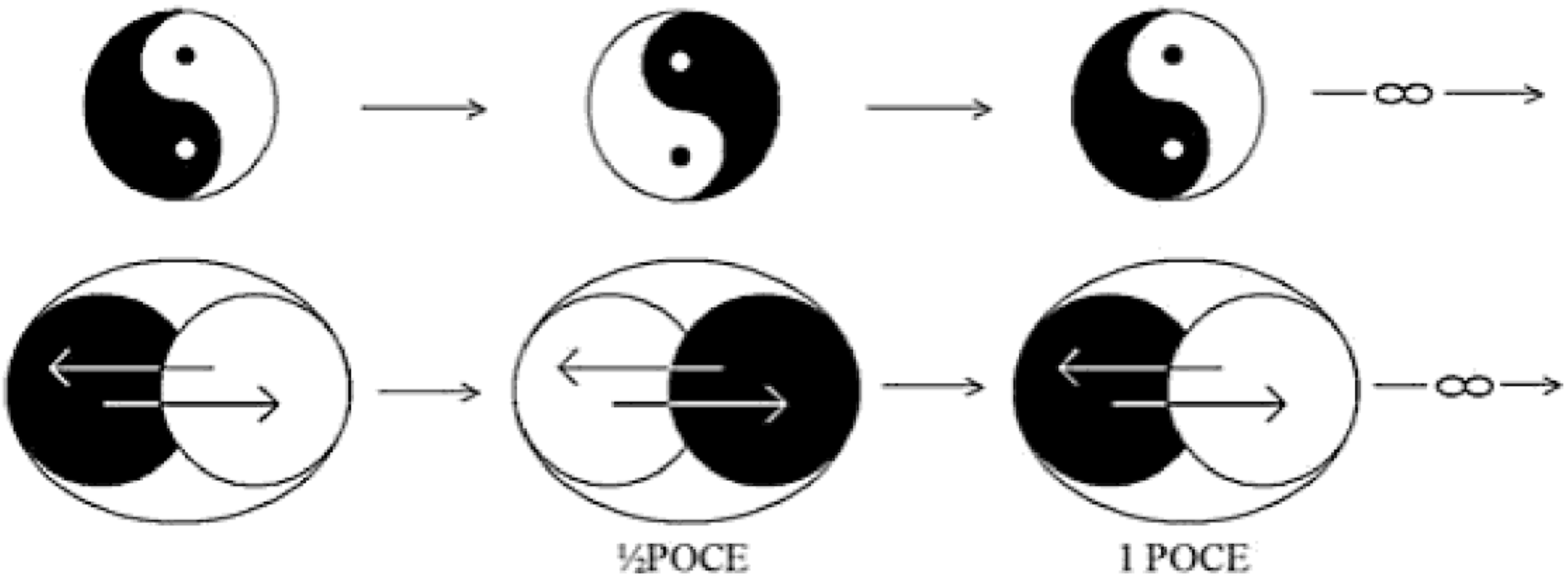


Figure 10 The reality-cell period of content exchange (POCE), illustrating the cyclic or periodic exchange of spatial content that occurs between reality cells as they continuously penetrate each other. One full

cycle of content exchange is one POCE. The paired arrows represent vectors of reality-cell expansion or penetration.

Now that we've defined both the structural and dynamic aspects of the reality cells in terms of the VE and POCE, respectively, we'll examine the relationship between these complementary aspects of reality cells.

4.3 *The relationship between reality-cell structure and dynamic*

4.31 *The rate-of-penetration constant*

In order to discuss the relationship between reality-cell structure and dynamic, we must first examine the *rate of penetration* between reality cells. This rate of penetration was depicted as the vectors of reality-cell expansion or penetration in figures 9 and 10.

As we've said, the reality cells continuously penetrate each other, creating a cyclic or periodic exchange of spatial content within the relational matrix. This continuous interpenetration of the reality cells must occur at a certain rate or velocity. The question is, is this rate of penetration the same or different for reality cells at different relational levels of existence, i.e., reality cells with different VEs? To answer this question, let's look again at what this rate of penetration represents.

The rate of penetration represents one reality cell penetrating the area occupied by another reality cell. Regardless of the size of the reality cells in question, it's still all the same existence (absolute existence) coming to exist in relation to itself and thus penetrating itself. That is, regardless of the size of the reality cells involved, this continuous interpenetration always represents the same existence undergoing the same process. Therefore, as part of the relational-matrix model, we'll define the rate of penetration of the reality cells as equivalent at all relational levels of existence. This rate of penetration is thus defined as invariant, i.e., as a constant, the *rate-of-penetration constant* (*k*RP).

Having defined the rate of penetration as a constant, we're now in a position to define the relationship between the structural and dynamic aspects of the reality cells, i.e., the relationship between reality-cell volumetric existence and period of content exchange, respectively.

4.32 *The inverse relationship between reality-cell structure and dynamic*

All reality cells, regardless of their relative size or volumetric existence (VE) and corresponding relational level of existence, continuously penetrate each other at the same constant rate. Thus, all reality cells with the same VE—i.e., existing at the same relational level of existence—will have the same period of content exchange (POCE). However, reality cells with smaller VEs will have larger POCEs (faster content exchange) than reality cells with larger VEs. Conversely, reality cells with larger VEs will have smaller POCEs (slower content exchange) than reality cells with smaller VEs. These relationships are depicted in **figure 11**.

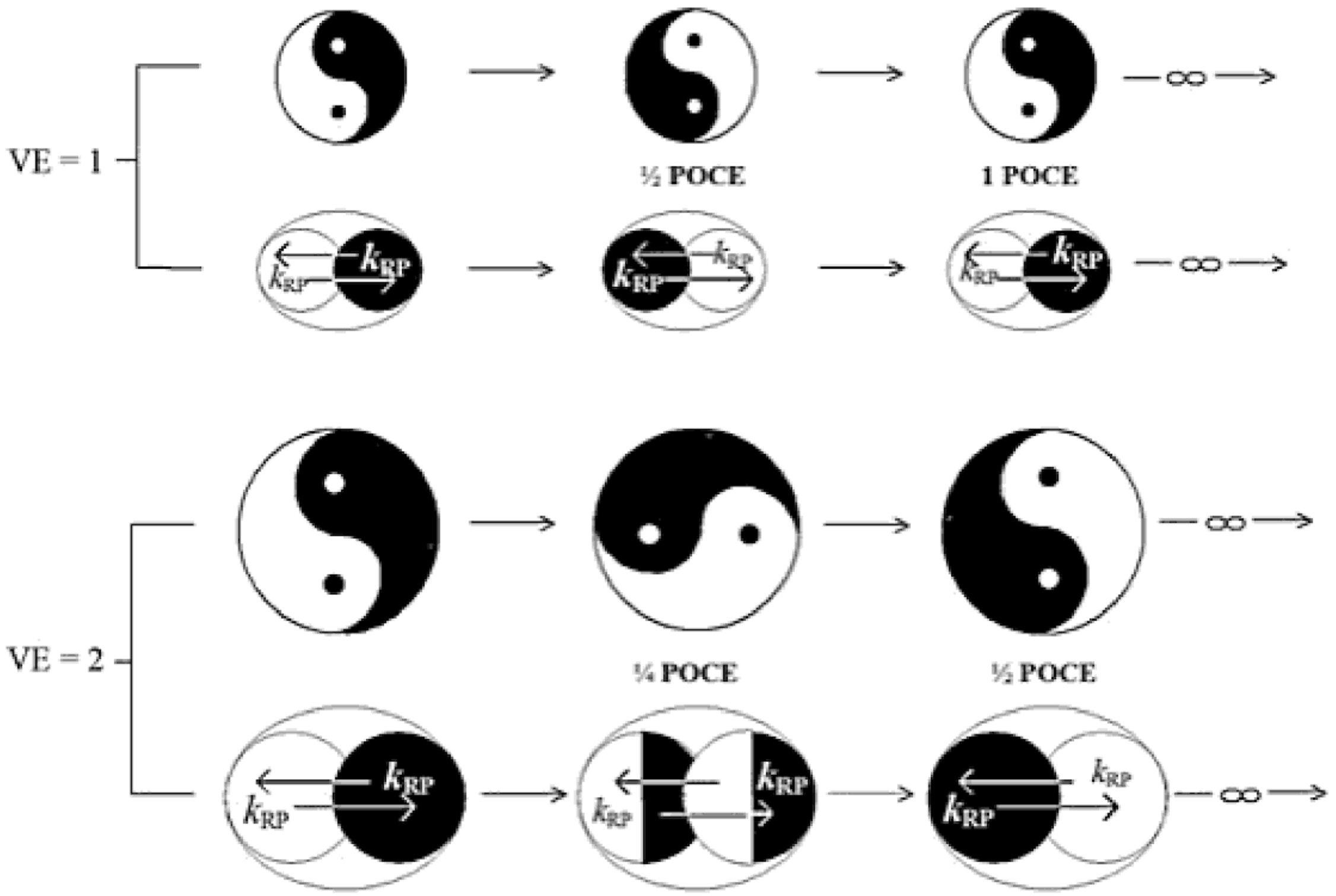


Figure 11 Since the rate of penetration is invariant, smaller reality cells will undergo a period of content exchange (POCE) faster than will larger reality cells. As we'll explain below, since the volumetric existence (VE) and POCE are related through a constant, i.e., *k*RP, the relationship between VE and POCE is *inverse*. As one relative measure increases by a multiplier, the other is divided by that same unit. For instance, in the example above, the reality cell with a VE 2× as large as the other reality cell's has a POCE ½ that of the smaller reality cell.

It simply takes longer for larger reality cells to undergo a POCE than it does for smaller reality cells because their spatial content has farther to go to get there and back again. Basically, if something has

twice the distance to go to get somewhere, and it's going at the same rate, it will take twice as long to get there. If it has four times the distance to go, it will take four times as long; and if it has one-fourth the distance to go, it will take one-fourth as long. Essentially, as reality-cell size increases, the relative measure of reality-cell dynamic decreases—i.e., as VE goes up, POCE goes down. Conversely, as VE goes down, POCE goes up.

The constancy of the rate of penetration allows us to mathematically define an *inverse relationship* between reality-cell VE and POCE. The VE is linked to the POCE through the rate-of-penetration constant (*k*RP). Therefore, we can define the inverse relationship between reality-cell VE and POCE as VE = *k*RP/POCE or POCE = *k*RP/VE, or simply POCE × VE = *k*RP.

What these equations state is that for each unit of increase in reality cell size (VE), the POCE for that reality cell will be decreased by the fraction of that unit of increase. Conversely, for each unit of decrease in reality-cell size (VE), the POCE for that reality cell will be increased by the denominator of the fraction of that unit of decrease.

For example, a reality cell twice (2×) as large as another reality cell will have one-half (½) the POCE, and a reality cell four times (4×) as large as another reality cell will have one-fourth (¼) the POCE. Conversely, a reality cell one-half (½) the size of another reality cell will have twice (2×) the POCE, and a reality cell one-fourth (¼) the size of another reality cell will have four times (4×) the POCE.

Again, this inverse relationship between reality-cell structure and dynamic exists because the rate of penetration is *invariant*. The actual value of that constant isn't itself important in defining the relationship between reality-cell structure and dynamic; what's important is only that it's a constant.

In chapter 2 of part I of this book, where we'll demonstrate that space-time functions as a relational matrix, the reality cells' VE will be related to the *wavelength* of electromagnetic radiation, and the reality cells' POCE will be related to the *frequency* of electromagnetic radiation. What we'll show is that the inverse relationship between reality-cell POCE and VE corresponds to the inverse relationship between the frequency and wavelength of electromagnetic radiation, and that the rate-of-penetration constant (*k*RP) corresponds to, and forms the basis of, the speed-of-light constant.

We've now described a relational matrix, which, through the dynamic equilibrium established by the continuous mutual

interpenetration of reality cells, maintains a relatively static structural integrity, while being at the same time in a continuous internal flux.

Eventually, we'll show that these complementary structural and dynamic aspects of the relational matrix form the basis of the *space-time duality*, with space being primarily the manifestation of the structural aspect of the relational matrix, and time being primarily the manifestation of the dynamic aspect of the relational matrix.

CONCEPTUAL CHECKPOINT I–2

The process of successive dualization of existence creates a stable set of relationships between complementary realities, giving reality its structure.

These stable relationships are maintained through an ongoing dynamic within and between those complementary realities, making the structure of reality intrinsically dynamic.

Existence, by repetitively and progressively forming relationships with itself, creates a dynamic structure, which is termed a "relational matrix."

A reality cell is the individual unit of relative existence.

Two reality cells existing in relation to each other are the basic components of relational structure.

Reality cells have interrelated structural and dynamic aspects.

The structural aspect of reality cells refers to their relative size and is defined as their volumetric existence (VE).

The dynamic aspect of reality cells refers to their continuous interpenetration, which creates a continuous cyclic exchange of spatial content. The relative rate of content exchange is defined as the period of content exchange (POCE).

The rate of penetration of the reality cells is invariant and is called the rate-of-penetration constant (*k*RP).

The relationship between reality-cell structure (VE) and dynamic (POCE) is inverse and is defined through the rate-of-penetration constant as VE × POCE = *k*RP.

Section 5 Defining the Structure of the Relational Matrix

In the preceding section, we defined the structural and dynamic

aspects of reality cells. In this section, we'll discuss how reality cells are organized into a relational whole.

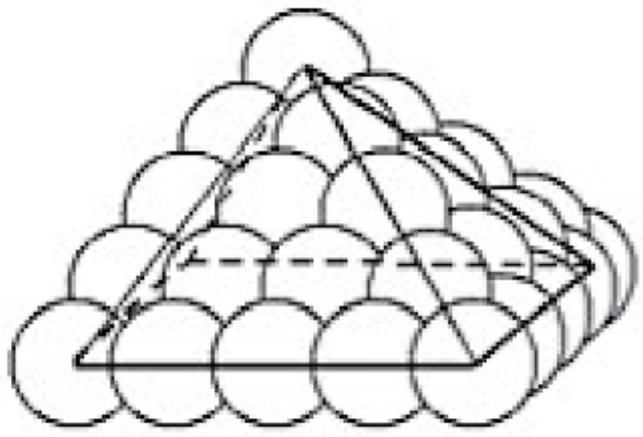
The goal of part I of this book is to relate the behavior of the relational matrix to the behavior of physical reality, and thereby to demonstrate that space-time functions as a dynamic structure, composed of existence repetitively and progressively forming relationships with itself. In order to relate the relational matrix to physical reality, we need to define a particular configuration of the relational matrix in terms of a particular arrangement of reality cells, so that certain aspects of physical reality can be visualized or visually modeled.

Defining a particular configuration of the relational matrix means defining how the reality cells are arranged into a stable set of relationships. Heretofore, we've defined the reality cells as spheres, but how are those spheres arranged in three dimensions to form the relational matrix, i.e., the structure of space?

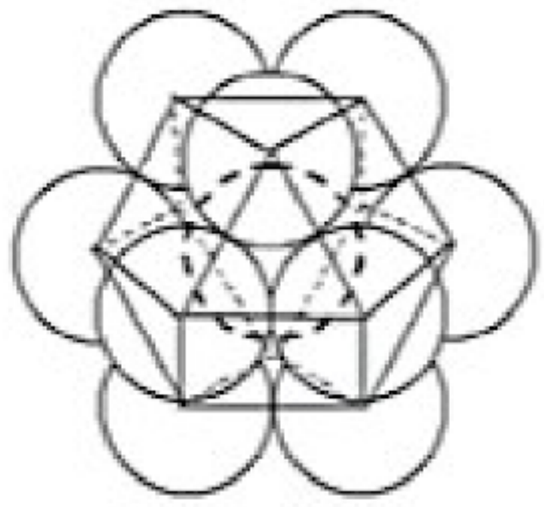
Since we've defined the reality cells as spheres, we can describe their arrangement in terms of what's called *sphere packing*. Sphere packing involves analyzing the percentage of space that's occupied when equiradial spheres are arranged in a certain way. For our purposes, we're interested in the relationships that occur, and the structure that's created, when spheres (or reality cells) are packed or arranged in the most symmetrical way.

Symmetry is spatial balance, and balance is structural equivalence. All reality cells are equal, inasmuch as they're all ultimately the same existence coming to exist in relation to itself. Therefore, as an expression of the absolute existence underlying all relative existence and, thereby, all relationships and all structures, how reality cells are arranged into a stable set of relationships will here be defined as the spatial arrangement of packed spheres that creates the greatest symmetry, balance, and equivalence of relationship between those spheres.

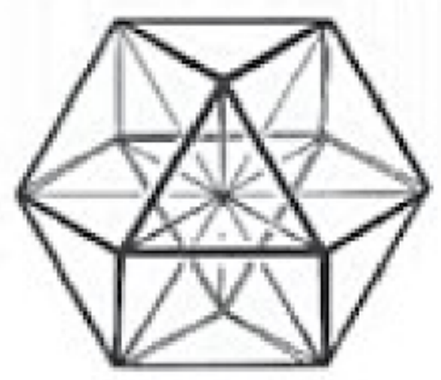
As it turns out, the most symmetrical, balanced, and equivalent spatial arrangement of packed spheres is also the most economical—i.e., the way of placing the most spheres into a given area (called closest packing or close packing) also results in maximally symmetrical, balanced, and equivalent relationships between adjacent spheres. This arrangement, called *cubic close packing*, is depicted in **figure 12**.[5]



cubic closepacking



a nuclear cluster: 13 spheres in cubic-closepacking array (with superimposed cuboctahedron)



cuboctahedron
(vector equilibrium)
vector diagram of 13 spheres in cubic-closepacking array

Figure 12 The symmetry, balance, and equivalence of relationship between adjacent spheres that results from cubic close packing of equiradial spheres. (Left) Cubic close packing, i.e., stacking spheres in the form of a pyramid, allows the maximum number of spheres to be placed into a given area. This method of close packing creates an arrangement of spheres wherein each sphere is surrounded by, or adjacent to, 12 other spheres (center). This arrangement of 13 spheres is referred to as a *nuclear cluster*. In order to visualize the structure created by the relationships between these 13 spheres, these 13 spheres can be represented vectorially as the geometric structure called a cuboctahedron, or what Buckminster Fuller called "vector equilibrium." (Right) The spheres are represented by points at their center, and their relationships are depicted by lines or vectors between those points. As can be seen from the structure of the cuboctahedron, in the cubic-close-packing arrangement, each central sphere has an equivalent relationship from center to center to all 12 adjacent spheres, in terms of both distance and angle.

Drawings in center and on right from Amy C. Edmondson, *A Fuller Explanation: The Synergetic Geometry of R. Buckminster Fuller* (Boston: Birkhäuser, 1987), reprinted with permission.

There's some precedent for describing the spatial construct in terms of this particular arrangement of close-packed spheres. Buckminster Fuller based much of his work on a description of the spatial construct in terms of the cubic-close-packing arrangement of spheres.[6] Fuller wasn't so much interested in the spheres themselves as in using sphere packing as a medium through which spatial constraints could take visible shape. In order to study the equilibrious distribution of forces in space, Fuller converted the cubic-close-packing arrangement into a system of vectors that he called the *isotropic-vector matrix,* depicted in **figure 13**. Although in this book we're interested in the spheres themselves as reality cells, as the containers of spatial content, Fuller's vector description of the cubic-close-packing arrangement of spheres is useful for allowing a visualization of the consistency of the three-dimensional structure

formed by this particular arrangement of spheres.

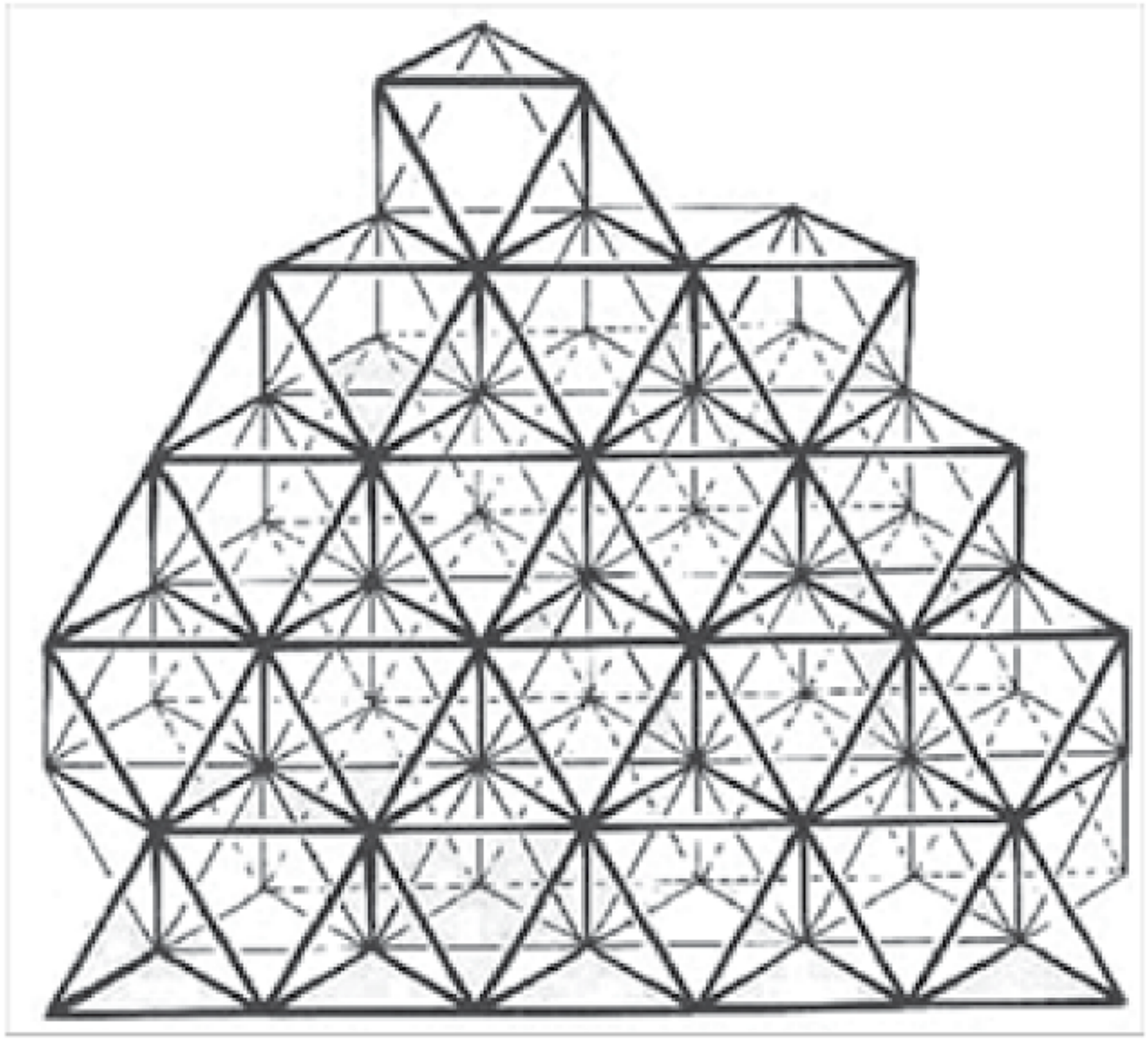


Figure 13 The cubic-close-packing arrangement of spheres reduced to vectors, with each vertex representing the center of a sphere. Buckminster Fuller called this particular arrangement the *isotropic-vector matrix* (IVM). Each intersection of vectors, i.e., each vertex, is also a point that's the center of a cuboctahedron or vector equilibrium. Thus, each vertex represents the center of a sphere in a nuclear cluster. This representation allows a visualization of the symmetry, balance, and equivalence of relationship that exist between spheres or reality cells when placed in the cubic-close-packing arrangement. The distance between adjacent spheres is equal, and all the angles between adjacent spheres are also equal.

Drawing from Amy C. Edmondson, *A Fuller Explanation: The Synergetic Geometry of R. Buckminster Fuller* (Boston: Birkhäuser, 1987), reprinted with permission.

The important points to note here are that describing space as having a structure, and describing that structure or shape in terms of an arrangement of spheres, aren't themselves new ideas. Furthermore, if space can be described in terms of an arrangement of spheres, the way those spheres relate to each other as a representation or manifestation of the spatial construct has already been well defined by Buckminster Fuller.

As Arthur Loeb stated in the introduction to his book *Space Structures*: "Space is not a passive vacuum, but has properties that impose powerful constraints upon any structure that inhabits it. These constraints are independent of specific interactive forces, hence geometrical in nature."[7] In other words, space has a structure that

places constraints upon what can exist as structure within it, in the same way that a room has structural dimensions which limit the size and shape of what can be placed in that room. Expressed in terms of relative existence, the relationships between different aspects of existence that form the spatial structure limit the further types of relationships and structures that can form upon, and as extensions of, the underlying framework which is the spatial structure.

As we'll describe in detail in chapter 2 of part I of this book, *what we experience as physical reality doesn't exist "in" space, somehow apart from space, but rather exists as an extension of the underlying spatial structure*. For this reason, the relationships that are expressed in material structures and physical reality must have as their basis relationships already present in the spatial structure. In order to erect a building, there must be a foundation. *The foundation upon which physical reality rests is the relational structure of space-time*. For this reason, the close packing of physical spheres is a relevant and valid way of representing and modeling spatial relationships, constraints, and structure.

A relationship can't be expressed as a structure unless there's some *underlying basis* for that relationship. The underlying basis for the relationship that forms the relational matrix or spatial structure is absolute existence itself. Once that underlying spatial structure is established, all other relationships and structures which extend as realities from the foundation of that structure are limited and constrained by the fundamental relationships which compose that structure. Were the spatial structure arranged differently, then the arrangement of spheres that's the most symmetrical, equilibrious, and closest packing would itself be different, because space would allow it —would, in fact, demand it—as a reflection and extension of the relationships that form its own intrinsic structure.

Whereas geometry can be used to define material structures in space, the spatial structure itself determines what can geometrically exist. That is, the relationships that compose the spatial structure are what determine the relationships and, thus, the structures that can exist as realities appearing within space.

Structure is relationship, and relationship requires constraints. The first constraint that existence imposes upon itself is that of relative existence. By placing itself in a state of existence that's dependent on a complementary state of existence, existence imposes a constraint upon itself and so becomes a relational structure. This primary

constraint creates *the primary structure of reality—i.e., the relational matrix*. All other structures must use this most basic structure as a foundation, as an underlying framework, and so all other structures that form within this reality, as extensions of this reality, are limited and constrained by the arrangement of this primary structure.

Thus, modeling space in terms of a cubic-close-packing arrangement of spheres isn't arbitrary or chosen at random but is used here because it's the most symmetrical, balanced, and equivalent arrangement that the spatial structure allows. This particular spatial arrangement reflects the underlying equivalence of structure and relationship that results from existence coming to exist in relation to itself.

However, there's a significant difference between the way physical spheres can be packed to form a material structure and the way reality cells are packed to form the structure of the relational matrix. In packing physical spheres, there's no overlap between adjacent spheres, and so there's always some space left over between the spheres, no matter how closely and efficiently packed they are. In sphere-packing reality cells, because the reality cells aren't material structures but rather are relational structures, with each reality cell existing as such only in relation to the others and so containing parts of the others, there's overlap between adjacent reality cells, and so there's no left-over space between reality cells. Furthermore, there can be no space between reality cells because, as we'll show, this arrangement of reality cells itself creates what we experience as space-time—i.e., it creates a place where things can exist and happen.

Although the three-dimensional structure of the relational matrix is that of interlocking spheres, for simplicity and owing to the constraints of the literary medium we're communicating in, we'll illustrate the relational matrix primarily in two dimensions, using interlocking circles, as depicted in **figure 14.**

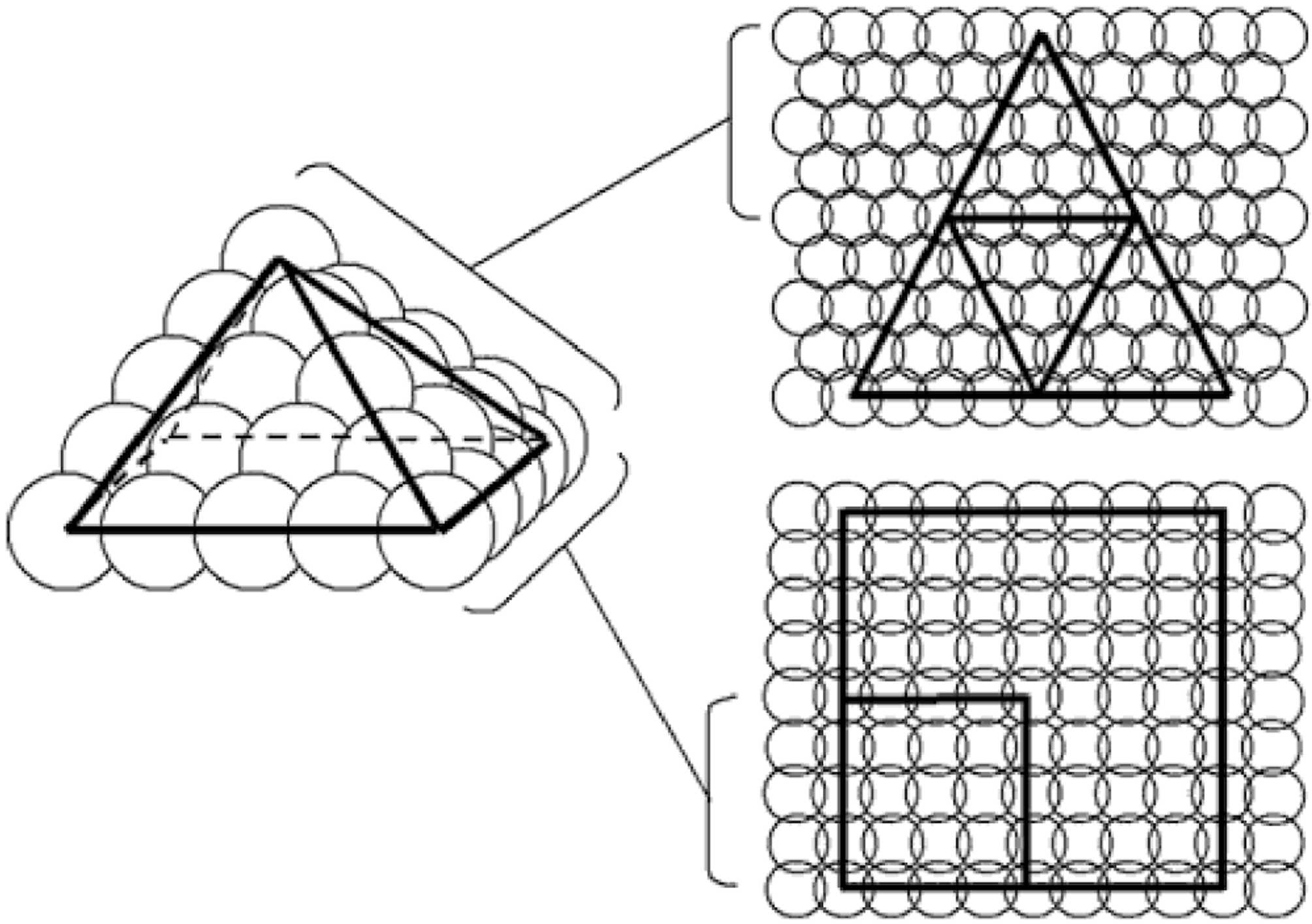


Figure 14 The translation of the three-dimensional cubic-close-packing arrangement of spherical reality cells into two-dimensional arrays of interlocking circles. The cubic-close-packing arrangement of reality cells (left) contains two distinct planar arrays of reality cells: a hexagonal arrangement (upper right) and a cubic array (lower right). In the hexagonal array, all the reality cells are adjacent, whereas in the cubic array, the reality cells that are diagonal to each other are nonadjacent. In this book, we'll use the two-dimensional hexagonal array of reality cells most often to illustrate the relational matrix.

The two-dimensional hexagonal array of reality cells is the most useful two-dimensional representation for depicting the stable dynamic relationships between the reality cells that compose the relational matrix. This two-dimensional hexagonal array of reality cells depicted in figure 14, then, will be primarily used in this book to help illustrate how the relational matrix as a whole functions as a dynamic structure.

5.1 *The uniformity and consistency of structure*

An important aspect of the relational matrix that we need to address is the uniformity and consistency of its structure. This uniformity and consistency of the structure of the relational matrix occurs both *between* reality cells existing at any one relational level of existence,

all of which have the *same* volumetric existence (VE), and *within* reality cells existing at different relational levels of existence, all of which have *different* VEs.

The uniformity and consistency of the structure *between* reality cells existing *at any one relational level of existence* refers to the situation where, regardless of the relational level of existence—i.e., regardless of reality-cell size or VE—the basic structural relationships between reality cells at that relational level of existence are always the same, in that they always occur in the cubic-close-packing arrangement. *Thus, the structure of the relational matrix is the same at every relational level of existence*, meaning that the structural relationships between reality cells existing at any one relational level of existence can always be expressed vectorially as an isotropic-vector matrix, as depicted in figure 13.

The uniformity and consistency of the structure *within* reality cells existing *at different relational levels of existence* refers to the situation where every reality cell contains within itself the same internal spatial arrangement of smaller reality cells. This uniformity and consistency of internal structure occurs, again, in the cubic-close-packing arrangement, whereby each smaller reality cell is adjacent to, and surrounded by, 12 other similar reality cells, creating a *nuclear cluster* of 13 reality cells. This nuclear cluster of 13 reality cells in cubic-close-packing arrangement is always in the shape of a cuboctahedron or vector equilibrium, as depicted in figure 12. What this spatial arrangement means specifically is that each reality cell can be considered to be composed of a nuclear cluster of 13 smaller reality cells, each of which is itself composed of a nuclear cluster of 13 even-smaller reality cells, and so on, *ad infinitum*. Thus, every reality cell has an internal spatial arrangement of 13 smaller reality cells arranged in the form of a vector equilibrium.

The uniformity and consistency of the structure of the relational matrix is depicted in **figure 15,** using the two-dimensional hexagonal array of reality cells that was depicted in figure 14.

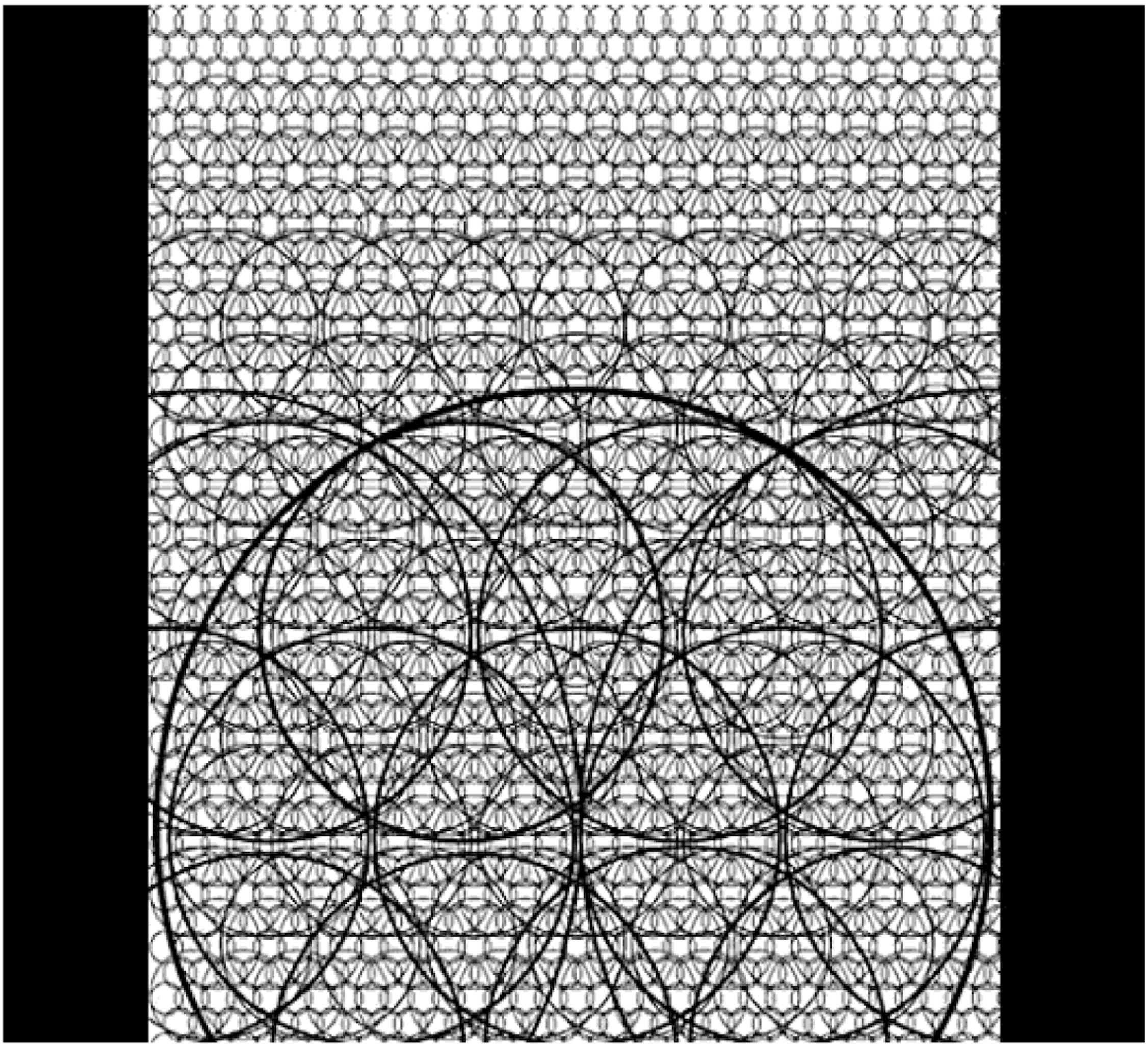


Figure 15 The uniformity and consistency of the structure of the relational matrix occurring both *between* reality cells at any one relational level of existence, and *within* reality cells at different relational levels of existence. Depicted here are five relational levels of existence, represented by five different-size circles representing five different-size reality cells. At the top, the overlapping levels have been omitted for better visibility of the different relational levels of existence depicted in the diagram.

Here, it can be seen that, regardless of the relational level of existence, the reality cells are always arranged in a hexagonal array or, by three-dimensional extension, a cubic-close-packing arrangement, illustrating the uniformity and consistency of the structure of the relational matrix that occurs between reality cells of any one relational level of existence. It can also be seen in this two-dimensional hexagonal array that each reality cell contains seven smaller reality cells from the next relational level of existence. In three dimensions, this situation translates into each reality cell containing 13 smaller reality cells from the next relational level of existence, arranged as a vector equilibrium. Furthermore, because the reality cells are relational and overlap, each larger reality cell shares all but its central reality cell with adjacent reality

cells. That is, all the peripheral reality cells of the nuclear cluster that composes a larger reality cell are also peripheral reality cells of an adjacent larger reality cell. As depicted in the two-dimensional diagram above, the six peripheral reality cells that compose any hexagonal cluster, or larger reality cell, are also peripheral reality cells of an adjacent hexagonal cluster.

The importance of the uniformity and consistency of the structure of the relational matrix, regardless of the relational level of existence being discussed, is that when processes are described as occurring at any one relational level of existence, those processes can also be inferred to occur at any relational level of existence, since the same underlying structure and relationships exist everywhere.

Thus, although the relational matrix is composed of reality cells of different sizes, within that difference there exist symmetry, balance, and equivalence of relationship, as a reflection of the ultimate equivalence of existence between the complementary realities of which the structure of the relational matrix consists. This equivalence of relationship and relative existence is what defines the structural aspect of the relational matrix.

CONCEPTUAL CHECKPOINT I–3

Structurally, the relational matrix is composed of reality cells in a cubic-close-packing arrangement, which is the spatial arrangement that provides the most symmetrical, balanced, and equivalent relationships between reality cells, because it's this spatial arrangement that reflects the existential relationships the reality cells have with each other.

Because the reality cells exist as such only in relation to each other, there's overlap between the reality cells in this cubic-close-packing arrangement, unlike the close packing of physical spheres.

In the cubic-close-packing arrangement, each reality cell is adjacent to, and surrounded by, 12 other reality cells in the form of a cuboctahedron.

These 13 reality cells, taken as a whole, form a nuclear cluster.

The central reality cell of any nuclear cluster has an equivalent distance from, and angular relationship to, all 12 adjacent reality cells, which arrangement can be expressed as the vector equilibrium.

As a whole, the cubic-close-packing arrangement of the reality cells at any one relational level of existence can be expressed as a system

of vectors of equivalent magnitude and angular relation called the isotropic-vector matrix.

Although the relational matrix is three dimensional, consisting of the relationships between spherical reality cells, we'll illustrate it primarily in two dimensions as a hexagonal array of circular reality cells.

The structure of the relational matrix is uniform and consistent throughout, both in terms of the relationships *between* reality cells of the same size (VE), and in terms of the relationships *within* reality cells of different sizes.

Section 6 Defining the Content of the Relational Matrix

6.1 *The duality of reality-cell content*

The relational matrix is composed of reality cells that are formed through the process of successive dualization, or repetitive and progressive self-relation, of existence. A reality cell consists of the spatial construct defined by a spherical or circular boundary, and of the spatial content within that boundary. Where there's structure, there's content; and where there's content, there must be structure. *Structure and content are thus complementary.* In the preceding section, we defined the structure of the relational matrix. In this section, we'll define the content that exists within and in relation to that structure.

Because the reality cells are the product of the dualization of a more fundamental reality, there exists *a fundamental duality of spatial content* between reality cells. That is, the spatial content of one reality cell must be the *opposite* of the spatial content of its complementary reality cell. This polarity or complementary of reality-cell content produced by the dualization of absolute existence is depicted in **figure 16**.

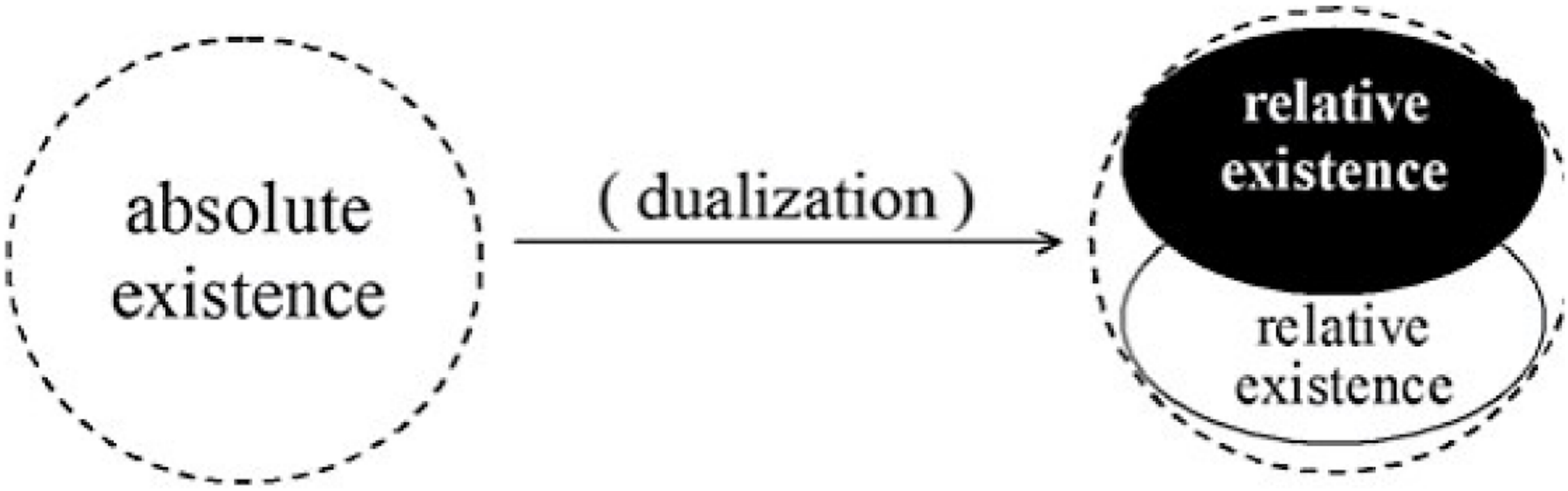


Figure 16 When absolute existence dualizes to form a relationship with itself, thereby creating two relative existences, there's also created a polarity or complementarity of spatial content between those relative existences, shown here as the opposites of black and white. Existence preceding the process of dualization has neither structure nor content and so is neither white nor black, neither this nor that, neither here nor there, for these are all aspects that exist as such only in relation to one another, i.e., within the context of absolute existence that has dualized to form a relationship with itself, within itself.

We'll call this fundamental duality of spatial content the *positive/negative polarity or complementarity* of reality-cell content. For our purposes, the terms "positive" and "negative" simply represent the opposite and, thus, mutually coexistent aspects of reality-cell content. No other attribute is ascribed to these terms, or needs to be, for each aspect of reality-cell content exists as such only in relation to the other, opposite aspect.

No matter how many times absolute existence dualizes into ever-smaller relational levels of existence, composed of ever-smaller reality cells, the process of dualization still yields the same fundamental duality of spatial content, since no matter what the level of dualization, it's still the same existence undergoing the same process. Therefore, the positive/negative polarity or complementarity of reality-cell content is applicable to all relational levels of existence.

Using black to denote positive reality-cell content and white to denote negative reality-cell content, the pattern of content distribution at any one level of reality can be depicted as in **figure 17**.

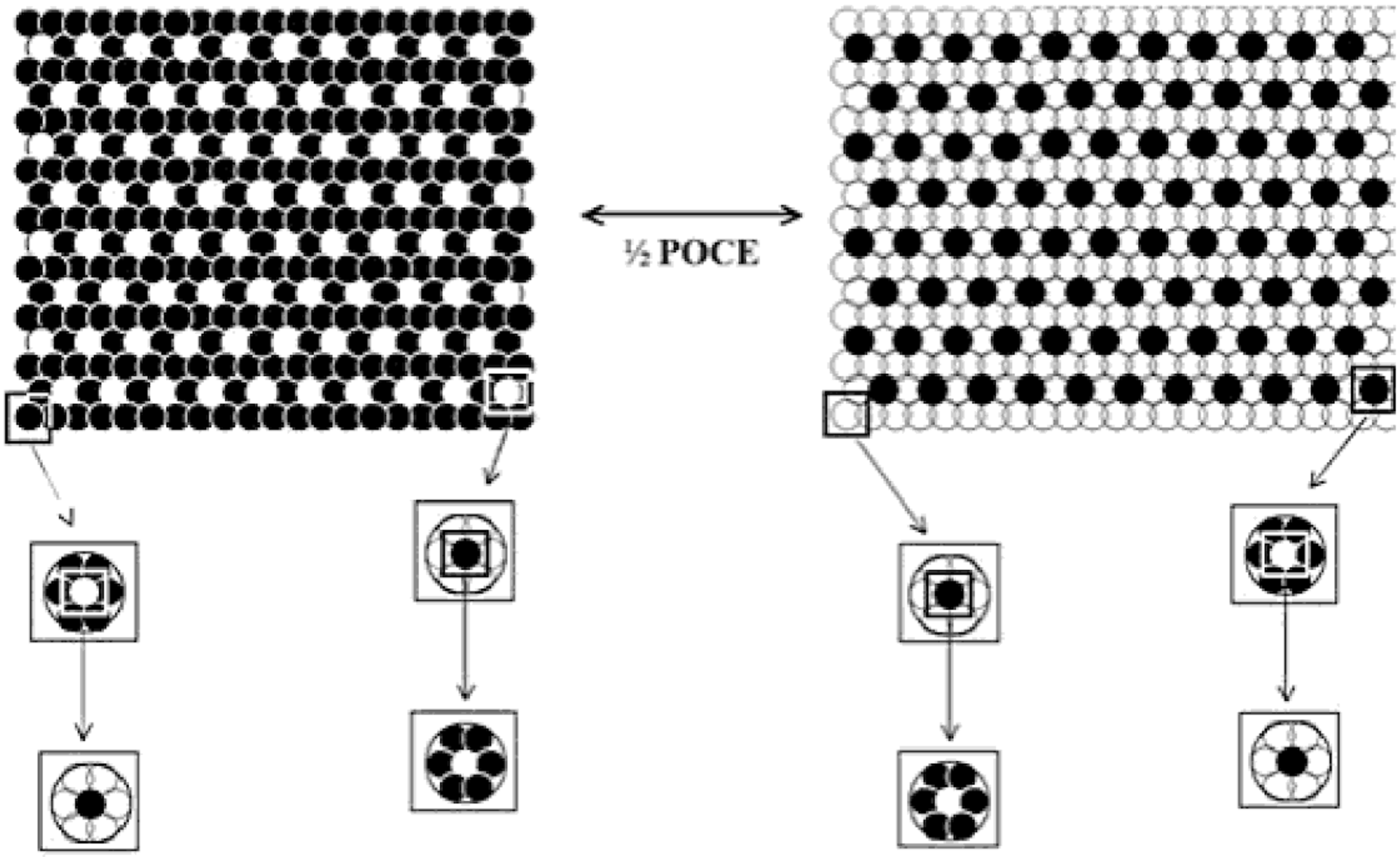


Figure 17 Complementary positive and negative configurations of the relational matrix, based on the pattern of distribution of reality-cell content. Owing to the continuous exchange of spatial content between reality cells (described previously in section 4), the relational matrix cycles between positive and negative configurations. In one half of a reality-cell period of content exchange (POCE), the positive aspect of spatial content is dominant (positive configuration); and in the other half of a reality-cell POCE, the negative aspect of spatial content is dominant (negative configuration). Note the uniformity of each pattern of content distribution, "uniformity" meaning that at any one moment no area of the relational matrix is differentiable or distinguishable from any other, because all areas have the same configuration, whether positive or negative.

The expanded views (boxes at bottom) show that when a relatively larger reality cell exists for a moment in a positive or negative configuration, this doesn't mean that the smaller reality cells within it all have positive or negative content. Rather, even though each reality cell may be described in terms of its spatial content as either positive or negative at its relational level of existence, within that reality cell there still exists the same fundamental duality of spatial content. Thus, the positive or negative configuration of a reality cell refers to the particular aspect of spatial content which at that moment is dominant or more prevalent within that reality cell.

There's always a balance between the positive and negative aspects of reality-cell content during an entire cycle or period of content exchange, and so neither aspect is ever really dominant. There must always be a maintenance of overall balance in positive/negative reality-cell content because these polar opposites

are relationally existent and thus mutually coexistent. One relational pole can never truly dominate or eliminate the other, for in doing so, it would thereby negate the basis of its own existence.

The most important thing to understand regarding the pattern of distribution of reality-cell content is that in both positive and negative configurations of the relational matrix, *at any one moment there exists a uniform and consistent pattern of content distribution everywhere, so that no area of the relational matrix is differentiable or distinguishable from any other area*. In the next subsection, we'll discuss that uniformity and consistency, as well as variations in the pattern of content distribution.

6.2 *Uniformity and distortion of the relational matrix*

As was depicted in figure 17, the positive/negative polarity or complementarity of reality-cell content creates a uniform pattern of content distribution within the relational matrix, which we'll define as the state of relational-matrix *uniformity*.

In the state of relational-matrix uniformity, the pattern of content distribution is such that at any one moment, no area of the relational matrix is differentiable or distinguishable from any other, because all areas have the same content pattern, the same configuration. The negative content of one reality cell may be different from the positive content of an adjacent reality cell, but because at any one moment this pattern of content distribution is the same everywhere, such a relationship doesn't serve to localize or define a particular somewhere in relation to anywhere else. For this reason, and for simplicity, we'll depict the state of relational-matrix uniformity as shown in **figure 18**.

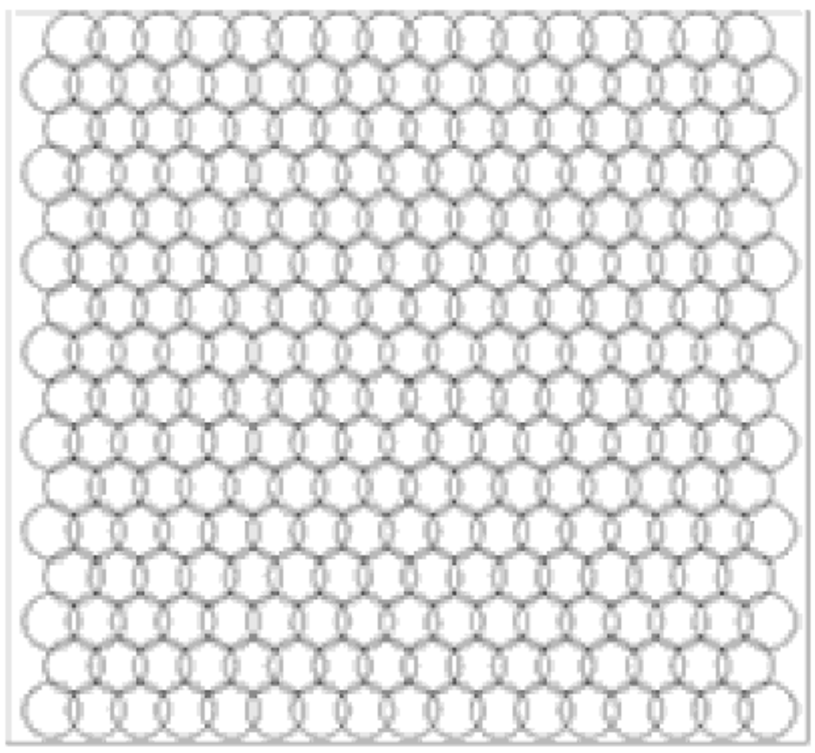


Figure 18 Simplified representation of what we've defined as the state of relational-matrix uniformity, in which the pattern of content distribution

is the same everywhere. The uniform pattern of content distribution within the relational matrix is depicted here by the uniform coloration of the reality cells. Here, the white coloration of the reality cells denotes neither positive nor negative content but only that there's a uniform pattern of content distribution, as depicted in figure 17.

There also exists the possibility that a reality cell could have a pattern of content distribution that's different from the uniform pattern of content distribution. In this case, such a reality cell would "stand out from" or "contrast with" the rest of the relational matrix.[8] An area of the relational matrix that contains a reality cell with a nonuniform pattern of content distribution will therefore be defined as an area of relational-matrix or reality-cell *distortion*, and that reality cell will be defined as *distorted*. This distortion isn't structural; rather, it simply represents a deviation from the uniform pattern of content distribution, as depicted in **figure 19**.

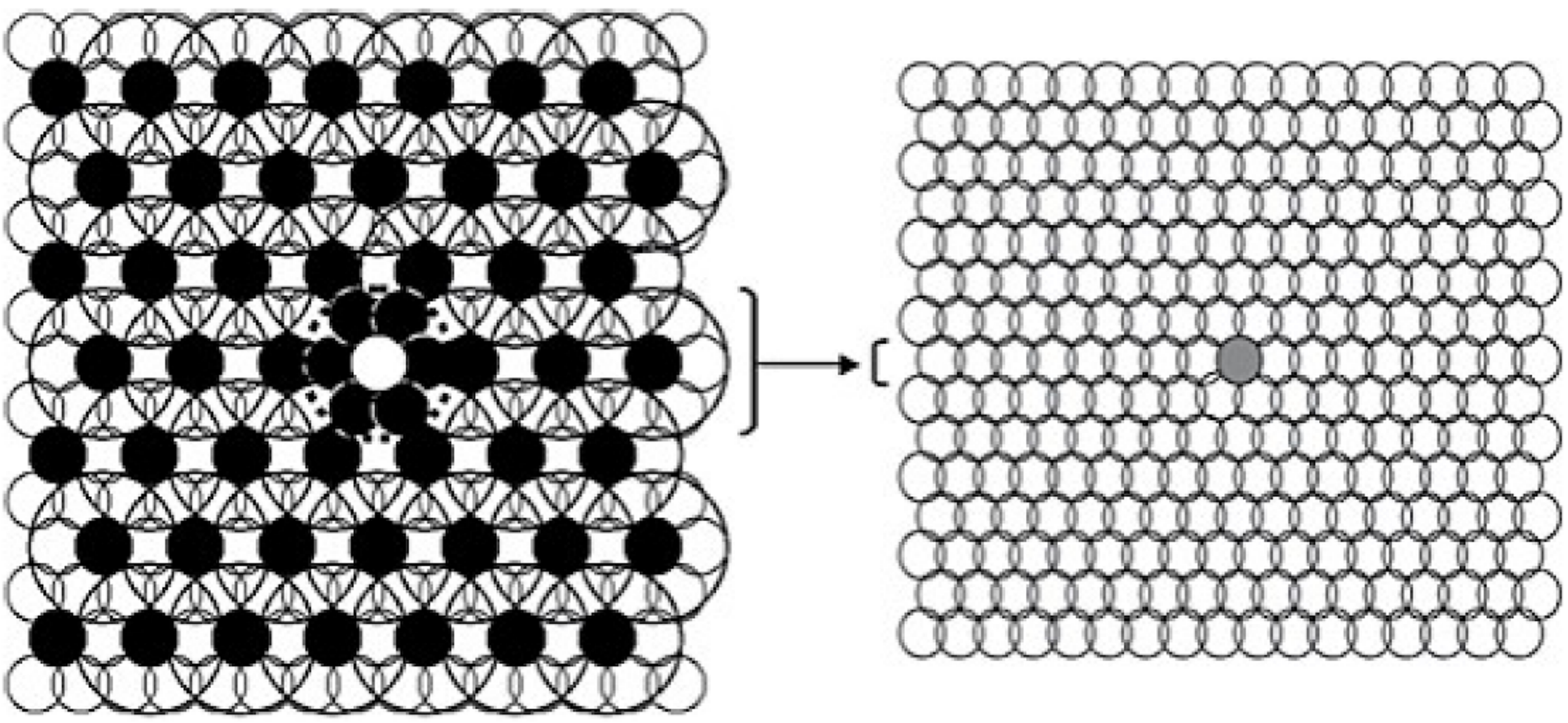


Figure 19 (Left) A reality cell with a pattern of content distribution that differs from the uniform pattern. The reality cell outlined by the dashed circle is in a positive configuration, while the rest of the reality cells at that relational level of existence are in a negative configuration. This reality cell is defined as distorted, and it represents an area of relational-matrix distortion. Note that the reality cells adjacent to the distorted reality cell are themselves distorted, though less so, since their pattern of content distribution also differs from the uniform pattern. This variation in the pattern of content distribution is what allows for the eventual differentiation of the relational matrix, because it allows one area of the relational matrix to be distinguished from other areas.

(Right) For simplicity, an area of relational-matrix distortion (i.e., a distorted reality cell) is depicted as shown. Here, the uniform pattern of content distribution is depicted as in figure 18, and the area of relational-matrix distortion is denoted by the shading of the distorted reality cell. It's in this way that reality-cell distortions will be depicted,

i.e., by some degree and manner of shading or stippling of the distorted reality cell(s). Note that the scale on the right is reduced, as indicated by the brackets.

This variation in the pattern of content distribution between and among reality cells creates a *uniformity/distortion duality* within the relational matrix. The uniformity/distortion duality represents a new level of relationship within the relational matrix, a new way in which existence can form a relationship with itself. The uniformity/distortion duality represents the next step in the evolution of absolute existence, as that evolution occurs through the process of repetitive and progressive self-relation. This new level of relationship is depicted and described as the second stage of existential self-relation in figure 2. As we'll describe in detail in chapter 2 of part I of this book, the uniformity/distortion duality represents the space/energy duality that exists in space-time. Structure is relationship, and what we experience as energy is the reality that's created when space exists in relation to itself.

Within the context of the uniformity/distortion duality we've just described, we can now begin to see how the process of repetitive and progressive self-relation works, as each stage of existential self-relation becomes the basis for the next. First, existence successively dualizes, or repetitively and progressively forms relationships with itself, to create the first level of reality: the relational matrix, or the structure of space-time. Once the relational matrix exists, once that first stage of existential self-relation has been created, the door is opened to another way in which existence can form a relationship with itself. That way is through the uniformity/distortion duality, as one area of relational-matrix distortion exists in relation to other areas of relational-matrix uniformity. It's all still ultimately the same existence, but it's the same existence coming to exist in relation to itself in a new and different way and, in the process, creating a second stage of existential self-relation, the energic level of reality, which can then itself function as the basis and foundation for a third stage of existential self-relation, the material level of reality.

As we proceed with our discussion in part II of this book, this process of repetitive and progressive self-relation will be described as occurring once more, resulting in the creation of a fourth stage of existential self-relation, the experiential level of reality.

6.3 *Degrees of reality-cell distortion*

Having defined the states of uniformity and distortion of the relational matrix, we can now discuss the relative degrees of reality-cell distortion.

Uniformity has no degrees. Either something is uniform, or it's not, and if it's not, it's nonuniform or distorted. On the other hand, there can exist varying degrees of nonuniformity—i.e., more or less distortion. For example, the surface of a body of water can be either calm (uniform) or uncalm (nonuniform). However, if it's uncalm, then it can exist in a more or less choppy or turbulent state—i.e., there exist varying degrees to which the surface of that body of water can be disturbed or distorted.

So, too, can distortions of the relational matrix exist in varying degrees. Whereas there's only one content pattern that represents the state of relational-matrix uniformity, there are different reality-cell content patterns that represent nonuniformity or distortion. Therefore, there can exist varying degrees of what we've defined as reality-cell distortion.

However, there's one degree of reality-cell distortion that stands out from other degrees of reality-cell distortion: This is the degree of distortion wherein the pattern of content distribution is the *exact opposite* of what we've defined as the state of relational-matrix uniformity. This degree of distortion is as distorted as the pattern of content distribution can get, for if any of the internal reality cells that compose the distorted reality cell had a different content pattern, then that content pattern would be more like the uniform pattern, and so the reality cell would be less distorted. Therefore, we'll term this degree of reality-cell distortion that's the exact opposite of the state of relational-matrix uniformity a *maximal distortion*. The relationship between the state of relational-matrix uniformity and the degrees of reality-cell distortion are depicted in **figures 20** and **21**.

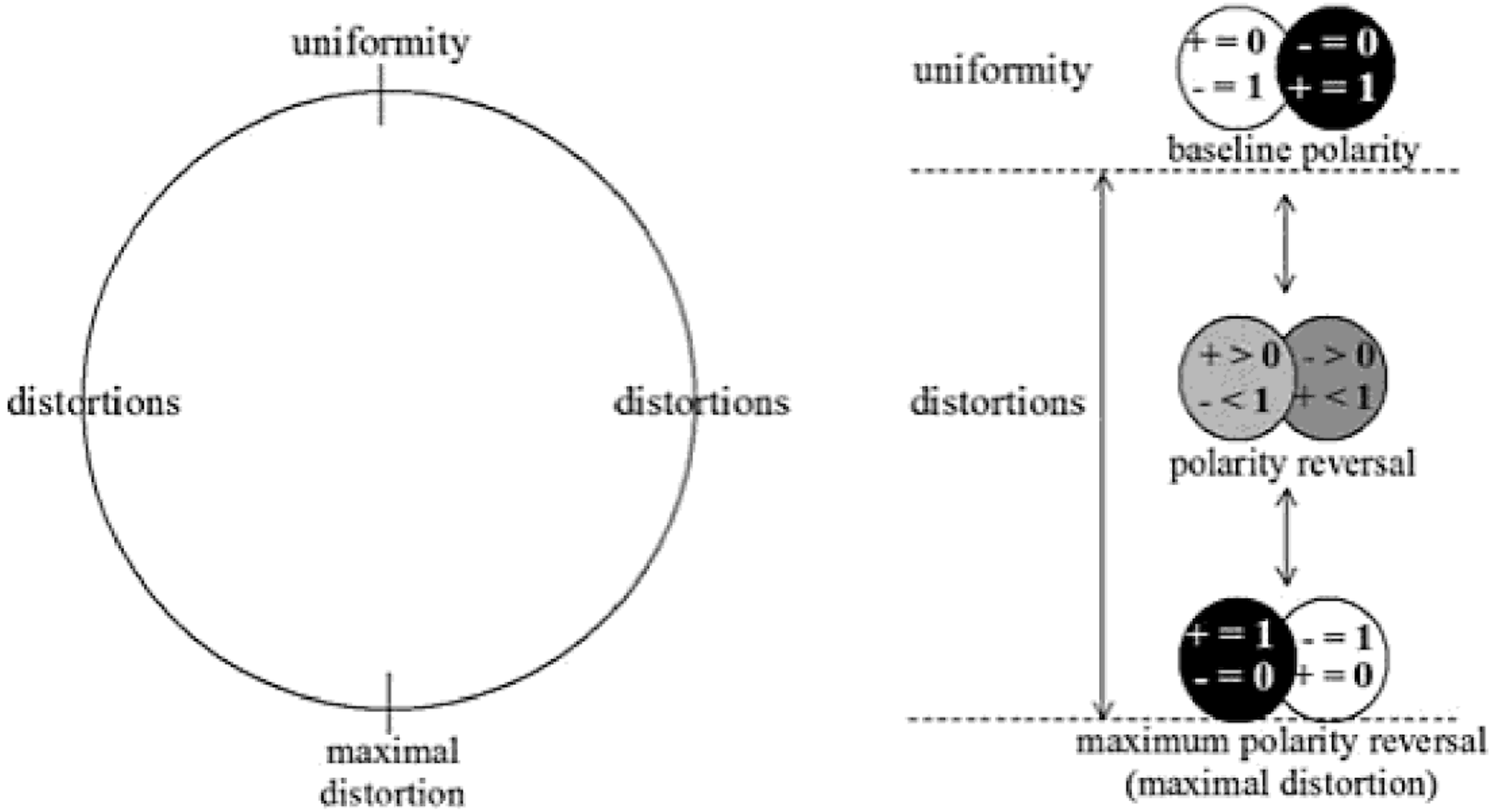


Figure 20 The relationship between the state of relational-matrix uniformity and the degrees of reality-cell distortion with regard to the pattern of content distribution. The maximal reality-cell distortion is the pattern of content distribution that's the exact opposite of the state of relational-matrix uniformity. Between these polar extremes lie an infinite number of intermediate degrees of reality-cell distortion, depicted by shades of gray. Any movement away from the state of relational-matrix uniformity is an increase in reality-cell distortion; any movement away from the maximal distortion is a movement toward the state of relational-matrix uniformity.

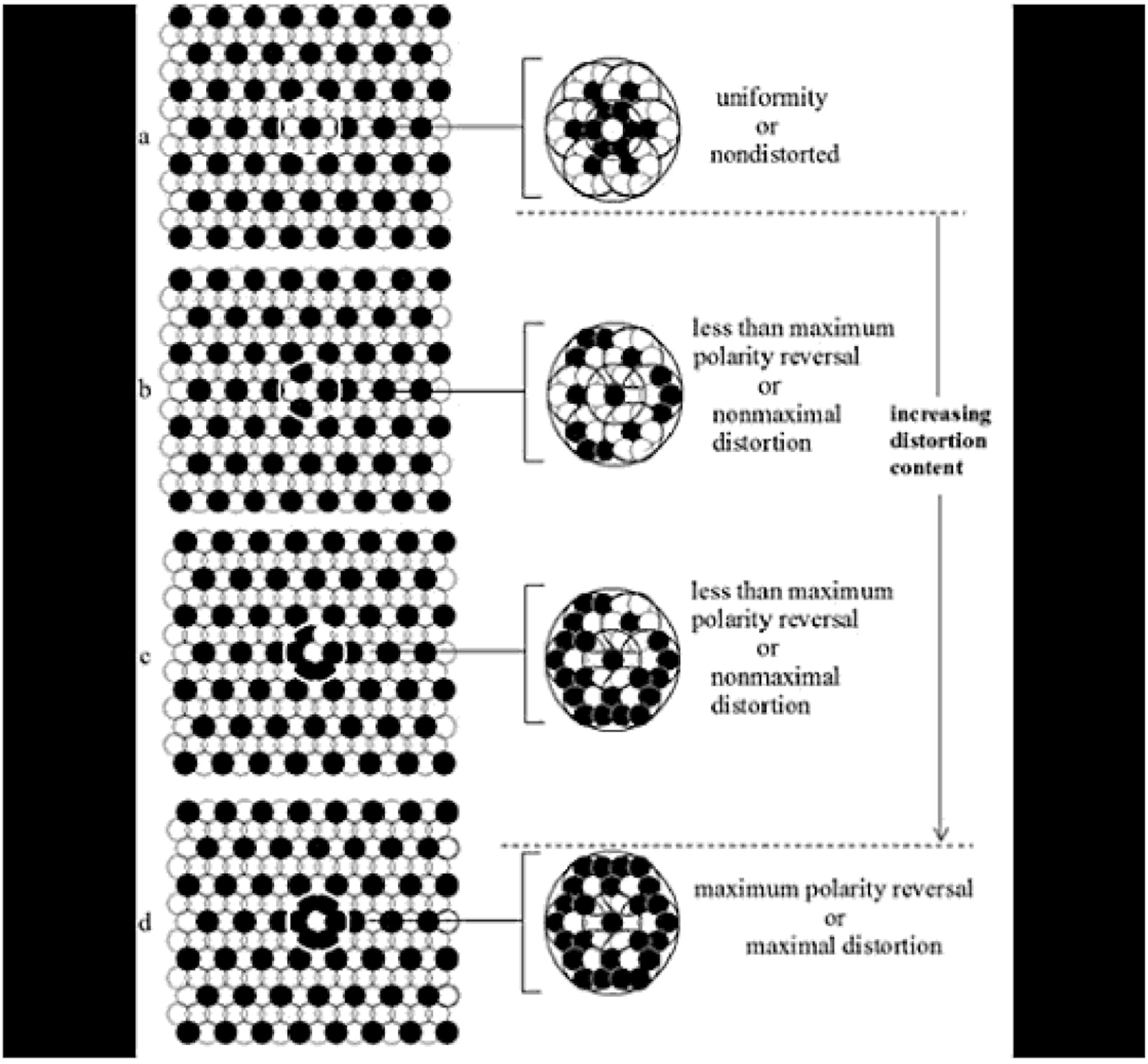


Figure 21 Owing to the infinitely regressive nature of reality-cell structure (i.e., each reality cell is composed of smaller reality cells), an infinite number of intermediate degrees of reality-cell distortion lie between the extremes of the state of uniformity and maximal distortion. (Left) The uniform pattern (a), maximal distortion (d), and intermediate degrees of reality-cell distortion (b and c). (Right) Those areas are expanded to show the internal patterns of content distribution. Since each reality cell consists of smaller reality cells, a distortion of any internal reality cell, at any relational level of existence, would also represent some degree of distortion of the larger reality cell of which it's a part. Because there's no limit to how small a reality cell can be, there's also no limit to how slight the degree of reality-cell distortion can be.

An important feature of maximal reality-cell distortions is that they must all have the same content pattern, since they all have a content pattern that's the exact opposite of the uniform pattern. So, maximal reality-cell distortions also have their own type of uniformity. This situation is somewhat analogous to what happens when someone

tries to assert their individuality, to be "cool" or "hip," by deviating as much as possible from what's considered the norm, with the result that they just end up looking and behaving like all the other so-called nonconformists.

These concepts, that maximal reality-cell distortions must all have the same content pattern, and that there exist an infinite number of intermediate degrees of reality-cell distortion, will be used in the next section, where we'll discuss the propagation of patterns of distortion content through the relational matrix. For, having described and defined the essential components of the relational matrix in terms of structure and content, we're now ready to show how those components, as an interconnected whole, function as a dynamic structure.

CONCEPTUAL CHECKPOINT I–4

Reality cells have content.

The spatial content of reality cells exists as a positive/negative duality or complementarity.

The difference between positive and negative reality-cell content isn't in what the content is, for it's all ultimately the same existence, but rather it's in the pattern of distribution formed by these relative states of content.

The pattern of distribution of positive and negative content within a reality cell establishes a content pattern for that reality cell.

There's one content pattern that's defined as uniform.

Any content pattern that's unlike the uniform pattern is defined as nonuniform or distorted.

Reality cells can exist in either the state of uniformity or in one of an infinite number of degrees of distortion.

The degree of reality-cell distortion that's the exact opposite of the state of relational-matrix uniformity is called a maximal distortion.

All maximal reality-cell distortions have the same pattern of content distribution.

SUMMARY, CONCEPTUAL CHECKPOINTS I–1 THROUGH I–4

The basic parameters of the relational-matrix model have now been

defined as outlined below:

1. The relational-matrix model has been defined in terms of reality cells, which are the individual units of relative existence.

   A. The structural aspect and relative size of the reality cells have been defined in terms of their volumetric existence (VE).
   B. The dynamic aspect and mutual interpenetration of the reality cells have been defined in terms of their period of content exchange (POCE).
   C. The fundamental duality of spatial content has been defined in terms of the positive/negative polarity or complementarity of reality cell content.
   D. The pattern of content distribution has been used to define a relative state of relational-matrix uniformity and degrees of reality-cell distortion.

We'll now use these parameters to describe how a pattern of distortion content can propagate through the relational matrix. Once the parameters of distortion propagation have been defined, we'll then be in a position to relate the relational-matrix model to space-time and physical reality, thereby demonstrating that space-time is a dynamic structure and that what we experience as physical reality is a relational extension of that structure.

Section 7 The Propagation of a Pattern of Distortion Content Through the Relational Matrix

The propagation of a pattern of distortion content through the relational matrix is a function of the dynamic aspect of the relational matrix, as defined in section 4. Let's review this dynamic aspect.

The reality cells of the relational matrix are continuously penetrating each other. This continuous interpenetration creates *a continuous exchange of reality-cell content*. This exchange of reality-cell content is cyclic or periodic, and is expressed as the period of content exchange (POCE). A reality cell's POCE is inversely related to its volumetric existence (VE) as a function of the rate-of-penetration constant (*k*RP), such that VE × POCE = *k*RP.

Owing to this continuous exchange of reality-cell content, any distortion of the pattern of content distribution will propagate through the relational matrix according to the parameters we've just reviewed. In this section, we'll analyze how these parameters determine the way in which a pattern of distortion content propagates through the relational matrix.

More than any other aspect of the relational-matrix model, the ability to relate distortion propagation to certain physical laws and constants is what will provide the strongest evidence that space-time functions as a dynamic structure in the form of what we're describing as a relational matrix.

7.1 *Distortion propagation—the basics*

The basic features of distortion propagation are (1) the rate of propagation of a pattern of distortion content through the relational matrix and (2) how that rate of propagation relates to the structural and dynamic aspects of the relational matrix—i.e., the reality cells' VE and POCE, respectively.

First, we'll discuss the rate of distortion propagation. The propagation of a pattern of distortion content through the relational matrix is a manifestation of the continuous interpenetration of the reality cells. Therefore, the rate of propagation of a pattern of distortion content through the relational matrix is equivalent to the rate-of-penetration constant (*k*RP). What this means is that all patterns of distortion content, regardless of the size or VE of the distorted reality cell, propagate at the same rate or linear velocity, a constant rate of distortion propagation equivalent to *k*RP, as depicted in **figure 22**.

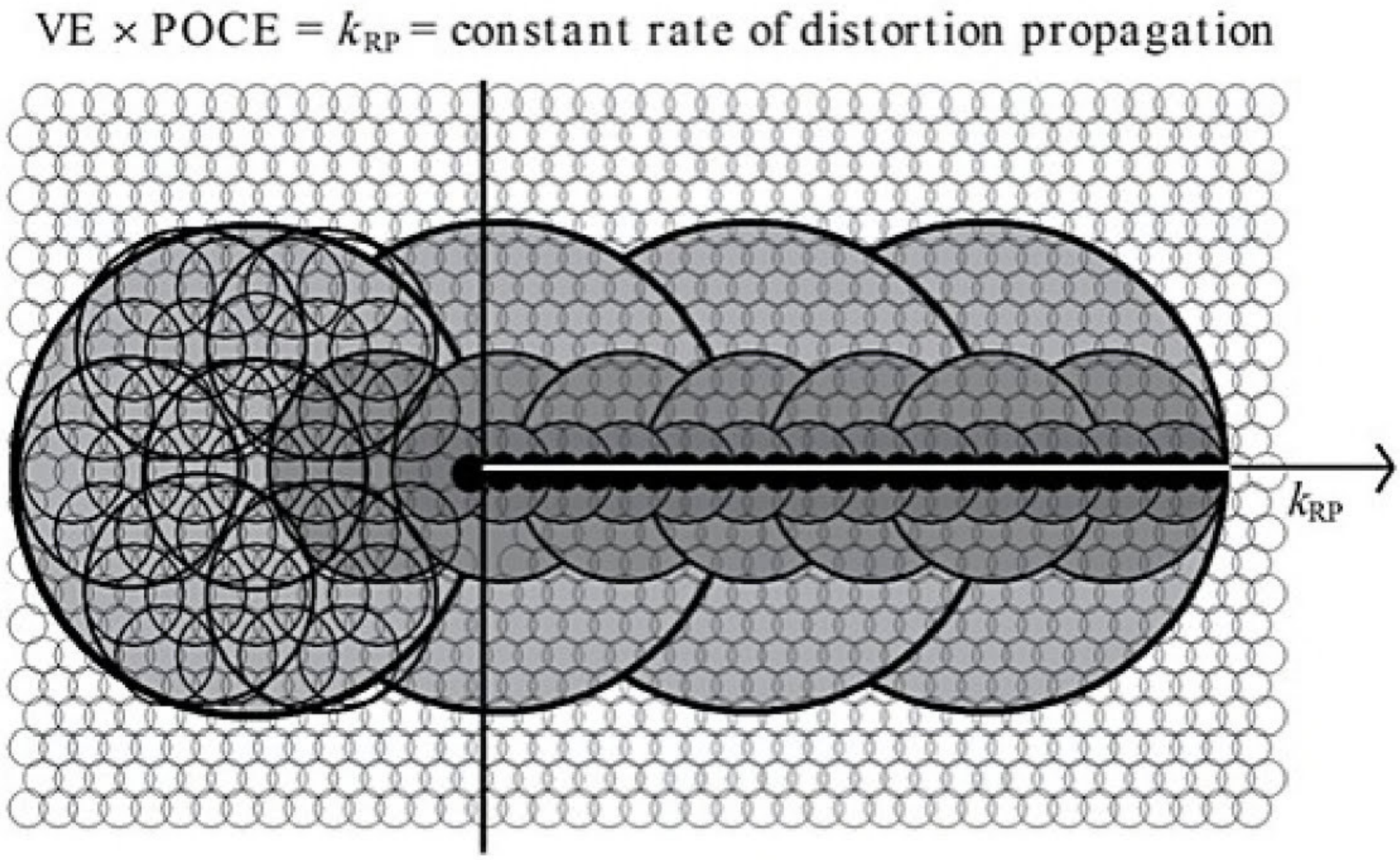


Figure 22 Using a single vector of penetration (horizontal arrow), this diagram depicts how the rate-of-penetration constant (*k*RP) results in an equivalent and constant rate or linear velocity of distortion propagation for all reality cells, regardless of their size or volumetric existence (VE). Here, uniformity of reality-cell content is depicted in white, while distorted reality cells of four different sizes or VEs are depicted in four different shades of gray. The vertical line is tangent to all four sizes of distorted reality cells to the left, and serves in this diagram as the starting point for evaluating distortion propagation as it proceeds to the right. The constant-rate- of-penetration vector is perpendicular to that tangent. Because the rate of penetration is the same for all reality cells, regardless of size, the rate of propagation of a pattern of distortion content is also the same, regardless of the size or VE of the distorted reality cell.

What figure 22 also shows is that distortions in smaller reality cells must undergo many more POCEs in order to travel the same distance as distortions in larger reality cells.

Now, we'll discuss how the constant rate of distortion propagation relates to the reality-cell VE and POCE. In figure 22, the second-largest reality cells undergo three POCEs (progressing two reality cells in each POCE), while the second-smallest reality cells undergo six POCEs, in order to propagate the same distance. Because all patterns of distortion content propagate at the same rate, equivalent to *k*RP, smaller distortions in terms of reality-cell size, which have a relatively smaller VE, must have a correspondingly larger POCE.

Conversely, larger distortions in terms of reality-cell size, which have a relatively larger VE, must have a correspondingly smaller POCE. As we described earlier, the relationship between VE and POCE is inverse and can be stated as VE × POCE = *k*RP.

In chapter 2 of part I of this book, we'll demonstrate that the equation VE × POCE = *k*RP is analogous to the equation λ (wavelength) × v (frequency) = *c* (the speed-of-light constant). There, we'll show that the constant rate of reality-cell penetration, resulting in the constant rate of distortion propagation, is what results in the phenomenon scientists have been able to observe as the speed-of-light constant.

Having discussed the most basic parameters of distortion propagation, we'll now use those parameters to analyze different patterns of distortion propagation.

7.2 *Patterns of distortion propagation*

The topics that we'll address in this subsection are (1) the possible patterns of distortion propagation and (2) what happens to a pattern of distortion content as it propagates through the relational matrix.

First, we'll describe what happens to a pattern of distortion content as it propagates through the relational matrix.

Essentially, the content pattern of a reality cell is determined by the sum of the content patterns of all the reality cells that penetrate it, and that it also penetrates. Let's clarify. In the two-dimensional hexagonal relational-matrix diagram, any reality cell is continuously penetrating six adjacent reality cells, as depicted in **figure 23**.

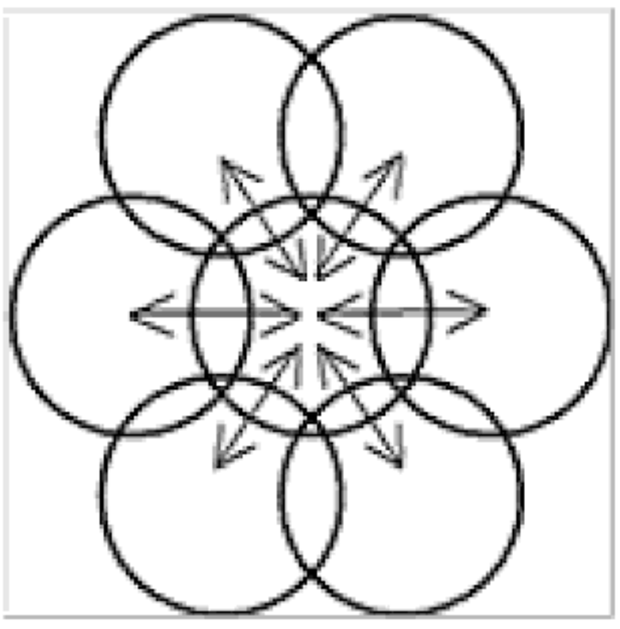


Figure 23 Owing to the continuous exchange of spatial content between reality cells, the content pattern of a central reality cell is dependent on the content patterns of the adjacent reality cells that penetrate it and that it also penetrates. The arrows represent the constant-rate-of-penetration vector, i.e., *k*RP.

Thus, any reality cell, in one half-POCE, has the content patterns of six adjacent reality cells propagating into it, while its content pattern is simultaneously propagating into them. In this two-dimensional model, the content pattern of the central reality cell, after the mutual interpenetration occurring in one half-POCE, would be some part of the sum of the content patterns of the six adjacent reality cells that have just penetrated it and that it has just penetrated, since they're interdependent, or mutually coexistent.

Even this picture is an oversimplification, since the content patterns of the adjacent reality cells, after the mutual interpenetration occurring in one half-POCE, would be dependent on the prepenetration content patterns of any other reality cells adjacent to them in the next peripheral layer of reality cells, as well as on the prepenetration content pattern of the central reality cell. This increasingly complex situation is depicted in **figure 24.**

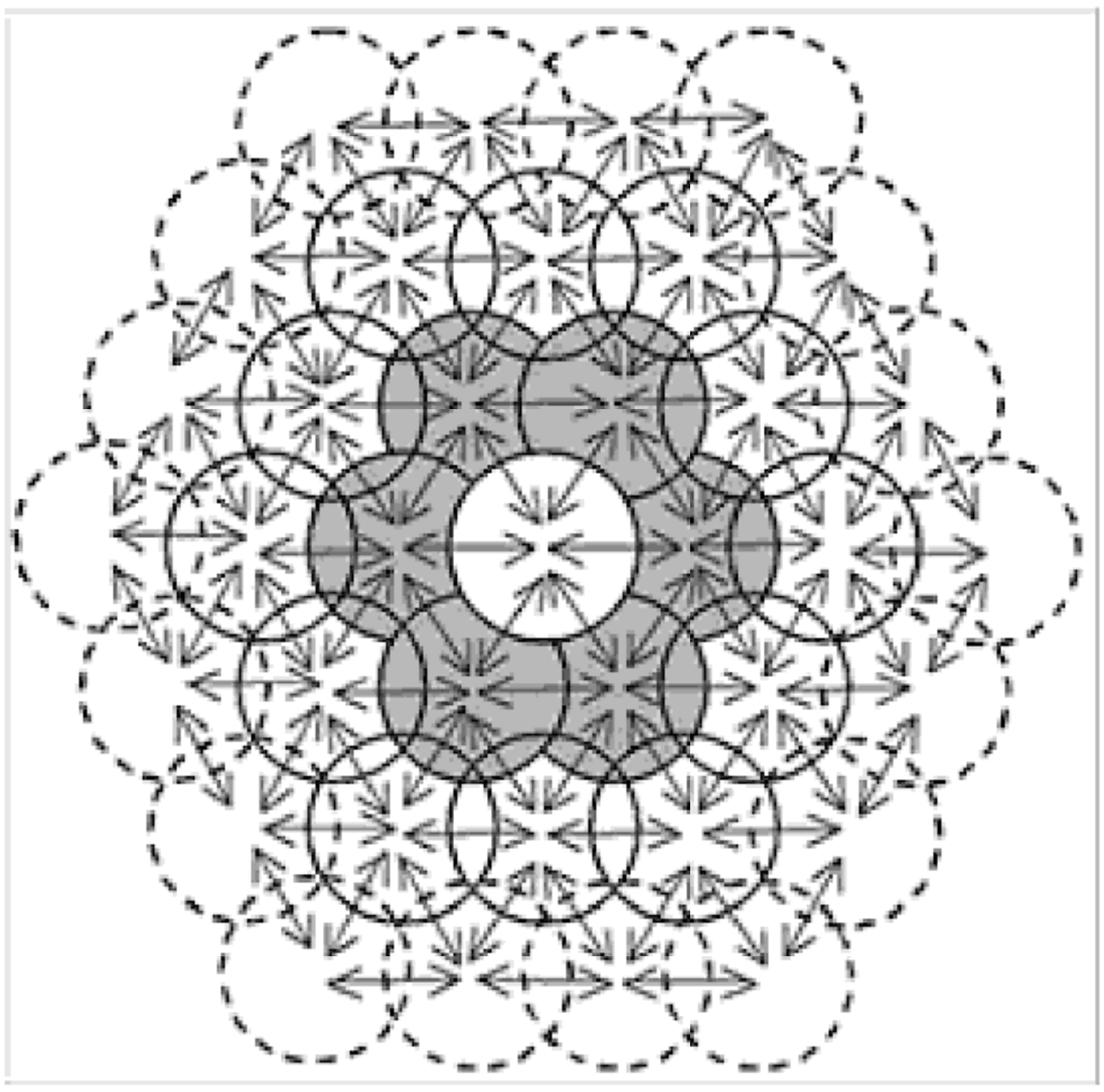


Figure 24 The content patterns of reality cells (shaded gray) adjacent to a central reality cell are dependent on the content patterns of the reality cells adjacent to them in the next peripheral layer of reality cells, which, in turn, are dependent on the content patterns of the reality cells adjacent to them in the next peripheral layer of reality cells (dashed circles), and so on. In other words, the precise determination of the content pattern of a particular reality cell after a full cycle or half-cycle of interpenetration, such as the central reality cell, must take into account the content patterns of all the reality cells in the relational matrix, since they're all connected through the continuous exchange of spatial content with adjacent reality cells. The arrows represent the constant-rate-of-penetration vector, i.e., *k*RP.

What the above discussion is meant to point out is that, owing to

the relational nature of the reality cells, we can't define the content pattern of the central reality cell after a half-cycle of interpenetration without simultaneously knowing the content patterns of at least 18 other reality cells. Furthermore, we can't define the content patterns of those 18 other reality cells without simultaneously knowing the content patterns of the next peripheral layer of reality cells, and so on, *ad infinitum*, until we reach the point where we understand that the content pattern of no one reality cell can be defined independent of the content patterns of all the other reality cells in the relational matrix, since they're all relationally existent and, thus, mutually coexistent. Therefore, the attempt to precisely define the content pattern of a particular reality cell after a half-cycle of interpenetration is futile.

Although we can't make specific *quantitative* statements regarding the changes in content pattern during distortion propagation, we can make specific *qualitative* statements regarding the changes in content pattern during distortion propagation. In other words, although we can't say precisely how much the content pattern of a particular reality cell changes after a POCE, we can say whether or not that content pattern is more or less distorted following that POCE.

We may not have a measuring device accurate enough to measure the length of a piece of wood, but this doesn't prevent us from making valid statements regarding the length of that piece of wood relative to other pieces of wood. So it is with reality-cell content. We may not be able to specifically define the content pattern of a particular reality cell, but we can still make valid statements regarding its content pattern relative to the content patterns of other reality cells, and so speak in qualitative terms of more and less distortion.

Therefore, we'll define what happens to a propagating distortion of reality-cell content only in relative terms. In these relative terms, we can state that the pattern of distortion content—i.e., the nonuniform pattern of reality-cell content—as it propagates from one reality cell to an adjacent reality cell, can (1) become less distorted, (2) become more distorted, or (3) maintain an equivalent degree of distortion.

Since we've defined a distortion as a deviation from the uniform pattern of reality-cell content, "less distorted" here means that the content pattern is more like the uniform pattern, "more distorted" means that the content pattern is less like the uniform pattern, and "an equivalent degree of distortion" means that the deviation from the uniform pattern is the same as in the previous reality cell.

Having outlined the three different things that can happen to a

pattern of distortion content as it propagates through the relational matrix, we're now in a position to examine the different patterns of distortion propagation. We need to examine these patterns of distortion propagation because in the next chapter, where we'll relate the relational-matrix model to space-time and physical reality, these patterns of distortion propagation within the relational matrix will be shown to represent how energy travels through and is distributed within space-time.

7.21 *The pattern of propagation in which distortion content decreases*

First, we'll examine a scenario wherein the distortion content decreases as a distortion propagates through the relational matrix.

As a reality-cell distortion propagates into an area of relational-matrix uniformity, or of much less distortion, the distortion content decreases. This decrease in distortion content is due to the fact that the content pattern of a reality cell after one half-POCE depends on the content patterns of all the reality cells adjacent to it, with which it's continuously exchanging spatial content. Thus, as a distortion propagates into a reality cell that's surrounded by uniform reality cells, the distortion content after propagating would be lessened by the uniform patterns of the other reality cells that are penetrating that reality cell, as depicted in **figure 25**.

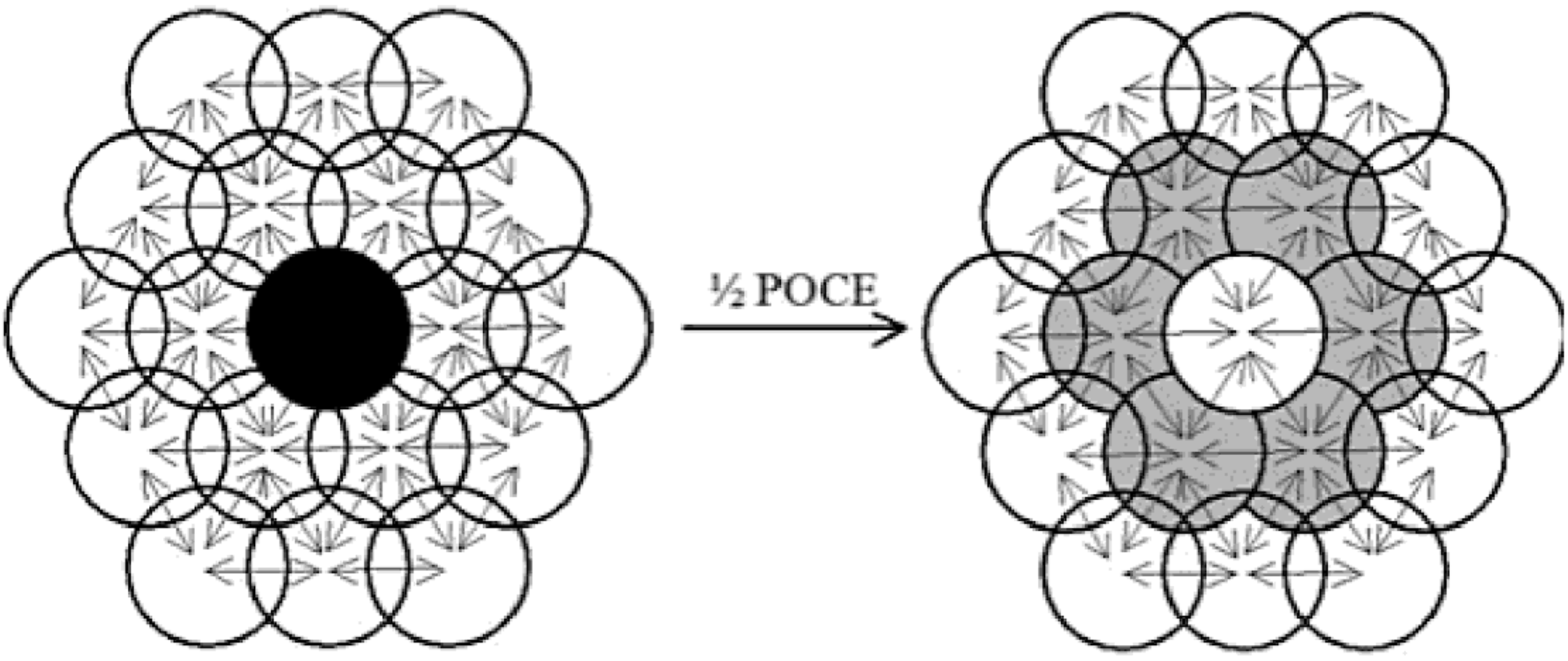


Figure 25 The distortion content decreases when a distortion propagates into a reality cell that's surrounded by, and simultaneously interpenetrating, less distorted or uniform reality cells. As the distortion content of the central reality cell (black circle in diagram on left) propagates into the adjacent reality cells, the distortion content is lessened in those adjacent reality cells (depicted as gray shading in

diagram on right). The arrows represent the constant-rate-of-penetration vector, i.e., *k*RP.

If we assume a focal distortion to arise in an area of relational-matrix uniformity, then that distortion would propagate from the point of origin radially, and the distortion content would decrease the farther it propagates from that point of origin, as depicted in **figure 26**. However, as explained in subsection 6.3, owing to the infinitely regressive nature of reality-cell structure, such a propagating distortion would never diminish or become so dilute as to reach a state of relational-matrix uniformity.

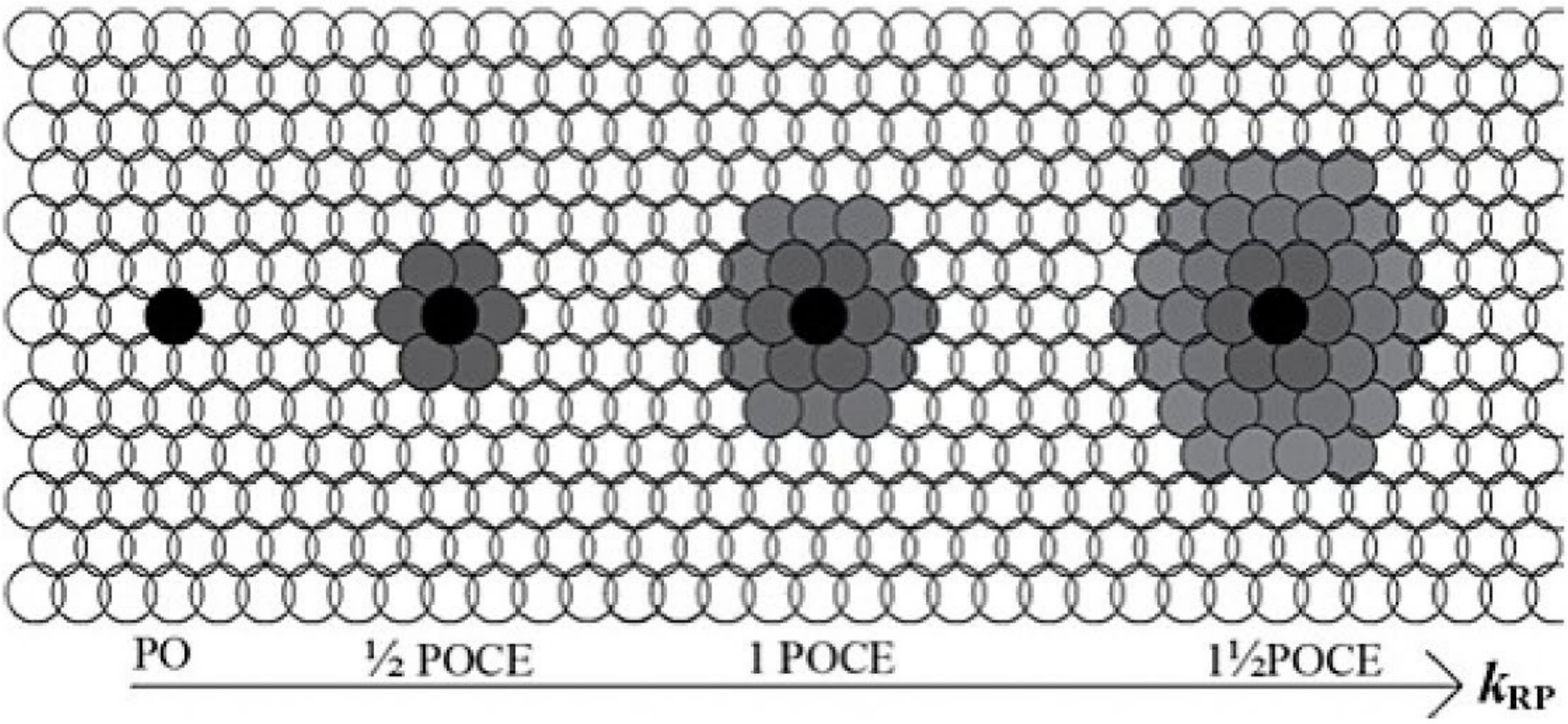


Figure 26 The radial propagation of a focal distortion of relational-matrix content. The distortion propagates one reality cell farther from the point of origin (PO) in each half-period of content exchange (POCE). The distortion content decreases, becomes diluted or lessened, as the distortion propagates away from the PO. This decrease in distortion content is depicted by incrementally lighter shades of gray in the more peripheral layers of distorted reality cells. Although the central area or PO would itself become less distorted as the distortion propagates radially, in order to illustrate the decrease in distortion content as the distortion propagates, the distorted reality cells in the central area are shown not as they would be but rather as they were. The arrow represents the constant-rate-of-penetration vector, i.e., *k*RP.

7.22 *The pattern of propagation in which distortion content increases*

Now, we'll examine a scenario wherein the distortion content increases as a distortion propagates through the relational matrix. Such a situation can occur when a distortion propagates into a reality cell that simultaneously has other distortions propagating into it. The

additive effect of these distortions causes an increase in the distortion content of the reality cell into which the distortions are propagating, as depicted in **figure 27**.

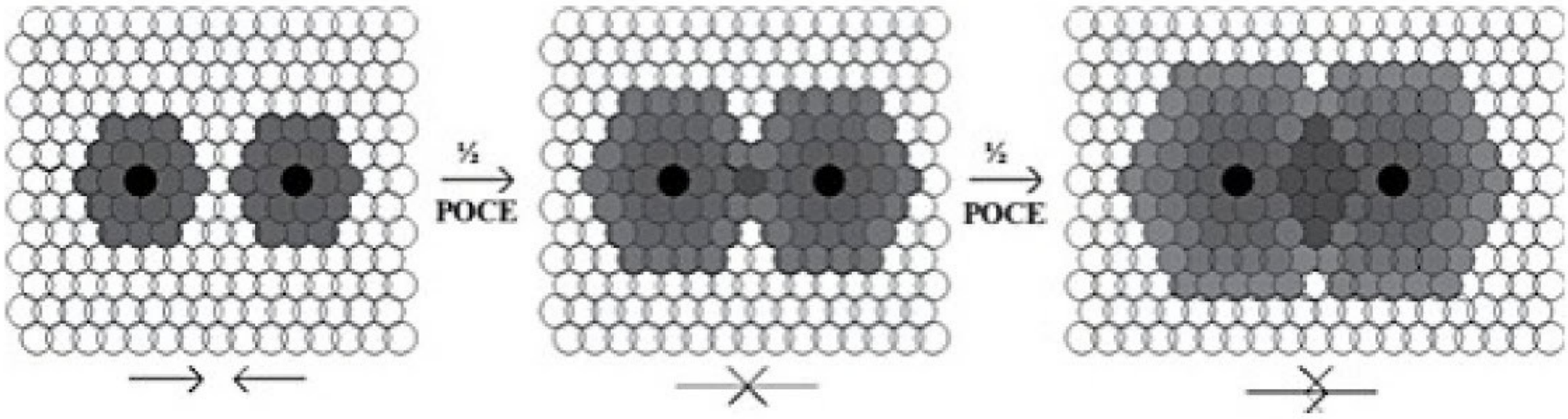


Figure 27 The additive effect created when two distortions meet. In an area of the relational matrix where two radially propagating distortions meet, an increase in distortion content can occur, rather than a decrease in distortion content. Less distortion content is shown by lighter shades of gray, and more distortion content by darker shades of gray. Again, in order to illustrate the decrease and then increase in distortion content as the distortion propagates radially, the distorted reality cells in the central areas are shown not as they would be but rather as they were. The arrows represent the propagation vectors of the two distortions, i.e., the constant rate of distortion propagation equivalent to *k*RP.

In a combination of the first and second scenarios—i.e., both decreases and increases in distortion content with distortion propagation—we could postulate that, in an area where propagating distortions meet, as in figure 27, the distortion content may not increase as the distortion propagates through the relational matrix, but it wouldn't decrease as much as it would if there weren't a convergence and summation of propagating distortions.

7.23 *The pattern of propagation in which distortion content remains constant*

Now, we'll examine a scenario wherein the distortion content remains constant as a distortion propagates through the relational matrix.

Such a situation would be dependent on the fact that no distortion can exceed the maximal distortion, which was defined in subsection 6.3 as the content pattern that's the exact opposite of the uniform pattern.

A convergence of distortion content upon a reality cell where the

sum of the distortion content would exceed the maximal distortion can't occur, since no distortion can exceed the maximal distortion. Therefore, such a convergence of distortions upon a reality cell could result only in that reality cell being no more than maximally distorted.

A cup can hold only so much water. The cup is empty, full, or somewhere in between. A reality cell is uniform, maximally distorted, or somewhere in between. If you line up four identical cups and pour one, two, three, and four pitchers of water into the four cups, all the cups will end up with the same amount of water in them, regardless of how many pitchers were poured into them. It's the same with reality-cell distortion: No matter how great the sum of the distortion content converging upon a single reality cell, that reality cell can't be more than maximally distorted.

The importance of this inability of a reality cell to be more than maximally distorted is that it provides the basis for the existence of a pattern of distortion propagation wherein there's a repetitive convergence of distortion content up to the maximal distortion, creating *a linearly propagating distortion in which the distortion content is maximal*, as depicted in **figure 28.**

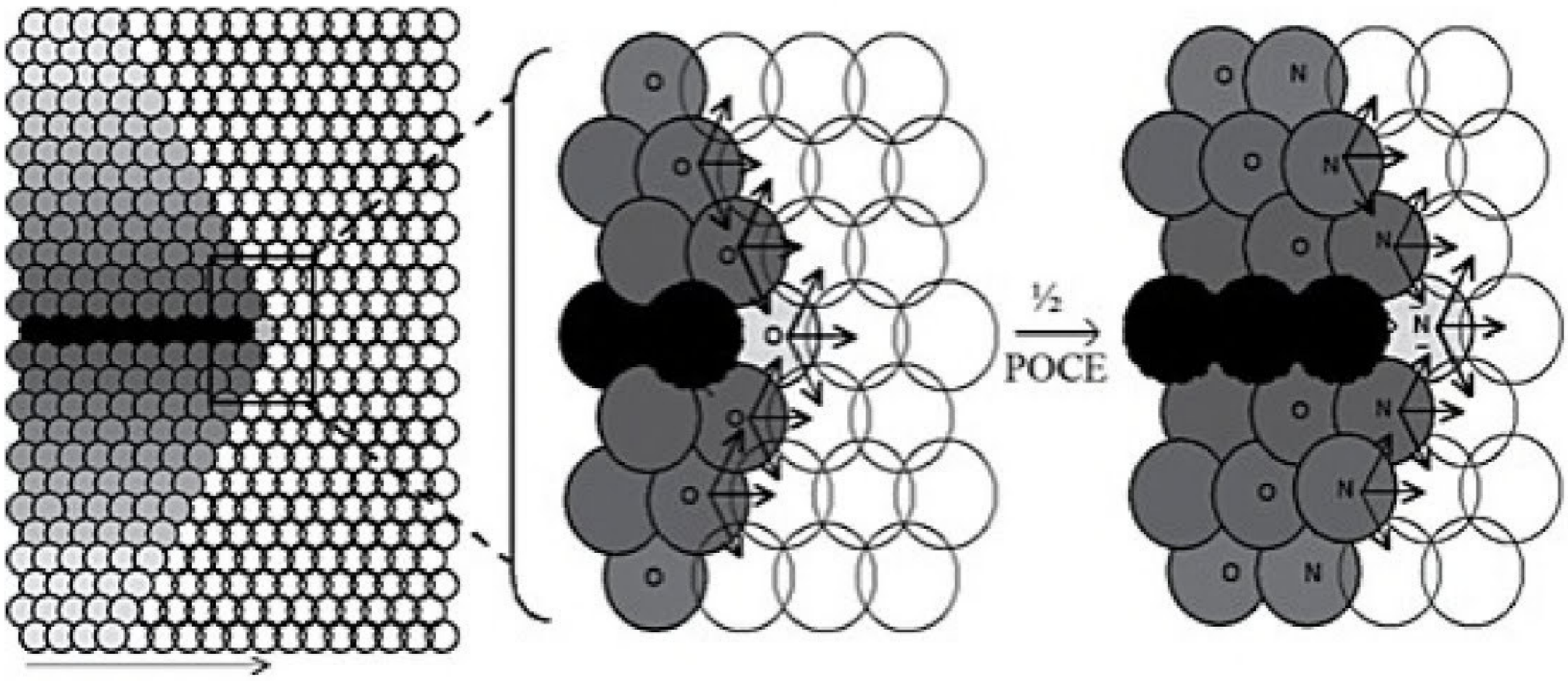


Figure 28 A convergent pattern of distortion propagation that continuously re-creates a maximal distortion. The black areas represent a linearly propagating maximal distortion; the gray-shaded areas represent radially propagating submaximal distortions, in which the distortion content is decreasing as they propagate away from the axis of maximal-distortion propagation. The stippled reality cell at the apex of the advancing distortion is the next reality cell in sequence that will become maximally distorted (O = original distortion, N = new distortion).

In each half-POCE, as the distortions converge upon the stippled reality cell, it becomes maximally distorted, and the maximal distortion

thus propagates into that reality cell. As this process repeats itself endlessly, re-creating a maximal distortion in the next adjacent reality cell in sequence, it results in the linear propagation of a maximal distortion through the relational matrix. Associated with this linearly propagating maximal distortion is a radially propagating "wake" of decreasing distortion content. This combination is defined as a *linear-radial distortion complex*. Again, in order to illustrate the relative levels of distortion content, in these diagrams the preceding distortions are shown not as they would be but rather as they were. The arrows represent the constant-rate-of-penetration vector, i.e., *k*RP.

The linear propagation of a maximal distortion through the relational matrix is dependent on there being a balanced distortion field to repetitively create and linearly propagate the maximal distortion into the next reality cell in sequence, as depicted in figure 28.

Should the propagating maximal distortion encounter another distortion field, the balance of the surrounding distortion field would change, altering the direction of propagation of the maximal distortion. That is, it would continue to propagate linearly as a maximal distortion, but its direction of propagation would be altered, specifically toward the area of increasing distortion content, as depicted in **figure 29.**

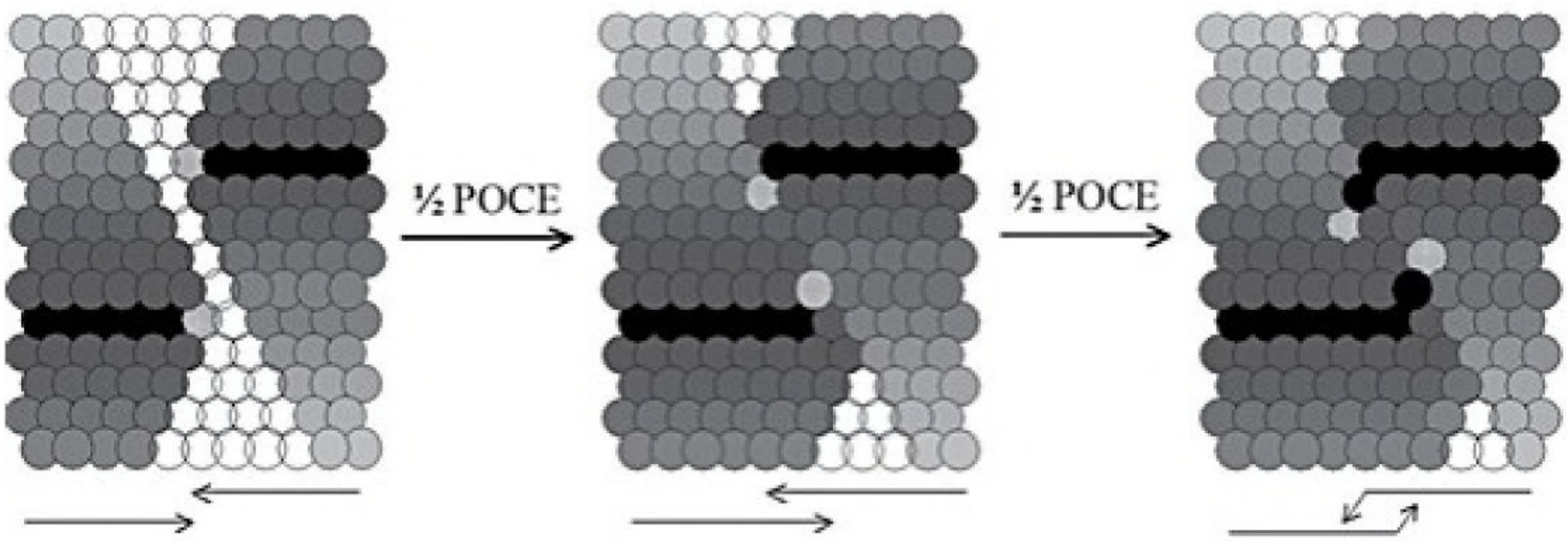


Figure 29 The alteration of the direction of propagation of a maximal distortion. The stippled reality cell in each drawing indicates the next reality cell that will become maximally distorted. A maximal distortion will propagate linearly through the relational matrix as long as it's the next reality cell in linear sequence that becomes maximally distorted. This linear progression occurs when there's no other distortion field present, or when a surrounding distortion is balanced or symmetrically distributed around the axis of propagation. However, once the balance or symmetry of the surrounding distortion field changes, with greater distortion content existing on one side of the axis of maximal-distortion propagation, it's not a reality cell in linear sequence, but rather one on the side of increasing distortion content, that next becomes maximally distorted. In this way, the direction of maximal distortion propagation is

altered. Thus, as a linearly propagating maximal distortion encounters another distortion field, its direction of propagation will always be altered toward the area of increasing distortion content.

7.3 *The linear-radial distortion complex*

We've now discussed one scenario wherein the distortion content decreases as a distortion propagates, another scenario wherein the distortion content increases as a distortion propagates, and a third scenario wherein the distortion content remains constant as a maximal distortion propagates through the relational matrix.

We'll now define a specific type of propagating distortion, already mentioned in figure 28, that represents a combination of the first two scenarios. Specifically, we'll define a type of propagating distortion composed of both a radially propagating distortion of decreasing distortion content and a linearly propagating distortion of constant maximal distortion content. We'll call this combination a *linear-radial distortion complex*. Two views of this complex are depicted in **figure 30**.

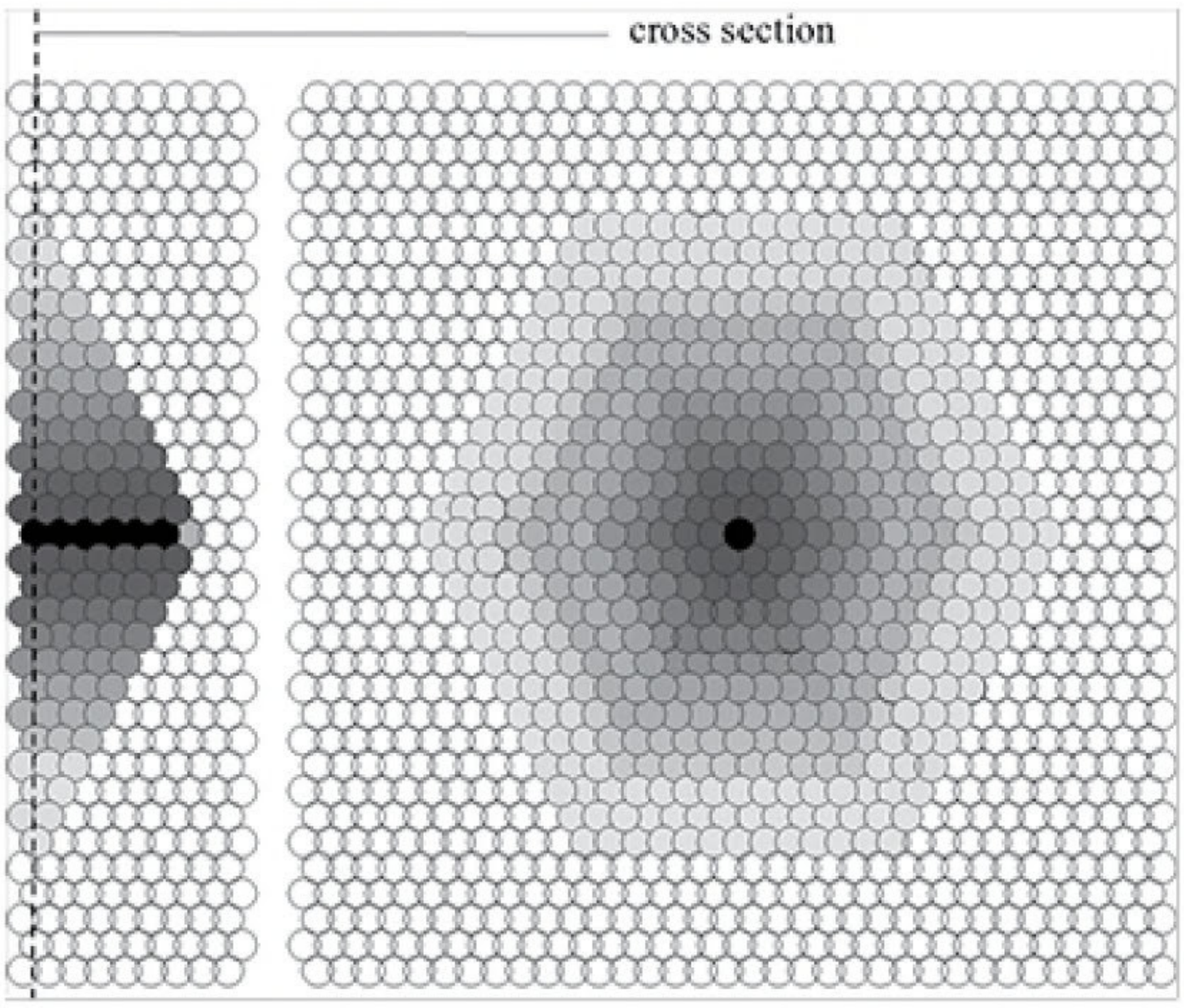


Figure 30 Side view (left) and front view (right) of a linear-radial distortion complex. The distortion content of the radially propagating distortions (depicted by increasingly lighter shades of gray) decreases as they propagate farther from their axis of origin (in black), while the linearly propagating component (black areas) maintains a constant level

of distortion content equivalent to the maximal distortion.

The linear and radial components of the propagating distortion are the dual aspects of a single process. In the linear-radial distortion complex, the radially propagating distortions converge to create the linearly propagating maximal distortion, while the linearly propagating maximal distortions simultaneously create the radially propagating distortions, as depicted in figure 28.

Thus, in the linear-radial distortion complex, there's a situation of mutual coexistence, with the radial components creating the linear component, and the linear component creating the radial components. Which comes first, radial or linear? Neither; they mutually coexist, with each aspect supporting the existence of the other. Understanding the linear-radial distortion complex will be central to our task of relating the relational-matrix model to space-time and physical reality. Having defined and described the structural and dynamic relationships that compose the relational matrix, we're now prepared to undertake this task.

CONCEPTUAL CHECKPOINT I–5

Owing to the continuous interpenetration of the reality cells, whereby one reality cell continuously exchanges spatial content with adjacent reality cells, any distortion of reality-cell content will propagate through the relational matrix at a constant rate equivalent to the rate-of-penetration constant.

The relationship between the rate-of-penetration constant, the constant rate of distortion propagation, reality-cell structure, and reality-cell dynamic is expressed as VE × POCE = *k*RP.

The content pattern (i.e., degree of distortion) of a reality cell is determined by the sum of the content patterns of all the adjacent reality cells that penetrate it and that it also penetrates.

Distortions can diminish, decreasing in distortion content as they propagate.

Distortions can summate, increasing in distortion content as they propagate.

Any distortion cannot increase in distortion content beyond the maximal distortion.

One type of distortion can maintain a constant level of maximal distortion content as it propagates.

A maximal distortion will propagate into the adjacent reality cell where there's a convergence of distortion content up to the maximal distortion.

Where no other distortion field is present, this convergence results in the maximal distortion propagating into the next reality cell in linear sequence, resulting in the linear propagation of the maximal distortion.

When another distortion field is present, altering the balance of distortion content around the axis of maximal-distortion propagation, the maximal distortion will propagate into an adjacent reality cell not in linear sequence, thereby altering the previous direction of propagation.

A linear-radial distortion complex is a single distortion process consisting of two mutually coexistent components: (1) a linearly propagating distortion, propagating with a constant maximal distortion content; and (2) a radially propagating distortion, the distortion content of which decreases as it propagates farther from the axis of maximal-distortion propagation.

> *"I wished to show that space-time isn't necessarily something to which one can ascribe a separate existence, independently of the actual objects of physical reality. Physical objects are not in space, but these objects are spatially extended. In this way the concept of 'empty space' loses its meaning."*
>
> —Albert Einstein, June 9, 1952,
> note to the 15th edition of *Relativity*[9]

CHAPTER 2
The Dynamic Structure of Space: Relating the Relational-Matrix Model to Space-Time and Physical Reality

Section 1 Introduction

> Einstein's efforts to uncover a unified field theory were rooted in his belief that the structure of space-time is the key to understanding the characteristics of the electromagnetic and gravitational forces.[10]

Almost 100 years ago, Albert Einstein, in his special and general theories of relativity, developed mathematical formulas which told us that matter and energy are equivalent, that space and time are inseparable, that no material object can travel faster than the speed of light, and that the rate of passage of time for a body in motion is relative to that body's rate of travel through space. In this way, Einstein was able to mathematically demonstrate that these apparently separate aspects of physical reality were all connected.

Einstein understood that all physical phenomena are connected through the spatial structure, existing as extensions of that underlying structure. However, because he was unable to develop a visual model of the spatial structure, he was never able to demonstrate *how* all these things are connected through that structure.

In this chapter, we'll demonstrate that *space-time functions as a dynamic relational structure*. The relational-matrix model, as a visualizable representation of the spatial structure, will be used to explain, among other things, why the physical relationships that Einstein mathematically described exist. Using the relational-matrix model to explain the observed behavior of physical reality, we'll establish a conceptual basis for understanding how what we experience as physical reality emerges, extends, and evolves from the spatial structure. By the end of this chapter, we'll also have established a conceptual basis for understanding why nothing can truly be separated from anything else—i.e., why nothing can be said

to exist independent of all other things.

Section 2 The "Big Bang" and the Relational Matrix

The universe is expanding. This observation, based on astronomical measurements, has led to the theory that the universe began in an outward explosion from some singular point. In general, the idea of this initial explosion and subsequent expansion of the universe is called the "big bang" theory.

The relational-matrix model, as a visualizable representation of space-time, is consistent with the view of an expanding universe that began as a single point. We've described the relational-matrix model as the dynamic structure that results when existence repetitively and progressively forms relationships with itself. Yet there's another relationship within existence implied by the existence of the relational matrix that we haven't yet discussed. That implied relationship is between existence that's coming to exist in relation to itself to form a relational matrix, and existence that isn't forming a relational matrix. *That is, the relational matrix, as an aspect of existence, must itself exist in relation to another aspect of existence that's not a relational matrix.* Putting it still another way, the relational aspect of existence must exist in relation to a complementary nonrelational aspect of existence.

The relational matrix, as a structure, represents a constraint, a limitation, imposed upon absolute existence. Infinite borderless absolute existence can be imagined as a ubiquitous *no-thing*, as a nonstructure, like a blank sheet of paper extending forever in all directions. The relational matrix, as a structural imposition upon this structureless nothingness, can be imagined as a dot (or point) placed somewhere upon that blank sheet of paper. This dot is relative existence as structure coming to exist in relation to absolute existence that's nonstructural. This dot is the relational aspect of existence in contrast to the nonrelational aspect of existence. In other words, the first relationship that existence forms with itself must be between relative and absolute existence, between existence as relational structure and existence as nonrelational nonstructure, between the finite point and the infinite nonpoint.

Existence is just what it is, whether or not the dot is there. However, the dot can't exist except within the context of existence that's not a

dot—i.e., the dot can't exist other than as finite bordered relative existence in relation to infinite borderless absolute existence. The dot is existence coming to exist in relation to itself. The dot is relative existence, existence that's what it is by virtue of its *relationship* to a complementary aspect of existence. This is why the dot successively dualizes into a relational matrix, because what the dot is is the relational aspect of existence; what the dot is is existence forming a relationship with itself. Therefore, the dot undergoing a process of successive dualization, of repetitive and progressive self-relation, isn't other than relative existence continuing to be what it is—i.e., existence that has formed a relationship with itself. For this reason, existential self-relation, once it has happened, becomes an ongoing process.

However, as a reality, the dot (i.e., the relational matrix) must do more than just internally dualize. As a reality, the dot must also penetrate or expand into the absolute existence that it exists in relation to. That is, just as the reality cells of the relational matrix maintain their relative existences through the ongoing dynamic of continuous interpenetration and interexpansion, the relational matrix as a whole must itself also maintain its relative existence by continuously penetrating and expanding into whatever it is that it exists in relation to, which in this case is infinite borderless absolute existence.

The universe conceived as expanding from a point of origin owing to an initial "big bang" represents our view of the dynamic that must be occurring in order for existence to sustain the relationship it has formed with itself. What we observe as the expansion of the universe isn't other than the ongoing penetration of one aspect of existence into its complementary aspect of existence. What we observe as the expansion of the universe isn't other than the ongoing penetration and expansion of the relational matrix, as relative existence, into existence that's not a relational matrix. In other words, what we observe as the expansion of the universe is one half of the dynamic involved in maintaining the relational state of existence that is the universe.

The other half of that dynamic involves the universe as relational matrix, as finite bordered relative existence, being penetrated by whatever it is that it exists in relation to, which, again, in this case is infinite borderless absolute existence. *That is, as the universe expands into the surrounding nonuniverse, that surrounding nonuniverse must also be expanding into the universe.* Putting it

another way, as the relational matrix penetrates and expands into existence that's not a relational matrix, existence that's not a relational matrix must also be penetrating and expanding into the relational matrix.

It's these penetrations of the relational matrix by existence which isn't a relational matrix that create what we've previously defined and described as *distortions* of the relational matrix. Distortions are patterns of reality-cell content within the relational matrix that differ from the uniform or baseline pattern and are at some level the opposite of the uniform pattern.

As we'll explain in upcoming sections, what we perceive as the fundamental forms of electromagnetic and gravitational energy aren't other than the propagation of these distortions of reality-cell content through the relational matrix, once they've come into existence, with that propagation being driven by the dynamic intrinsic to the relational structure of space-time. This situation is somewhat analogous to what happens when the uniformly calm surface of a body of water is penetrated by some object, with the surface of the water in that area becoming then uncalm, or distorted, in relation to the uniformly calm pattern, followed by the propagation of that distortion from its point of origin outward as a water wave.

To summarize, what we observe as the expansion of the universe is our perception, from within the universe, of the relational aspect of existence penetrating or expanding into the nonrelational aspect of existence. Also, what we experience as propagating distortions—i.e., what we observe as the electromagnetic and gravitational energy of the universe, as well as their material products—is the result of the nonrelative nonuniverse having penetrated the relative universe.

Thus, the universe contains infinite form, endless structural variation, because it's undergoing a process whereby finite structural existence is expanding into infinite nonstructural existence, while infinite nonstructural existence is also expanding into finite structural existence. The seeming infinity of form observed in the universe is the result of an ongoing dynamic between existence as structure and existence as nonstructure. In this way, the interplay or interrelation between structural constraint and unconstrained possibility creates a universe of infinite form and endless structural variation, wherein no snowflake is identical to another snowflake. This is finite structural existence embodied (i.e., taking shape) within, and in relation to, infinite nonstructural existence. Look at a flower, and what you're

seeing is the marriage of the infinite to the finite, the marriage of existence to itself, existing in relation to itself. Look at anything else, or look into a mirror, and you're observing the same.

Section 3 Space-Time and the Relational Matrix

Einstein's relativity theory demonstrated the inseparability of spatial and temporal existence by revealing that the rate of passage of time which a material object is observed to experience varies with that object's rate of travel through space. This connection between the passage of time and material velocity established the idea that space and time are the dual aspects of a single underlying reality, which is now referred to as space-time.

The structural and dynamic aspects of the relational-matrix model also have been described as the dual aspects of a single underlying reality. We'll show that space and time are inseparably linked because they're the manifestations of the structural and dynamic aspects, respectively, of the dynamic relational structure that underlies our perception of the universe, as depicted in **figure 31.**

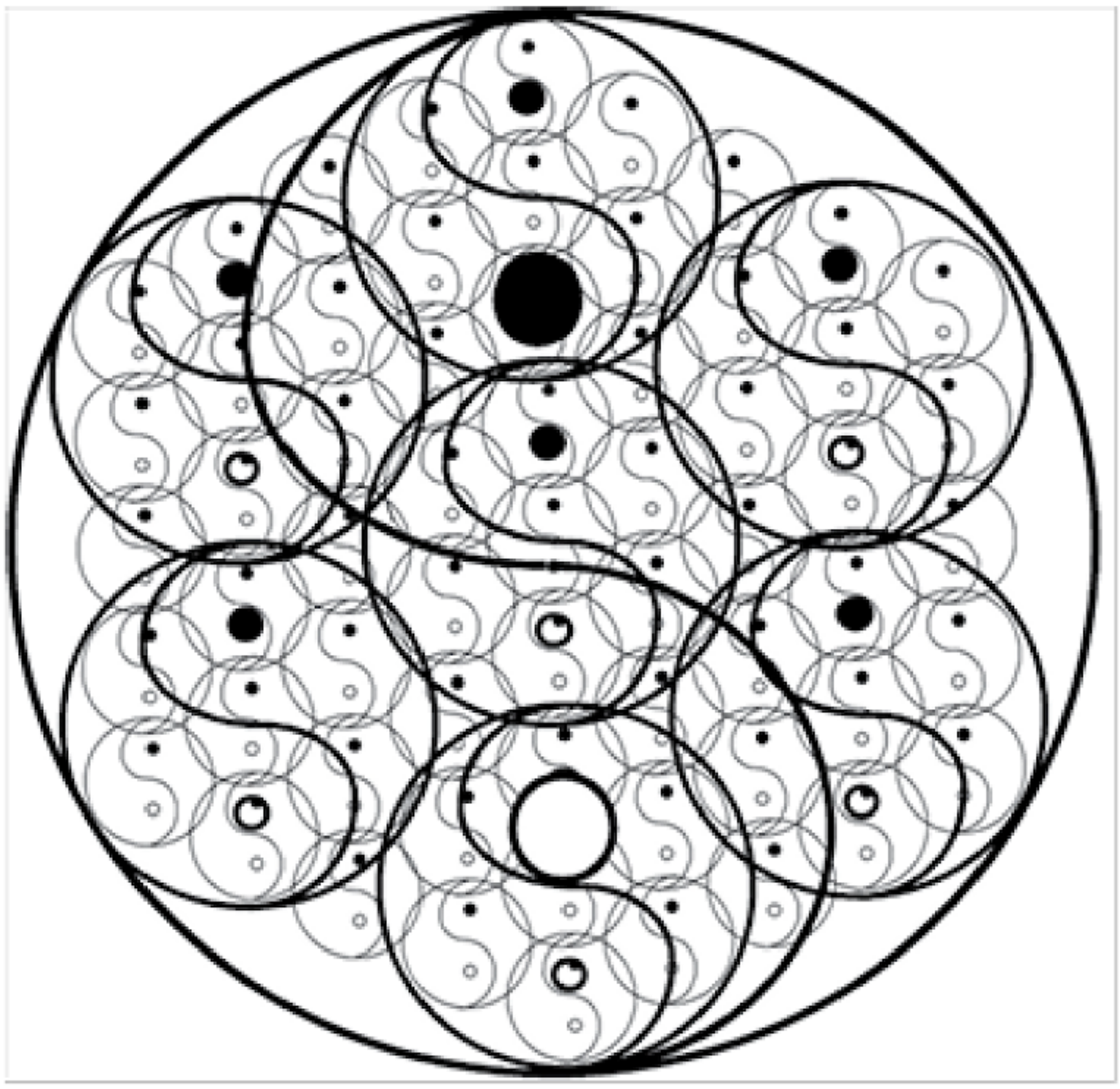


Figure 31 Diagrammatic representation of the dynamic structure we perceive as space-time. "Space" is derived from the static aspect of the

> spatial structure, wherein areas of existence are defined in relation to each other as reality cells of a certain size or volumetric existence (VE). "Time" is derived from the dynamic aspect of the spatial structure, which involves the continuous exchange of spatial content between reality cells.

In the relational-matrix model, space is the manifestation of the *structural* aspect of the relational matrix, i.e., the volumetric existence (VE) of the reality cells. A reality cell defines a spatial construct, an area of relational structure within existence. The area so defined exists as spatial content, as an area of space. Space doesn't exist "within" the reality cell; space *is* the reality cell, and the structure of space is derived from the relationships between reality cells. As we'll describe in upcoming sections, there's no empty space for things to be "in"; there's only the dynamic structure of space, which, as existence repetitively and progressively forming relationships with itself, composes the energy, the matter, and then the experience of those things as existing "in" space.

Time, then, is the manifestation of the *dynamic* aspect of the relational matrix. Essentially, time will be shown to be nothing more than a measure of the cyclic or periodic activity of compound distortion processes, or matter. Since time doesn't exist until there exists matter, we can't explain how the dynamic aspect of the relational matrix relates to time until we've first shown how matter arises within the context of the unified model of reality.

To demonstrate that space-time functions as a dynamic structure, and to eventually show how matter arises within the context of that dynamic structure, we'll now relate reality-cell distortions and distortion propagation to some fundamental aspects of electromagnetic radiation and gravitation.

Section 4 Electromagnetic Radiation and the Relational Matrix

In this section, we'll define the existence of electromagnetic radiation (EMR) within the context of the relational-matrix model.[11] We'll demonstrate that the propagation of electromagnetic radiation through space is represented in the relational-matrix model by linearly propagating distortions which have a distortion content equivalent to the maximal distortion. In other words, electromagnetic radiation will be shown to represent the linear component of the linear-radial

distortion complex. Modeling electromagnetic radiation within the context of the relational matrix will reveal the basis of some of its fundamental physical properties.

An individual electromagnetic wavicle, or photon, is defined by its frequency, wavelength, and energy, all of which are related through physical constants.[12] Wavelength (λ) and frequency (v) are inversely related through the speed-of-light constant (*c*), as stated in the equation λv = *c*. The frequency (v) of an individual electromagnetic wavicle is directly related to its energy (*E*) through Planck's constant (*h*), also known as the quantum of action, as stated in the equation *E* = *h*v. The relationship between wavelength, frequency, and the speed of light is depicted in **figure 32**.

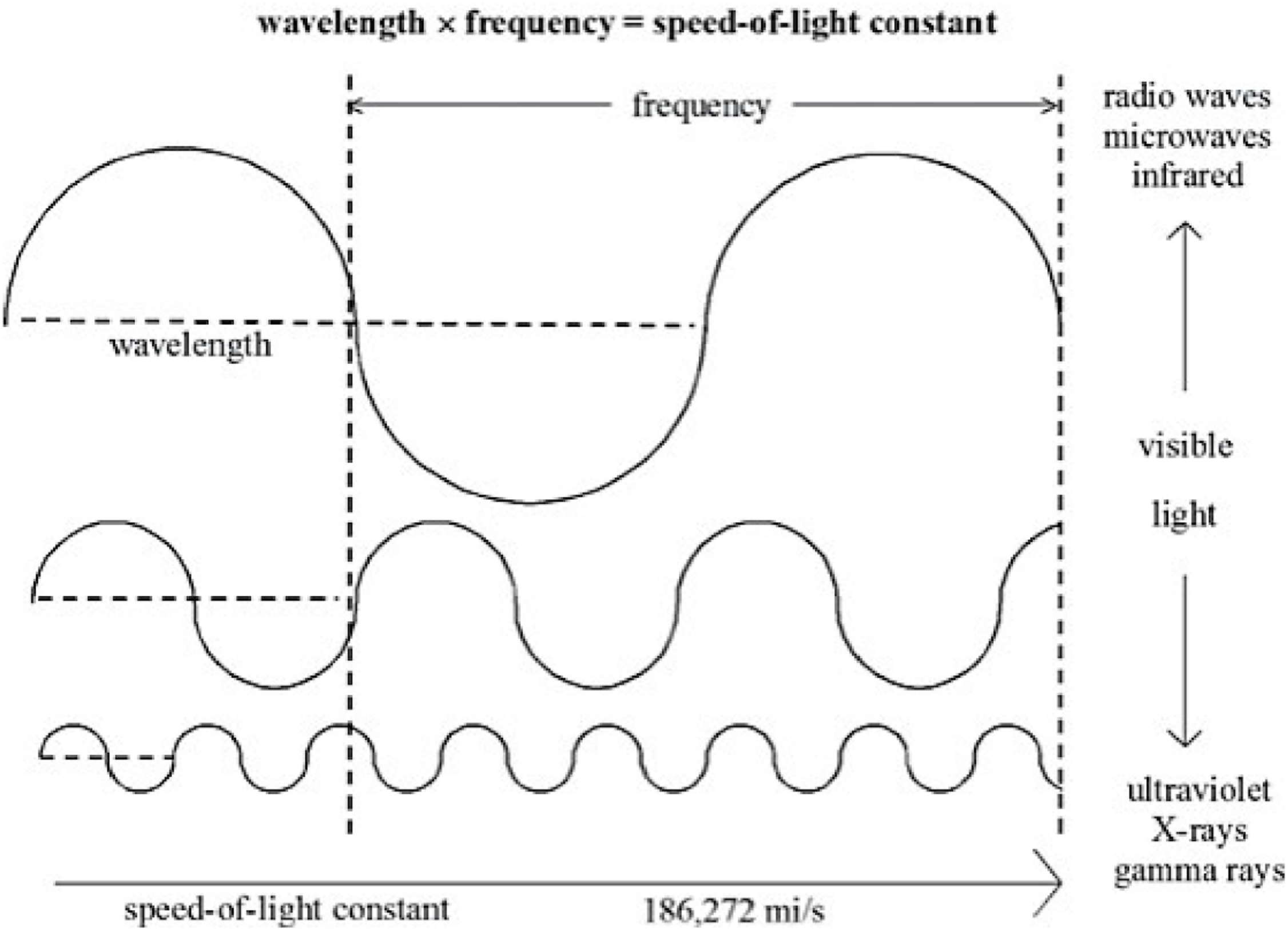


Figure 32 The relationship between the wavelength, frequency, and velocity of electromagnetic radiation. The shorter the wavelength, the higher the frequency. In a vacuum, all electromagnetic radiation, regardless of its wavelength and frequency, propagates at the same velocity of approximately 186,272 mi/s (300,000 km/s). This invariant velocity is the speed-of-light constant (*c*).

In this diagram, three different electromagnetic wavicles are depicted, representing, from largest to smallest wavelength, the primary colors, red, green, and blue, for which we have specific sensory

receptors. However, visible light makes up only a very small part of the electromagnetic spectrum, which extends from waves of extremely high frequency and short wavelength to waves of extremely low frequency and long wavelength.

In the next few subsections, we'll demonstrate that electromagnetic wavelength and frequency are manifestations of the structural and dynamic aspects of reality cells—i.e., the volumetric existence (VE) and the period of content exchange (POCE), respectively. We'll also demonstrate how the energy associated with an electromagnetic wavicle is related to the distortion content of a reality cell. Finally, we'll demonstrate that the speed-of-light constant and Planck's constant are both manifestations of constant relationships which exist within the dynamic structure that's space-time.

4.1 *Wavelength, frequency, the speed of light, and the relational matrix*

Previously, we defined the complementary structural and dynamic aspects of reality cells in terms of their volumetric existence (VE) and period of content exchange (POCE), respectively. Within space-time, electromagnetic radiation also has complementary structural and dynamic aspects that define its existence. These complementary structural and dynamic aspects of electromagnetic radiation are wavelength and frequency, respectively.

In terms of reality cells, the VE and POCE are inversely related through the rate-of-penetration constant (*k*RP). In terms of electromagnetic radiation, the wavelength and frequency are inversely related through the speed-of-light constant (*c*).

The rate of propagation of a distortion of reality-cell content is equivalent to *k*RP, which is defined as VE multiplied by POCE—i.e., VE × POCE = *k*RP. Similarly, the linear velocity of electromagnetic radiation is equivalent to the speed-of-light constant (*c*), which is defined as the wavelength multiplied by the frequency—i.e., $\lambda v = c$.

Thus, the relationships between the complementary structural and dynamic aspects of electromagnetic radiation exactly parallel the relationships between the complementary structural and dynamic aspects of reality cells. These parallels allow us to begin to define electromagnetic radiation within the context of the relational-matrix model as a linearly propagating distortion of reality-cell content.

Within the context of the relational-matrix model, electromagnetic

wavelength is equivalent to reality-cell VE, electromagnetic frequency is equivalent to reality-cell POCE, and the speed-of-light constant is equivalent to k*RP and the constant rate of distortion propagation.* The parallels between these different aspects of electromagnetic radiation and linearly propagating distortions of reality-cell content are depicted in **figure 33**.

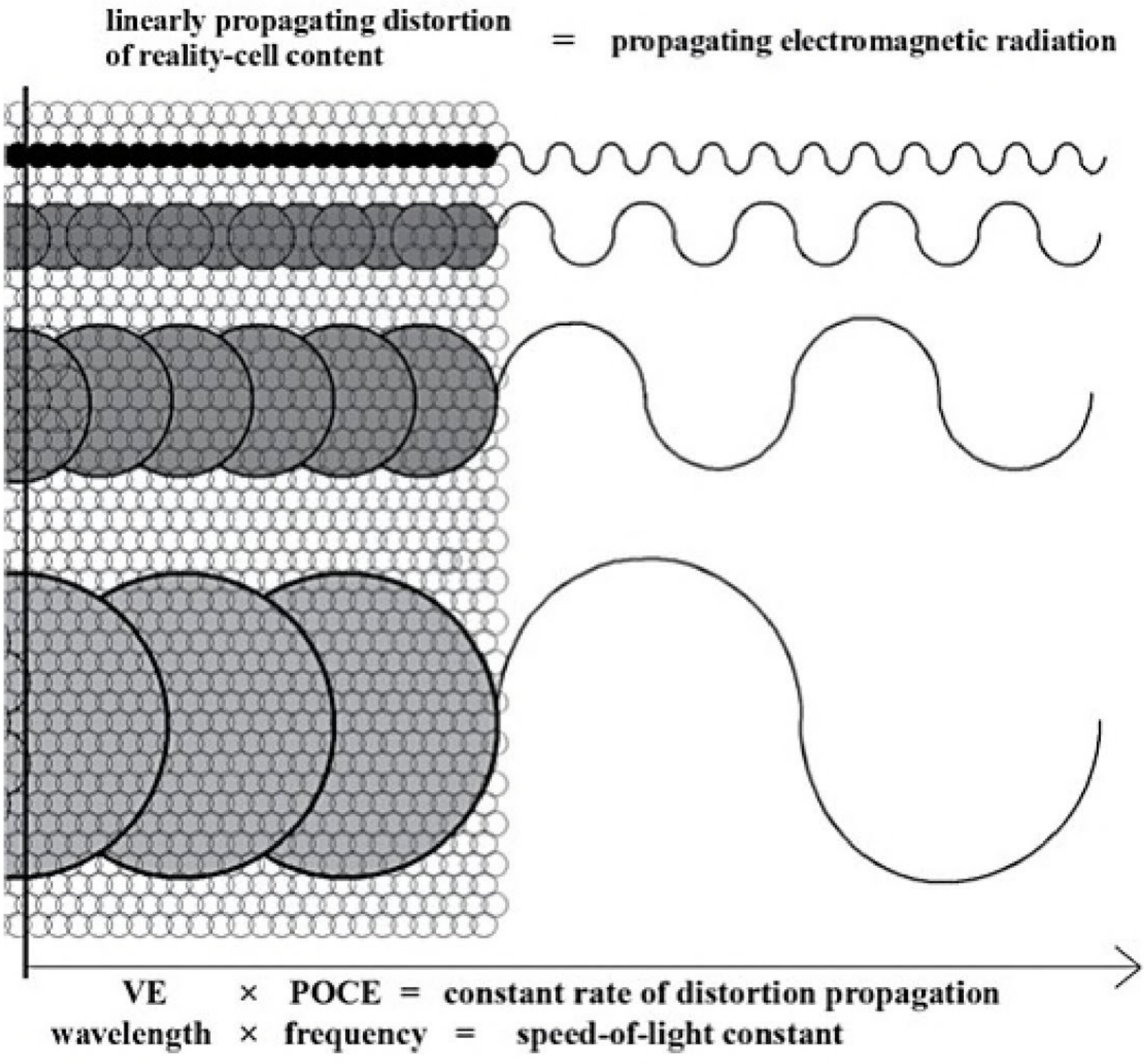


Figure 33 The relationship between the basic aspects of distortion propagation and electromagnetic radiation (EMR). (Left) Four different linearly propagating distortions of different sizes or VEs. (Right) Four different wavelengths of EMR. The reality-cell VE is equivalent to EMR wavelength, the reality-cell POCE is equivalent to EMR frequency, and the constant rate of distortion propagation is equivalent to the speed-of-light constant. Also, as discussed in the next subsection, the discrete relationship between reality cells at different relational levels of existence, depicted here as four different sizes of propagating distortions, is what's responsible for the quantum nature of EMR.

Having defined electromagnetic radiation within the context of the relational-matrix model, we'll now relate other aspects of electromagnetic radiation to that model. In so doing, we'll provide further evidence that space-time functions as a dynamic structure, and that what we experience as physical reality exists as a relational extension of that dynamic structure.

4.2 *The quantum nature of electromagnetic radiation*

> **quan·tum** (kwòn¹tem) *noun, plural* **quan·ta** (-te) **1.** A quantity or an amount. **2.** A specified portion. **3.** Something that can be counted or measured. **4.** *Physics.* **a.** The smallest amount of a physical quantity that can exist independently, especially a discrete quantity of electromagnetic radiation. **b.** This amount of energy regarded as a unit.[13]

The concept of electromagnetic quanta refers to the fact that the energy associated with electromagnetic radiation exists in discrete quantities, rather than in a continuous gradation. That is, although there's an electromagnetic spectrum or continuum, that continuum isn't continuous! Rather, the electromagnetic spectrum is divided into specific and discrete energy quantities.

The reality cells of the relational matrix also have a discrete or quantum nature. The reality cells don't occur in a continuous gradient but in discrete sizes. Because each reality cell exists as a result of the dualization of a larger reality cell, this relationship creates "quantum jumps" between one reality-cell size and the next smaller or larger reality-cell size. Thus, each relational level of existence within the relational matrix is made up of reality cells that all have the same specific and discrete VE and POCE—i.e., they all have the same discrete structural and dynamic parameters.

Having related electromagnetic wavelength to reality-cell VE, and electromagnetic frequency to reality-cell POCE, we can now state that the discrete quantum levels of electromagnetic radiation each correspond to a certain relational level of existence within the relational matrix wherein all the reality cells have the same discrete structural and dynamic parameters. *In other words, the discrete nature of reality-cell existence is what forms the basis of the quantum nature of electromagnetic radiation.* This discrete nature of reality-cell existence is depicted in figures 15, 22, and 33.

We can now use this understanding of the existence of

electromagnetic frequency, wavelength, and quanta, as they've been defined within the context of the relational-matrix model, to examine and understand the existence and basis of the energy itself that is, and is associated with, electromagnetic radiation. To do so, we'll need to revisit the concept of distortion content and the special case of distortion content that represents a maximal distortion.

4.3 *Energy and the relational matrix*

In this subsection, we'll relate the concept of energy, as it applies to the quantity of energy associated with electromagnetic radiation, to the relational- matrix model. Specifically, we'll approach the concept of energy through the well-known relationship of electromagnetic energy (E) to frequency (v) and Planck's constant (h), as stated in the equation $E = h\text{v}$.

We've already related electromagnetic frequency to reality-cell POCE, and so we can begin by substituting POCE for frequency in the equation $E = h\text{v}$ as $E = h \times$ POCE. However, to understand the nature of energy within the context of the relational-matrix model, we must also define Planck's constant within the context of this model, so that we can then solve for E in the equation $E = h\text{v}$ wholly within the context of the model.

In the following subsection, we'll show that Planck's constant is the manifestation of a relationship intrinsic to reality cells which remains constant at all levels of scale. Understanding the basis of Planck's constant within the context of the relational-matrix model will allow us to understand what makes energy *energetic*.

4.31 *Electromagnetic radiation, Planck's constant, and the relational matrix*

Electromagnetic wavicles, or photons, each are associated with a certain quantity of energy, and propagating distortions each are associated with a certain pattern of distortion content. So, there's a parallelism between the distortion content of a propagating distortion and the energy of an electromagnetic wavicle, inasmuch as they both represent what's delivered by their respective realities. We can then postulate that *energy is equivalent to distortion content*, as depicted in **figure 34**. The nature of this equivalence is what we'll explore next.

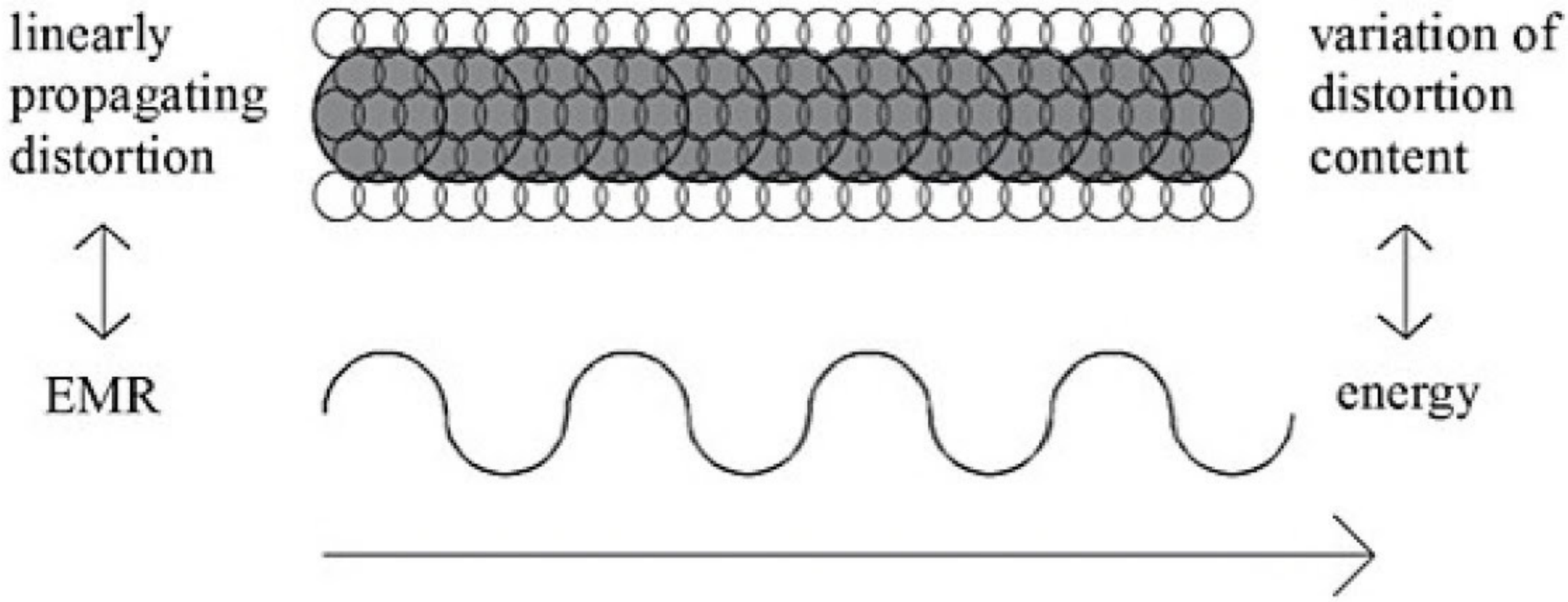


Figure 34 The energy associated with an electromagnetic wavicle is equivalent to the distortion content associated with a propagating distortion. Electromagnetic radiation (EMR) represents a certain quantity of energy, whereas a propagating distortion represents a certain pattern of distortion content. Since electromagnetic radiation has been modeled as a linearly propagating distortion, the energy associated with an electromagnetic wavicle is then equivalent to the pattern of distortion content associated with a propagating distortion.

For a particular electromagnetic wavicle, the quantity of energy is constant, as stated in the equation $E = h\nu$. That is, the quantity of energy associated with an electromagnetic wavicle doesn't increase or decrease as it propagates. We also know that in a vacuum, and in the absence of a gravitational field, an electromagnetic wavicle propagates in a straight line. We'll use these properties to further define electromagnetic radiation within the context of the relational-matrix model as a specific type of propagating distortion.

Since electromagnetic energy is equivalent to distortion content, and since the quantity of energy associated with a particular electromagnetic wavicle is constant, then electromagnetic radiation modeled as a propagating distortion should be represented by a reality-cell distortion that propagates through the relational matrix with a constant pattern of distortion content. In chapter 1, where we developed the relational- matrix model, we described the scenario of a linearly propagating distortion with a constant pattern of distortion content.[14] In that scenario, the constant pattern of distortion content is that of a maximal distortion.

Using the parallelism between wavelength and VE, frequency and POCE, and the speed-of-light constant and the constant rate of distortion propagation, we've already defined electromagnetic radiation within the context of the relational-matrix model as a linearly

propagating distortion.

Now, using the parallelism between constant electromagnetic energy and constant pattern of distortion content, we'll further define electromagnetic radiation within the context of the relational-matrix model as the *linear propagation of a maximal distortion*. As described in chapter 1, a linearly propagating maximal distortion is one component of a linear- radial distortion complex.[15] Therefore, we'll define electromagnetic radiation as the *linear component* of the linear-radial distortion complex, as depicted in **figure 35.**

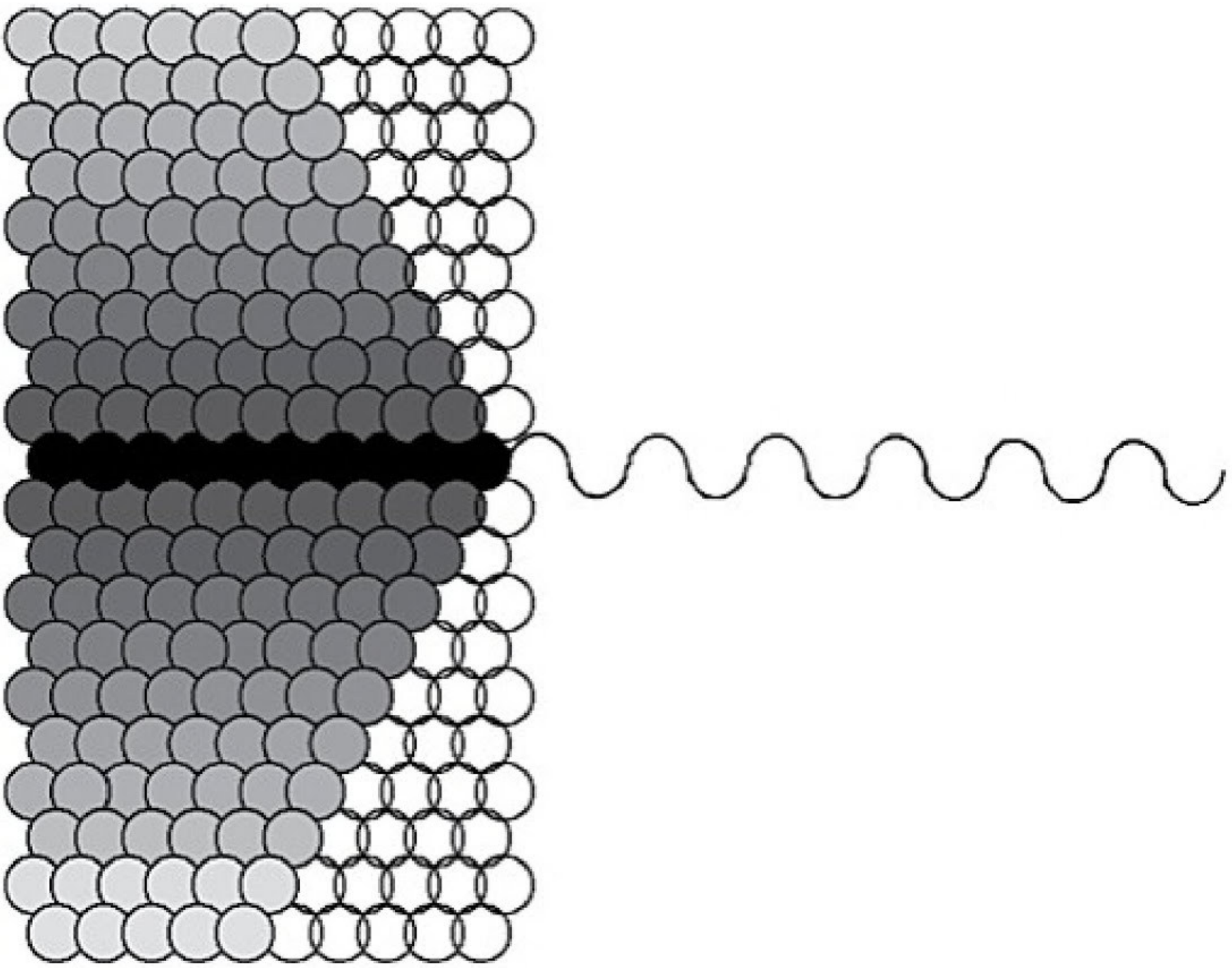


Figure 35 (Left) A linear-radial distortion complex. (Right) An electromagnetic wavicle. Within the context of the relational-matrix model, electromagnetic radiation is equivalent to the linear component of the linear- radial distortion complex. As explained earlier, the pattern of distortion content represented by the linear component of the linear-radial distortion complex is that of a maximal distortion.

Distortions of the relational matrix consist of patterns of reality-cell content distribution that differ from the content pattern which is defined as uniform. Maximal distortions all have the same pattern of reality-cell content distribution, regardless of reality-cell size, or VE,

because the content pattern that represents the maximal distortion is the opposite of the uniform pattern. Thus, the pattern of reality-cell content distribution must be the same for all maximal distortions.

The relationship between any two quantities can be expressed as a ratio, which is one quantity divided by the other. Thus, any pattern of distortion content could be expressed as a positive/negative or negative/positive ratio, which we can call the *distortion ratio* (DR). Since the maximal distortion represents a constant and consistent pattern of distortion content—i.e., a constant and consistent pattern of reality-cell content distribution—its distortion ratio would be invariant, or a constant, regardless of the size of the maximal distortion—i.e., regardless of the VE of the maximally distorted reality cell. The *distortion-ratio constant* associated with maximal distortions will be denoted as *k*DR. The relative quantification of the distortion ratio is depicted in **figure 36**.

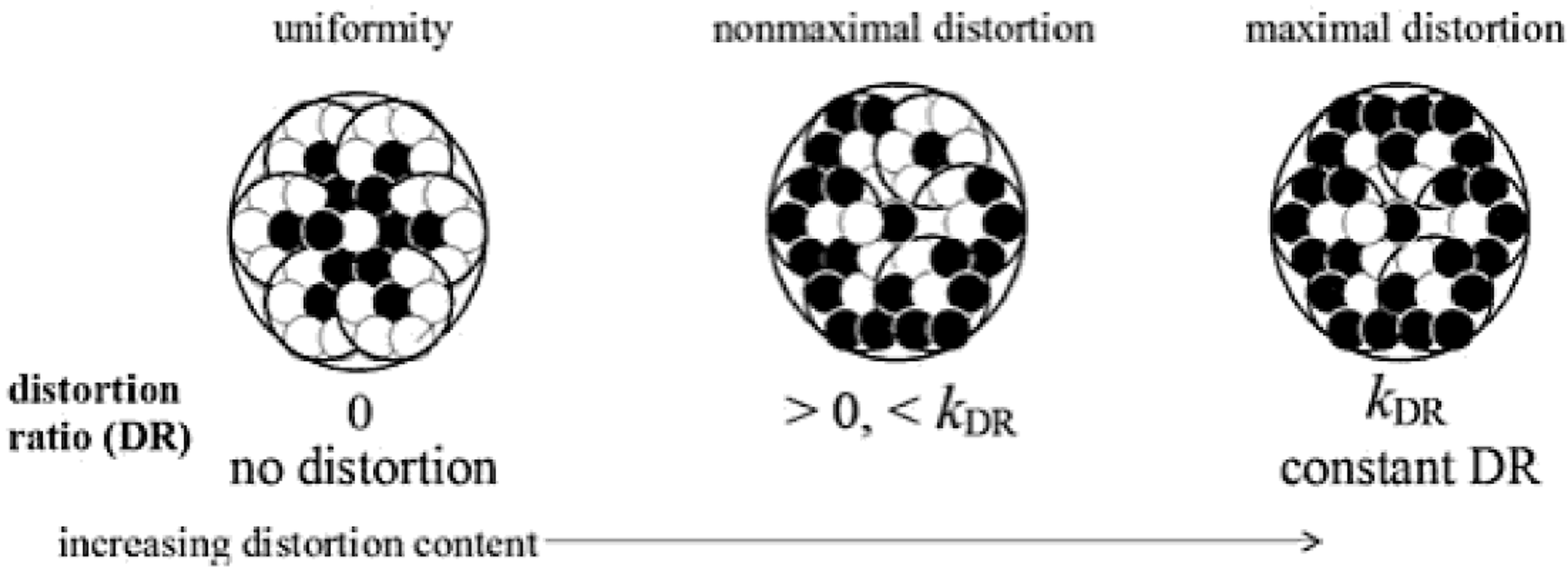


Figure 36 The distortion ratio (DR) is the positive/negative or negative/positive content ratio of reality-cell content that exists for distortions—i.e., the nonuniform pattern of reality-cell-content distribution. Uniformity, being a state of nondistortion, has a distortion ratio defined as zero. The maximal distortion has the greatest distortion ratio, which is the distortion- ratio constant (*k*DR), and all intermediate degrees of distortion have a distortion ratio between zero and *k*DR.

As stated previously, the quantity of energy associated with an electromagnetic wavicle is equivalent to the distortion content of a linearly propagating maximal distortion. The distortion content of a linearly propagating maximal distortion can be expressed as a constant positive/negative or negative/positive ratio of reality-cell content called the distortion-ratio constant. Therefore, the quantity of energy associated with electromagnetic radiation is related to the distortion-ratio constant (*k*DR).

However, the quantity of energy associated with electromagnetic radiation isn't precisely equivalent to the distortion content of a linearly propagating maximal distortion, or else the energy associated with all electromagnetic wavicles would be identical, since the distortion content or distortion ratio of all linearly propagating maximal distortions is the same.

What a linearly propagating maximal distortion delivers is a constant and consistent pattern of distortion content, as represented by *k*DR. Reality cells existing at different relational levels of existence deliver those constant and consistent patterns of distortion content in different sizes (i.e., with different VEs) and at different frequencies (i.e., at different POCEs).

We know from the equation $E = hv$ that energy is directly related to variable electromagnetic frequency through Planck's constant. Therefore, within the context of the relational-matrix model, the "energy" associated with a linearly propagating maximal distortion is related to the reality-cell POCE through a constant analogous to Planck's constant (h), expressed as E = (constant) × POCE. The question is, what constant in the relational-matrix model represents Planck's constant?

In the preceding paragraphs, we developed a constant, *k*DR, that represents the constant and consistent pattern of distortion content propagated by the linear component of the linear-radial distortion complex. Planck's constant, according to the equation $E = hv$, represents an invariant quantity of action associated with electromagnetic radiation. As the frequency of electromagnetic radiation increases, its energy, equivalent to Planck's constant times the frequency, also increases, and so the energy for a higher frequency of electromagnetic radiation is greater than for a lower frequency of electromagnetic radiation.

What a propagating distortion does is change the pattern of reality cell content in an area of the relational matrix. This is the specific action performed by a propagating distortion. For linearly propagating maximal distortions, this action is always the same, since the degree of distortion is always maximal. While the area of that action, and its frequency, vary according to the inverse relationship between reality-cell VE and POCE, the action itself, that of maximal distortion, is invariant.

Thus, there's a parallel between Planck's constant, as an invariant

quantity of action intrinsic to electromagnetic radiation, and the distortion-ratio constant (*k*DR), as the invariant action intrinsic to linearly propagating maximal distortions. *Therefore, within the context of the relational-matrix model, Planck's constant is equivalent to the distortion-ratio constant,* as depicted in **figure 37**.[16]

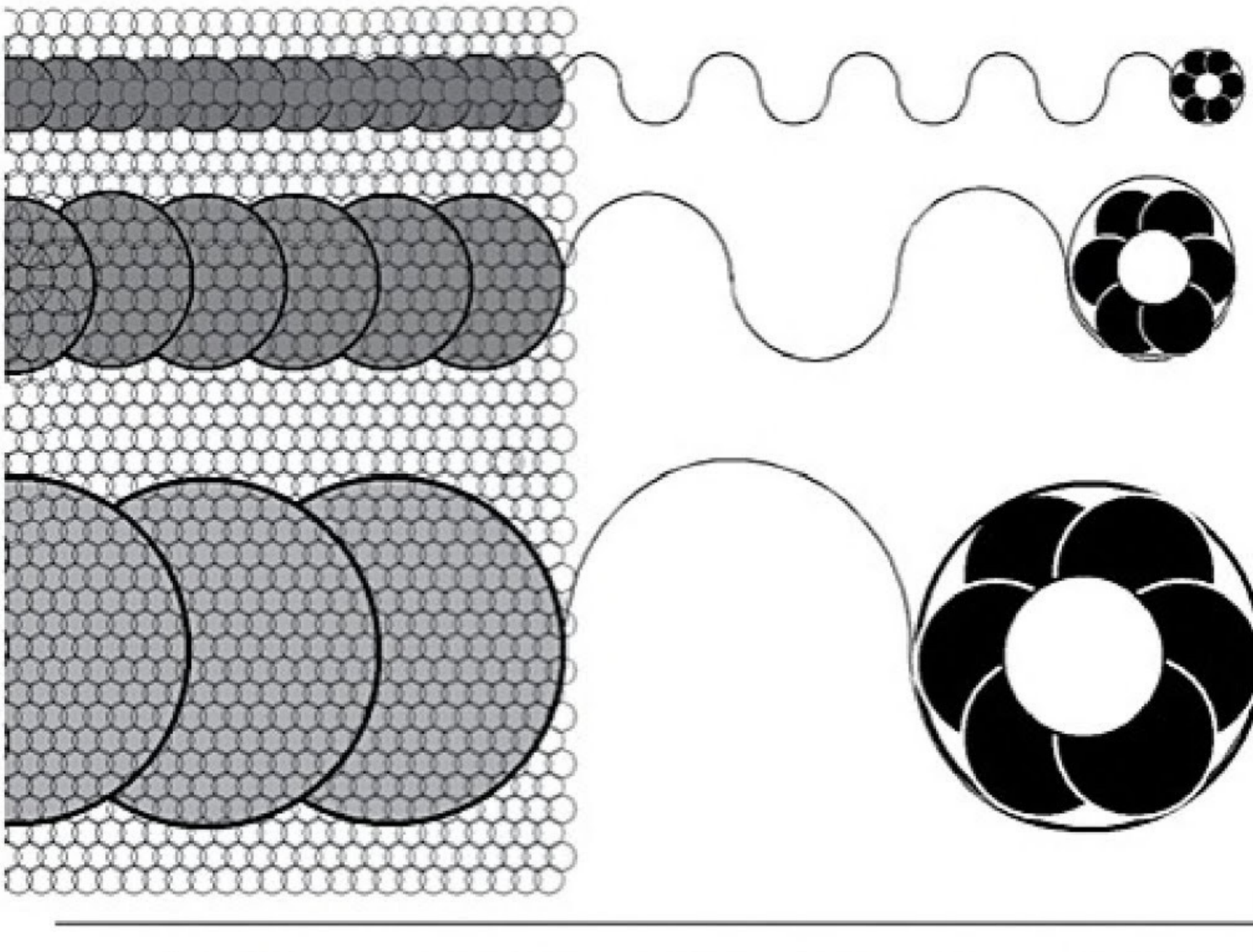


Figure 37 The parallelism between Planck's constant and the distortion-ratio constant. Electromagnetic radiation (EMR) has been modeled as a linearly propagating maximal distortion. The maximal distortion content that's propagated has been relatively quantified as the distortion-ratio constant (*k*DR). Whereas Planck's constant (*h*) represents an invariant quantity of action associated with EMR, *k*DR represents an invariant action intrinsic to linearly propagating maximal distortions. Therefore, Planck's constant is equivalent to the distortion-ratio constant. (Left) Propagating distortions. (Right) Electromagnetic wavicles, modeled as all carrying the same pattern of maximal distortion content represented by *k*DR. What both linearly propagating maximal distortions and electromagnetic wavicles deliver is a constant degree of spatial-content distortion. The frequency (POCE) of that distortion content is the variable that determines the quantity of energy associated with a particular wavelength of EMR.

Substituting *k*DR for Planck's constant, we can now solve for

electromagnetic energy in terms of the relational-matrix model. The equation $E = h\nu$ can be stated as $E = k\text{DR} \times \text{POCE}$. What this equation shows is that, *within the context of the relational-matrix model, the energy associated with electromagnetic radiation is equivalent to the frequency of maximal distortion*.

So, energy is related to distortion content, although energy doesn't exist directly as distortion content. That is, energy, in terms of the relational- matrix model, is directly related to both the frequency of distortion and the degree of distortion. The greater the frequency (POCE), with the distortion ratio held constant, the greater the energy. Conversely, the greater the distortion ratio, with the frequency held constant, the greater the energy. Lesser degrees of distortion, creating smaller distortion ratios, with the frequency held constant, would correspond to less energy. That is, for submaximal distortions, according to the equation $E = k\text{DR} \times \text{POCE}$, the smaller the distortion ratio, the less the energy associated with that distortion.

Although intuitively it may seem that more energy should be associated with a larger area of distortion (i.e., greater VE or wavelength), this isn't the case. As stated in the equation $E = h\nu$, or $E = k\text{DR} \times \text{POCE}$, it seems that what's important in terms of the quantity of energy isn't *how large* is the area of space with a distorted content, but *how distorted* is the area in question, along with the *frequency* with which that distortion occurs.

Basically, the point of relating Planck's constant to the distortion-ratio constant was to show that, according to the equation $E = h\nu$, energy is fundamentally nothing else than a propagating distortion of spatial content. How the concept of energy as a propagating distortion is analogous to the concept of an energy field will be discussed in the next subsection.

4.4 *Energy as distortion field*

Because the reality of space-time consists fundamentally of existence coming to exist in relation to itself, nothing is what it is intrinsic to itself. Rather, all things are what they are only in relation to the complementary thing that they're not. Thus, hot exists in relation to cold, up in relation to down, good in relation to bad, distortion in relation to uniformity, and energy in relation to nonenergy. The only thing that's just what it is, as it is, is absolute existence, which really

isn't a "thing" at all.

What is energy? *Energy is fundamentally a distortion of reality-cell content propagating through the relational matrix.* Even though we've defined propagating distortions as energy, it should be understood that energy doesn't exist as such except in relation to nonenergy—i.e., distortions exist as such only in relation to uniformity. There are no independently existent energy processes or distortions. The existence of any reality is derived from the relationship to its complementary reality. Thus, what energy *is* can be understood only in the context of its relationship to what it's *not*.

That energy is inseparable from what's not energy can be understood by considering energy as a field. What's a field? It's one area of space that's distinguishable from another area of space in terms of its content or appearance. A field of wheat is distinguished from a field of corn by what grows in them. Were all spatial content the same, no area of space would be distinguishable from any other, and there'd be no field, no energy, only uniformity. So, a field is defined as such according to what it *is* in relation to what it *isn't*.

Likewise, energy is discernible as energy only in contrast to what's not energy. An energy field exists as such only in relation to other areas of space that aren't energy fields. In terms of the relational matrix, areas of reality-cell distortion within the relational matrix exist as such only in relation to areas of reality-cell uniformity. The relationship between fields, distortions, and energy is depicted in **figure 38**.

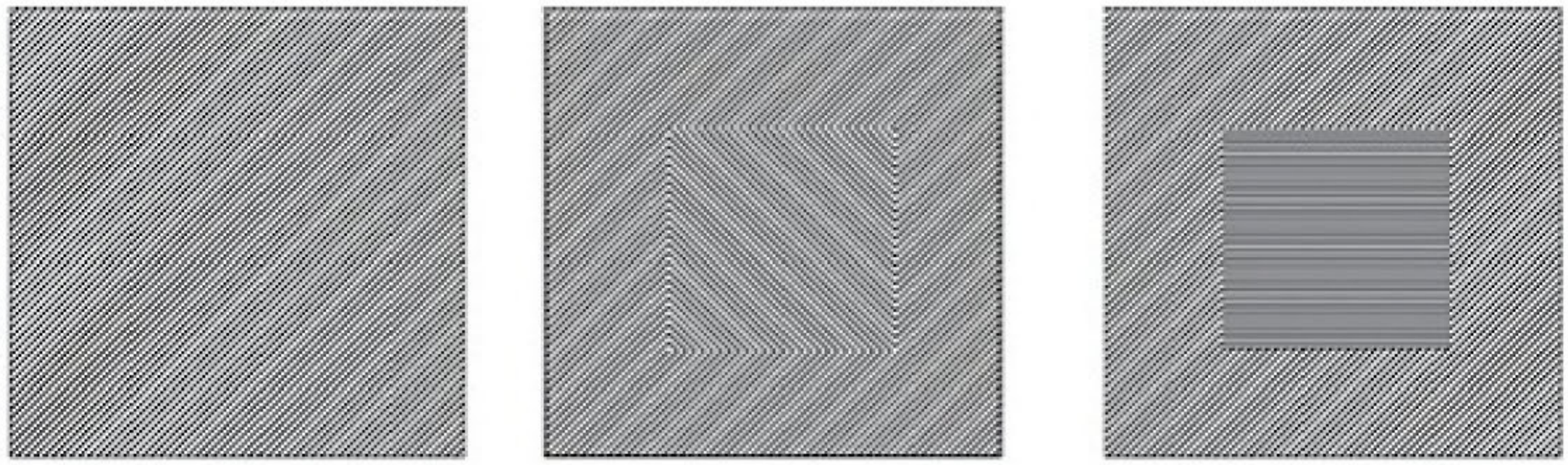


Figure 38 Depicted in the boxes at the top are fields, i.e., areas that have their content distributed in a pattern that's different from the way content is distributed in adjacent areas. Depicted in the boxes at the bottom are areas of the relational matrix that have their content distributed in a certain pattern. The boxes in the middle and on the right at the bottom contain distortions (bounded by white circles), which, like fields, are areas that have their content distributed in a pattern that's different from the way content is distributed in adjacent areas. The boxes on the left show the state of uniformity, the boxes in the middle show an intermediate variation of the uniform pattern, and the boxes on the right show a maximal variation of the uniform pattern.

We've described energy as a field because we recognize that energy represents some variation of content pattern within the spatial structure. Propagating distortions are equivalent to energy. Energy isn't something other than space; rather, energy is a propagating pattern of spatial content that differs from the baseline or uniform pattern of spatial content.

Energy doesn't exist "in" space, as if it were somehow separately existent from space. Energy *is* space, but it's space where the pattern of content is deviated or distorted from its original state.[17] Energy is a spatial "field," an area of space that's distinguishable from other areas of space because of a difference in its content pattern. Just as a water wave is still water, it's also an area of water that's distinguishable from other areas of water because of a different pattern of existence in that area.

Energy thus represents a moving spatial field, or a propagating distortion of spatial content. *A distortion is energetic both because it exists in contrast to its opposite and because it propagates.* This characteristic property of energy derives both from the relative distortion of spatial content and from the fact that the distortion content is moving from place to place.

For many years, physicists have sought a unified-field theory, a way to explain all energies as variations or extensions of a single underlying field or force. The relational-matrix model represents a nonmathematical unified-field theory. In this model, the uniform pattern of spatial content of the dynamic structure of space-time is itself the underlying unified field from which different types of energy extend as variations of that content pattern. Specifically, variations of the uniform pattern of spatial content exist as propagating patterns of distortion content, or moving spatial fields, that form the basis of what we observe as energy. In this model, different patterns of distortion propagation represent different types of energy.

So far, we've related one type of energy, electromagnetic radiation, to one type of propagating distortion, the linear component of the linear-radial distortion complex. In the next section, we'll relate the gravitational field or force to the radial component of the linear-radial distortion complex. We'll then be in a position to describe the nature of matter and its relationship to, and its inseparability from, the dynamic structure of space-time. Once we've described the relationship between the nature of matter and the structure of space-time, we'll go on to describe the nature of time and its relationship to the dynamic aspect of the spatial structure.

CONCEPTUAL CHECKPOINT I–6

The inseparability of space and time is a manifestation of the relativity and mutual coexistence of the structural and dynamic aspects of the spatial structure.

Electromagnetic radiation is equivalent to the linear propagation of a maximal reality-cell distortion. Specifically, electromagnetic radiation represents the linear component of the linear-radial distortion complex.

Electromagnetic wavelength is equivalent to reality-cell VE.

Electromagnetic frequency is equivalent to reality-cell POCE.

The speed-of-light constant is a manifestation of the rate-of-penetration constant, which creates the constant rate of distortion propagation.

Planck's constant is equivalent to the distortion-ratio constant (*k*DR), which is the same for all maximal distortions.

The quantity of energy associated with each electromagnetic wavicle is, in terms of the relational-matrix model, a function and measure of the frequency of maximal distortion occurring in any area of the relational matrix, expressed as $E = k\text{DR} \times \text{POCE}$.

Energy is fundamentally a propagating distortion of spatial content.

Energy as a field is equivalent to a distortion of spatial content existing in contrast to the uniform pattern of spatial content.

The dynamic structure of space-time, along with its uniform pattern of spatial content, is itself the unified field from which energy extends as a variation, or distortion, of that uniform pattern. Different patterns of distortion propagation represent different types of energy.

Section 5 The Complementarity of Electromagnetic Radiation and Gravitation

In this section, we'll define gravitation within the context of the relational- matrix model. Essentially, what we'll demonstrate is that *electromagnetic radiation and gravitation represent the complementary patterns of distortion propagation intrinsic to the linear-radial distortion complex*. The linear component of the linear-radial distortion complex has already been accounted for through our description of electromagnetic radiation as representing a linearly propagating maximal distortion. In this section, we'll relate gravitation to the radial component of the linear-radial distortion complex. However, first we'll develop a chain of logic to provide a basis for this proposed association between electromagnetic radiation and gravitation.

5.1 *Matter as associations of electromagnetic radiation*

According to Einstein's relativity theory, matter is made up of the accumulation, association, or interaction of the stuff we call energy. Thus, we can relate matter to electromagnetic radiation through the concept of energy. If matter is equivalent to energy, through the