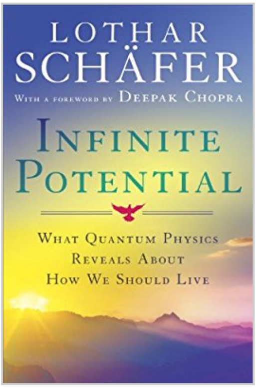

Infinite Potential: What Quantum Physics Reveals About How We Should Live

By Lothar Schafer

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A hopeful and controversial view of the universe and ourselves based on the principles of quantum physics, offering a way of making our lives and the world better, with a foreword by Deepak Chopra

In *Infinite Potential*, physical chemist Lothar Schäfer presents a stunning view of the universe as interconnected, nonmaterial, composed of a field of infinite potential, and conscious. With his own research as well as that of some of the most distinguished scientists of our time, Schäfer moves us from a reality of Darwinian competition to cooperation, a meaningless universe to a meaningful one, and a disconnected, isolated existence to an interconnected one. In so doing, he shows us that our potential is infinite and calls us to live in accordance with the order of the universe, creating a society based on the cosmic principle of connection, emphasizing cooperation and community.

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Editorial Review

Review
"When quantum physics emerged in the twentieth century, many of its grand architects believed it held valuable lessons for how we lead our lives. In *Infinite Potential*, Dr. Lothar Schäfer shows why. What emerges is not just a beautiful exposition of modern physics, but a powerful bridge that connects science, psychology, and spirituality. One cannot be a proper citizen of the twenty-first century without an awareness of the lessons in this gem of a book."
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"In this learned and daring analysis of the revolution in quantum physics, Lothar Schafer opens a door that cannot be closed: Science is teaching us that the world, and our role in it, is malleable to human choice and awareness. This radical truth, as Schafer explores, may shift our sense of possibility and self-conception in the twenty-first century in a manner similar to how Darwinism challenged human perceptions in the Victorian Age."
--Mitch Horowitz, author of *Occult America* and *One Simple Idea: The Secret History of How Positive Thinking Reshaped America*

"Lothar Schäfer's *Infinite Potential* presents ideas about the nature of reality, and our role in it, that at first seem utterly ridiculous. But as the book unfolds, his arguments become increasingly plausible. By the conclusion his ideas are both obvious and shocking. This tale of radical cosmic holism is not a flight of fancy or mystical revelation. It is firmly grounded in science and told by a distinguished professor of physical chemistry. A careful reading will transform your assumptions about who and what you think you are."
--Dean Radin, author of *Super Normal*

About the Author
Lothar Schäfer is the author of *In Search of Divine Reality: Science as a Source of Inspiration* and is a distinguished professor of physical chemistry (emeritus) at the University of Arkansas.

Chapter 1

Materialism Is Wrong: The Basis of the Material World Is Nonmaterial

"Modern atomic theory is thus essentially different from that of antiquity in that it no longer allows any reinterpretation or elaboration to make it fit into a naive materialistic concept of the universe. For atoms are no longer material bodies in the proper sense of this word?.?.?.?the experiences of present-day physics show us that atoms do not exist as simple material objects."

--Werner Heisenberg

The phenomena of quantum physics force us to believe that the basis of the visible world doesn't rest on some material foundation, but on a realm of nonmaterial forms that have the properties of waves, as though our world were afloat on an invisible ocean.

Western philosophy was born in Greece in the years between 600 and 400 BCE. Basically, all the concepts and possible views of the world that have dominated the thinking of the Western mind originated at this time, when people were interested in finding some sort of primeval stuff, some primordial matter out of which everything else is made. It was the birth of materialism and of the concepts of elements and atoms; that is, the idea that all things are made up of some tiny units of matter. If you take a material object and divide it into smaller and smaller parts, or so the argument went, then you will eventually arrive at a level where you can divide no more, no matter how sharp your knife is. This is the level of the indivisible constituents of things: Atomos in Greek means “indi-visible.”

In a constantly shifting and confusing world, the Greeks searched for something lasting and trustworthy, and they believed they found it in stuff, matter. If stuff is the source and basis of everything, then it isn’t amazing that the word matter has a connotation with mother. This connotation isn’t found in its Sanskrit roots, but in Latin: Matter is materia; mother is mater. Matter is the mother of it all--something sacred--and materialism is its religion. Quite generally, words trigger inner images in you and affect what you are thinking. Their hidden meanings aren’t accidental.

In the sixth century BCE, the city of Elea in Italy was an important center of learning. At that time one of its citizens, Parmenides, founded a school of philosophy whose teachings still affect us today. Parmenides added the concepts of space and time to matter. He asserted that stuff is eternal, indestructible, and unchangeable and fills space solid. This makes “being” and “nonbeing” the same as “full” and “empty.” To be means to fill space solid. If something doesn’t fill space, it isn’t real.

These ideas dominated science for centuries. In his book on optics, Isaac Newton, for example, wrote about material particles that “God in the beginning formed Matter in solid, massy, hard, impenetrable, moveable Particles.” This is exactly the point of view of the ancient Greeks. Newton took great pride in the fact that his science needed “no hypotheses” because he was dealing with facts--but it isn’t clear how he knew for a fact the manner in which God at the beginning formed matter. He even went on to claim that the solid, hard, and impenetrable particles are “so very hard, as never to wear or break in pieces; no ordinary power being able to divide, what God himself made one in the first creation.?.?.?.?And therefore, that Nature may be lasting.” With Newton, the doctrine of materialism entered the physical sciences and, after that, public life. Its connection with God’s will confirms the impression that it has religious roots.

It is interesting that Newton spoke of elementary particles when he referred to the microscopic constituents of things. The roots of this word are related to the Latin particula, meaning a “small part” or “little piece,” and to partiri, which means “to divide.” You divide a thing; you end up with small parts: particles. It seems simple! The problem is that the concept implies that the particles that you find at the bottom of material things are as solid and permanent as the things that they form. But that isn’t so. This is what we will have to work out in the rest of this chapter: The elementary particles at the bottom of things aren’t lumps of matter in the ordinary sense of this word. As we shall see, they have wavelike properties, and the nature of these waves is closer to the nature of thoughts than things. So instead of calling them particles, it would be entirely justified to call these elementary building blocks elementary waves, or wavelets. And since these wavelets have thoughtlike properties, it would be perfectly all right to call them elementary thoughts. In this sense, your body is made up of elementary thoughts.

From Material Particles to Waves

How many people do you know who can drive a car? Probably a lot of them! How many of them can drive a car safely, even though they know very little about how it works? Many people can drive a car even if they have no idea what a fuel injection system or a piston is. They may not even know about gears, if they first learned to drive on an automatic car. And yet they can drive safely from point A to point B. Something like this is what I propose for you to do in this chapter: move from point A to point B.

Of course, our focus in this chapter has nothing to do with driving cars. Rather, the task we are facing is to take a piece of matter--some stuff--and turn it into numbers. At point A we are holding a material object in our hands--some massy thing--and then at point B this thing will have turned into a bunch of numbers. Mass gone! You can think that the numbers represent a mathematical form, such as a circle or a sphere.

Turning matter into nonmaterial numbers or mathematical forms is the easiest thing that you have ever done; you don't even need a driver's license. This is so because, at the level of elementary material particles, matter turns itself into numbers, spontaneously: All you have to do is to create the right environment and, bingo, it happens. If the conditions are right, elementary units of matter, such as electrons, atoms, and molecules, will spontaneously make transitions from a matterlike state into a numberlike state, in which they are no longer material particles but mathematical forms, patterns of information: very much like ideas.

What does this have to do with driving a car? Well, to get from point A to point B in the quantum world, you can proceed in the same way in which you drive a car: You have a couple of options. You can do it with the expertise of a mechanic, who understands all the technical details of the process that will get you from point A to point B; or, you can simply hit the road without worrying too much about the technicalities of driving.

To understand why the phenomena of quantum physics force us to think that material particles turn into mathematical forms when the conditions are right, you can proceed at different levels of technical insight: You can take some time out and get a PhD in physics, so that you'll understand what is going on at a level where you can take the system apart into its nuts and bolts and enjoy putting it back together again. Alternatively, you can take a shortcut and consider the quantum phenomena as they appear to you, without getting into the bad habits of physicists--their passion for complex theories and their joy in advanced mathematical -analyses--and you can still get safely from point A (states of matter) to point B (states of numerical forms), understanding the essence of that process, even though you skip the technical details.

I have the feeling that the first option--getting a PhD in physics--is perhaps not such a good idea for most of us, at least for the time being. However, between the extremes of knowing a little bit and knowing everything, there is a middle road where you acquire sufficient knowledge to help you develop a useful understanding of things.

And so, back to Newton and his massy thing at point A. Newton's description of the appearance of particles can't be improved. They appear as solid, massy, hard, impenetrable, and moveable things. You can think of ordinary balls or round bullets; they like to push one another and, in collisions, they bounce off of one another. That is what Newton had in mind when he spoke of particles.

At the bottom of ordinary things we find the elementary particles or units of matter: the atoms and molecules and electrons. By definition, these elementary constituents of things differ in size from the things that they form, but it is generally expected that they are otherwise identical in essence. Thus, we expect that, like all material things, the elementary units of matter also are localized and compact; and we expect that they fill space solid and love to push and shove one another, and when they collide, they bounce off of one another. We see that, compliments of Parmenides, the ancient ideas can be quite helpful in forming an image of matter in our mind.

I don't know whether you have noticed or not, but the use of language in the last paragraph is a little bit tricky. I have said that it is generally expected that elementary particles are in essence like the larger material structures that they form, and we expect that they are localized and compact. I have not said that they actually are like ordinary round bullets and that the way in which they appear to us is all that there is to it. As it turns out, they are more than they show to us because, when they are on their own and out of sight, they cease to be material particles.

For the time being, point A has been taken care of. In everyday life all material things, even a beer truck, are in some sense lumps of matter. When you get hit by a speeding beer truck, your understanding of what the properties of matter are is instant! Now, to complete our task and to get to point B, we must consider the properties of waves.

Waves have properties that are in some sense contradictory or incompatible with the properties of particles. There are lots of everyday experiences of waves that show you what I mean. If you live on a coast nobody has to explain to you what waves are like. Likewise, rivers, lakes, and creeks all give us an instant understanding of what waves are about.

In all our experiences, waves are dynamic, playful, and creative, a moving sequence of constantly changing and shifting forms, an enjoyable dance, swinging up and swinging down in a fascinating game. The motion of waves is continuous; particles are discrete. Waves are extended in space; particles are localized. A wave is a dynamic process; a particle is a static point. If you play a musical instrument, you will appreciate the description of waves and particles by physicist and theologian J. C. Polkinghorne, when he says that waves come legato, while particles come staccato. From these comparisons one conclusion seems to be clear: One and the same thing can’t have both the properties of waves and those of particles. However, at the foundation of things, elementary particles, the electrons and atoms and molecules--the tiny bullets--do just that: Under certain conditions they act like particles; under other conditions they act like waves.

When two waves meet in space, they don’t bounce off of each other; rather, they embrace each other, dance, and prance around together. They merge their mountains and valleys; they interpenetrate and superimpose, constantly creating new shapes and forms. Physicists call this the interference of waves. Wave interference creates interference patterns.

Take a glass dish, as large as you can find in your kitchen, and fill it with water. Then, when the surface is calm, take a sharp object, such as a needle, dip it in and out of the water, and watch how the waves that you create spread out across the surface of the water in the dish, reflect at its walls, and run back and forth. Dip two needles into different ends of the dish and watch how their waves run into each other, superimpose, make large waves in some places and small ones in others, and form fleeting patterns. Waves are always on the run, spreading out in space, dispersing, and forming interference patterns. The beauty of this phenomenon has fascinated so many people that you can find many delightful interference pictures if you search the Web for the interference of waves.

Something special happens when a wave hits a wall that has a number of slits in it. In this case characteristic interferences are formed, because when waves pass through a system of slits, they break down into smaller wavelets that interfere with one another. (Even though the technical details don’t concern us here, you may find it helpful to take a look at some of the pictures given in the appendix to this chapter on page 221.)

I think that, at this point, a short inventory of what we are dealing with is useful. We can use the following terms to describe particles: lumps of matter, pool balls, hard, fill space solid, discrete, noncontinuous, pushy critters. In contrast, the characteristics of waves: delocalized, extended in space, able to interfere and superimpose, coming legato. From this summary it is clear that, when a stream of bullets is shot through a system of slits, no fancy interference patterns appear: When bullets pass through slits, they form some simple piles behind them. However, here is the thing: When elementary particles such as electrons, atoms, or molecules are shot through a system of slits, they form the interference patterns of waves.

To sum up: At the bottom of material objects--beer trucks, bricks, and steel walls--we find elementary particles, tiny units of matter. They have all the properties of the larger things that they construct, but when we shoot them through some slits in a wall they create visible interference patterns, like only waves can do. This means that atoms and molecules, the components of all material structures, aren’t only particles, but can also behave like waves.

Take a single atom. Say you could snip an argon atom out of the air and hold it in your hand. Argon atoms are real things; they have a definite mass and a constant size. In special microscopes we can see single atoms, and they always appear as tiny dots. However, when we take these dots and shoot them through a system of slits, the impacts of many of them will form an interference pattern. We have no other way to look at this than by saying that elementary particles can dissolve in states that have wavelike properties.

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