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THE INFINITE PATTERN

Explaining Nature

by Chongo in collaboration with José

UNABRIDGED DELUXE SPECIAL EDITION

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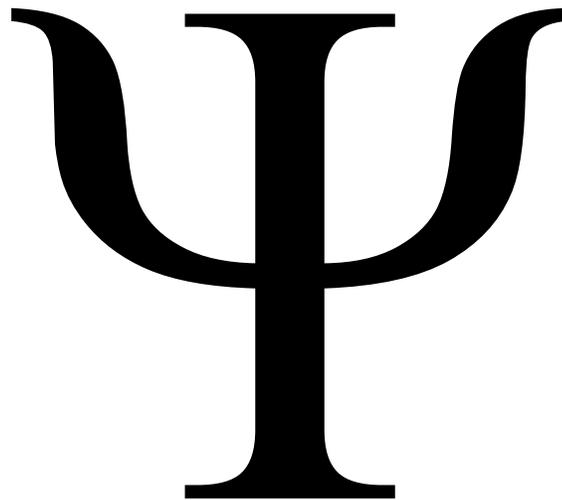
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Explaining Nature

**The pursuit of truth requires courage,
or it is the pursuit of something else.**

PLEASE, STOP AND READ FIRST!

Please note that if the reader embraces mysteries* or beliefs that he or she is convinced that they genuinely love, and he or she wishes to continue loving them, on, into the future, especially if they depend upon these ideas as a source of excitement, essential to their happiness, then the reader should not turn another page of this book. Mystery and belief CAN be exciting, especially when we are children (and as long as they are ultimately not mistakenly confused with real, physical truth, or, in particular, here in this text, confused with genuine scientific fact). Learning science, by virtue of science being the very pursuit of the discovery of physical truth, cannot avoid dispelling mystery and belief in the course of replacing them with explanation and understanding, because that is exactly what science does. In the process, the mysteries and beliefs that we may be convinced add so much to our lives, lose their capacity for doing so with the acquisition of accurate scientific knowledge. Thereafter, they may come to entertain and excite us little more, and in this way be 'gone' from our lives irrecoverably, forever, because explanation and understanding, once acquired, are never easily, if at all, really ever wholly forgotten. So if, for whatever reason, you wish to continue retaining your mysteries and beliefs, then close the book immediately after finishing reading this page, and do not open it ever again, until these ideas that might mean so much to you now, someday begin to falter in their power to bring joy, upon being faced with the certainty of the rigors that the immediate and unassailable realities of the actual, physical facts of life, as you age, are sure to eventually present in progressively greater and greater, abundance and frequency, with the continued passage of time. Should this moment arrive, the reader may then wish to revisit this page and choose to finally turn it, in order to begin discovering that the *true* story of how nature really works is *magnitudes and magnitudes* richer, deeper, grander, and far, far more beautiful, than any conjured mystery or mere belief *could ever hope to even begin to approach* (which again, to be perfectly clear, is an absolutely irrefutably true, physical fact, that turning this page and all those that follow, can begin to reveal, *to absolutely anyone*, who is willing to think).

* - Scientific mystery excluded.

**Mystery* and belief
are synonyms for
ignorance* and fear.**

* - Scientific mystery **included**. In science, besides being a synonym for ignorance, mystery is a synonym for opportunity (to discover).

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EXPLAINING NATURE

“In the life of a man, his time is but a moment, his bearing an incessant flux, his senses a dim flash of light, his body a prey for worms, his soul an unquiet eddy, his fortune dark, and his fame doubtful. In short, all that is of the body is like flowing water, all that is of the soul as dreams and vapors; life a warfare, a brief sojourning in an alien land, and after[ward] ... oblivion.

Where then can man find the power to guide and guard his steps?

In one thing and one alone: the love of knowledge.”

–Marcus Aurelius, Emperor of Rome, *Meditations*

Ψ

IN THE TWENTY FIRST CENTURY EVERYONE NEEDS

TO KNOW ABOUT THE FOUNDATIONS OF SCIENCE

This book is designed to educate. That is, to educate anyone in the foundations of what is commonly perceived as an extremely difficult subject, namely, theoretical physics. This is done by excluding all math. Picture illustrations and words are used instead. Pictures and words are all that are needed for explaining the concepts of theoretical physics, like quantum theory, for example.

Contrary to popular belief, the foundations of theoretical physics are not complex but simple, which is why everyone who can should learn them. At its heart, theoretical physics is easy to understand and can be grasped within a few months, leaving the individual who chooses to learn it intellectually far, far stronger than they would have been without it. Surely it is mistakenly perceived otherwise because such understanding has not yet become commonly widespread. Once, neither was reading skill; the world was mostly illiterate, and ignorance ruled. Today, nearly everyone reads, and a far better world than one without widespread literacy is the result. Now, just as life is enriched by so many being literate, so can it be even more by everyone understanding accurately how nature really works, starting with the *foundations* that describe it best, starting with energy's most fundamental, namely, the Theory of Quantum Mechanics, the most accurate description of nature's energy ever conceived.

An accurate understanding of nature changes forever one's view of the world, and provides hope for its future. For most, life itself is now better than it has ever been in human history, thanks in enormous part to science, genuine science, providing the marvels that so enrich our lives, like long life spans, travel, communication, and health, just to mention a few. Life would be much, much less, in the absence of modern scientific understanding, no less than it would, again, most certainly be, in the absence of simple literacy being commonplace. On the whole, people benefit from our more modern world filled with more and greater opportunities for humankind than a less modern world, one lacking genuine scientific understanding (one lacking its foundations, one lacking quantum theory) could ever offer instead. The more, overall who learn science, the richer the world becomes.

You can help yourself individually and help everyone else collectively in the process, by learning about the simple idea that the Theory of Quantum Mechanics is. Learning is far, far easier than one might have ever imagined. And, because quantum theory is easily grasped, once learned, this understanding lasts for the duration of one's entire lifetime, again, very, very easily. It is our nature, as thinking beings.



DEDICATION

This book is dedicated to the memory of a committed thinker, physicist, mathematician, a very conscientious human being, a scientist, a world-class rock climber, a skilled outdoorsman, as well as my tutor, collaborator, and best friend, José. His understanding of nature led to my ultimate understanding of it, which will hopefully, eventually lead to many other people's ultimate understanding of it too, as José would have wished.

“The real voyage of discovery is not in seeing new landscapes but in having new eyes.”

–Marcel Proust

FOREWORD

By Victor Pereyra, Professor of Mathematics, Stanford University

In the few years that began the twentieth century, Albert Einstein's Theory of Relativity revolutionized the world of physics by showing that Newton's account of natural laws did not model nature's motions accurately. At about this same time, a new model, named the Theory of Quantum Mechanics, expressed the individual wave character of all energy. Like no others before, these two descriptions of the world changed our understanding of the smallest to the largest, and everything in between, forever, enduring now over a century of repeated testing, with exquisite and unparalleled accuracy and precision, having never failed even once. Together, these two descriptions of the world encompass everything existent in nature, including our very awareness of life. No other body of ideas ever imagined even comes close in performance and revelation.

The consequences of these two giant leaps in science have had immense repercussions in everyday life. From atomic bombs to nuclear energy, from computers to cell phones, lasers and microwave ovens, the Theory of Relativity and the Theory of Quantum Mechanics have changed the world in which we live, in every way. Now,

after more than a century of unprecedented success, common and widespread understanding of these brilliant intellectual tools is still limited to the very few, even though the fundamentals can be understood by anyone capable of reading and of grasping the most simple of abstract ideas.

This work attempts to expose people to the simple ideas underlying these two magnificent accomplishments, and in so doing, advance overall human understanding of nature, by explaining these ideas in great conceptual depth, but without resorting to any mathematics whatsoever. Nature's founding principles are explained, using only words, a few illustrations, and a simplification of our own reality, by means of an imaginary world inhabited by much less complex, two-dimensional versions of us. Though far simpler than ourselves, just like us, these two-dimensional creatures discover the relativity of space and time measures with respect to the motion and gravity characterizing their much simpler world.

Next, these creatures discover their own version of the Theory of Quantum Mechanics, identical to ours. In doing so, their story shows us how we, much more complex three-dimensional creatures, in our much more complex three-dimensional world, can do the very same. And, we can do so far more easily, given our additional dimension of depth and its matching insight, by following their rich story of scientific discovery, which parallels our own even richer story. Together, the Theory of Relativity and the Theory of Quantum Mechanics comprise the most fundamental and accurate working description of space, time, and everything in them that has ever been conceived. They ultimately even lead to explaining life itself, and moreover, can flatly demonstrate life's distinction in actual physical experiments.

The foggy veil of mystery that seems to surround physics is a mere illusion. It exists only in a lack of a comprehensible exposure to the subject matter. This veil serves, no less than it has throughout human history, only as barrier to beholding what can be the richest, most interesting, and most lasting aspects of nature. Seeing through the illusion that that mystery is reveals a stunning beauty that lies hidden beneath this veil.

No mysteries need stand between us, and our understanding anything. If we simply choose to learn for ourselves the truths that science has worked so tenaciously, often at the price of enormous living sacrifice, to identify, we will discover that anyone can comprehend anything they wish to comprehend about natural phenomena, utilizing the sound conclusions of science as a foundation. No formal education is needed for this text. Simply choosing to learn is the only real step that one must take. All subsequent steps are far, far easier.

Understanding science begins with understanding its most fundamental description of the world, the Theory of Relativity and the Theory of Quantum Mechanics, which are, unquestionably, among the most outstanding of all human achievements, short of humankind's refinement of courage, insight, compassion, and liberty. Science gives these refinements, and many others like them that are their outcome, wings, so that humanity can soar, by each individual one of us being able to do so, if no where else, then in our minds.

The foremost purpose of this book is
to make available to those having the least access
to the most advanced achievements and discoveries in science,
an open window
into its most fundamental foundations
so that they too can have that access.
This is my opus.



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The term "infinity" replaces the term "effective infinitude" throughout. This was done first, to accommodate the understanding of the lay reader, who may be unfamiliar with the latter term, but also, for fitting the text within the original number of pages allowed, while maintaining an adequately large font for easy unaided reading. (And if the number of possible histories for reality is finite, then this term may refer to what is actually a finite number, but nonetheless, one that is so staggeringly big that it is effectively infinite. Application of the term outside of this context makes reference to a genuine infinitude, which may be either countable or uncountable infinitudes, whichever applies.)

THE **INFINITE PATTERN***

Explaining Nature

by Chongo in collaboration with José

Special Edition – August 2016

www.chongonation.org

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* -The term “pattern” used in the title could easily be replace by the term “formulation” or “computation,” either of which are perfect synonyms for what the content explains.

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"The most incomprehensible thing about the universe is that it *is* comprehensible."

—Albert Einstein

PREFACE

We live in a quantum universe, and there is a reason why we do: we must. Were our universe any other kind of universe besides a quantum one, then 'we' would not exist in it, nor would anything. Fortunately for us, our universe *is* a quantum universe, and because it is, 'something', each one of us, is here in it, very *alive*, along with everything else required that allows us to be. This book is a description of the principles upon which our quantum universe operates and an explanation of why these principles are what they are. Perhaps most of all, it is an exploration into the reasons why these principles *must* be what they are, and why they can be no others, in this universe.

In understanding this description, we can uncover the stunning beauty that lies beneath everything we observe, removing the myths and misunderstandings that have, now even up into these modern times, always

stood between us and what is really true about anything. Understanding the principles upon which a quantum reality is based can introduce anyone who simply wishes to know what is truest in nature, to a completely new way to see the universe, and possibly even a new way to consider physical existence.

Understanding the founding principles upon which our world is based can reveal why the smallest and most fundamental particles of nature (which includes *every last* bigger thing that is made of these particles) are actually finite partial ‘representations’ (projections) of something that is not finite at all, but infinite. In this way, we can see that a particle and a wave are two aspects of the very same thing, and thereby discover why physical existence is simply a shape and how all motion is just the shape of the universe changing, as we and everything living roll down a one-way road called time, observing the contours of this shape with each moment of our journey, in a connected series of moments that we call being alive.

By describing physical existence in this new way, we can ultimately discover the very nature of our awareness, and thus discover the true nature of all awareness anywhere; as well as its enormous significance in very real, very physical, and indeed very tangible and understandable terms. Using the conclusions made by physical science, namely, the Theory of Relativity and then the Theory of Quantum Mechanics, the book you are holding in your hand will explain exactly ‘what’ life is, precisely ‘why’ life is, and most importantly, **why life absolutely must be**, for there to be anything existent or purposeful at all!

This is the story of the Theory of Quantum Mechanics, described in a very simple manner, without any mathematical notation. Quantum theory can lead us to see why the universe is the way it is, by the necessity which is ‘implied’ by the other working physical theory, the Theory of Relativity, but which is **absolutely REQUIRED** by quantum theory. That necessity is the necessity for an observer in a universe, an observer who is ‘alive’ and who is ‘aware’ of something, *anything*. The presence of an observer and the fact that no observer is preferred (by the laws of nature) over any other lead not only to the inevitability of relativity for describing space and time, but to the inevitability of quantum mechanics too, for describing those things which lie within relativity’s space and time.

Quantum mechanics is an outcome of a universe characterized by constant and ongoing observation. The chapters that follow will explain how observation and the life that observation implies are a most natural and inescapable consequence of any physically ‘real’ universe. Most amazingly, living observers emerge because they absolutely *must* emerge, for the sake of a very naturally occurring and absolutely unavoidable ‘inevitability’, the all-encompassing one that we call “existence.” This, in a nutshell, is the substance of this book’s content and what it attempts to explain.

"The first step toward imagining something new is often to cease the imagining of something old – thus making room for the new."

PROLOGUE

IMPORTANT: If the reader already accepts the validity of the theoretical model and need no explanation of the basis for this validity, especially if he or she has read and understood the companion volume, *The Infinite Ocean*, then he or she may wish to proceed directly to the actual subject matter of the content, starting with the first actual chapter, which begins on page 1, ten pages ahead.

By addressing the subject of theoretical physics, one is compelled to ask, how in the world can an understanding of nature's deepest truths enrich one's life experience? What exactly are the benefits that a conceptual grasp of quantum theory, based upon first understanding relativity, yields, that can be applied in everyday practice? How can the contemplation of the motion of subatomic particles, particles that are far too small to ever be seen and whose existence can only be inferred, improve our participation in the big motions occurring around us and in us always? Why learn such a seemingly abstract subject?

First, to explain why, it is appropriate to state that, from the point of view of those individuals who have acquired such an understanding (not the least of which are the collaborator and the author), gaining it is as worthwhile an endeavor as one could ever pursue. According to this view, achieving an understanding of the founding principles, upon which nature – indeed, upon which existence – is based, matches the thrill of living the most exciting adventure, the satisfaction that comes from solving the most elusive puzzle, or the fulfillment of gratifying the deepest passion (all of which the collaborator and author have both genuinely known first hand). Indeed, such an understanding of the physical world can be bliss itself. Nonetheless, the realization of these esoteric rewards is always subject to the preferences of the individual, not to mention the faith that an individual might have in realizing them. So, one need not, necessarily, seek only these apparently intangible benefits, anticipating no others; there are others also.

The most practical and tangible reward that an accurate conceptual understanding of theoretical physics renders is that it makes understanding everything that 'is' reality much easier too, than does a lack of such an understanding. Having it, we can consider nature's phenomena using altogether new ways of thinking and using ideas that we probably (unless we already possess them) never imagined before. Remarkably, by having this new understanding, we can even shape our very wants, by understanding 'why' we even 'want' at all. That is to say, an understanding of quantum mechanics provides genuinely new ways of dealing with the world, ways that can provide the mind with completely new concepts and wholly new insights upon which to base its (i.e. our) decisions, concepts and insights that would simply never exist in our old ways of thinking (unless these old ways

incorporated a valid theoretical model). In understanding genuine science as the pursuit of natural truth, we gain intellectual tools that we may have imagined only others ever being capable of possessing, not us. But 'we', meaning anyone, can possess these very same tools, too!

Armed with these tools, we (as stated, anyone) can begin to see nature's founding design. Nature's ways need not be mysteries if we choose that they not be. Beyond mystery's illusion lies an elegant, abstract beauty that nature's apparent design encompasses. In recognizing the depth and extent of this beauty, one cannot help but come to appreciate the rigors utilized, that provided the means for arriving at these new ways of thinking, rigors that we (again, anyone) can apply in understanding anything. Science demonstrates that nature does not use mysterious powers for performing its apparent 'miracles'. It does not 'use' such things because it flatly never needs to do so.

Most wonderfully, and perhaps more so than all the other benefits, an understanding of physical theory (but in particular, an understanding, be it only in the most simplified, general, and conceptual terms only, of quantum theory) can identify those conventional notions that fail in the face of accurate understanding, exposing them for what they really are (and always were anyway): simply untrue. This, in turn, provides the opportunity for embracing those notions that demonstrate themselves to be consistent with nature and hence to be true in it, which are the very notions revealed by the theoretical model. Ignoring false notions and replacing them with true ones reveals the elusive yet magnificent beauty that quietly hides in nature's seeming mysteries, introducing reason as an alternative to patterned (reflexive) reaction. This hidden beauty waits, patiently indifferent, to be revealed by our understanding of it; starting with the simple idea of natural truth. Real science is the pursuit of natural truth, objective truth, truth that may be much, much different from what one might imagine truth being according to 'conventional', nonscientific views. Ideally, truth is not subjective for science, despite it so often commonly seeming to serve nothing else.

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The science of physics, like any discipline, can be a time-consuming labor to learn and understand. This is due to the simple reality, as the chapters will serially explain, that thinking, and therefore learning and understanding, are motion, no different from the motion of our overt actions, like when we walk or talk (or read). And, just as it is required for ALL overt motion, such as walking or talking (or reading), the motion of our thoughts requires time too. Time is required to think, and, unless our understanding is innate, time is required to understand, anything, meaning that time must be spent to learn and understand relativity and quantum mechanics. But, given enough time invested, which is not that much (a few months or so), and given a meaningful description of these theories and the conclusions that they yield (this book), ANYONE (like the reader) CAN eventually learn and understand, if only in purely conceptual terms alone (and, in the case of the condensed explanation of relativity, only in the most brief, general, and summary terms) these proven theories that model and describe physical reality so impeccably well – to reiterate, ANYONE (keeping in mind that, besides being willing to read, one is willing to likewise accept the validity of scientific fact and the truth that this fact reveals).

That is the intention of this book (among many), to educate anyone in the principles of modern theoretical physics. In particular, the text was designed for those individuals with least access to the means, material, and resources necessary for gaining such an understanding (e.g. poor, disadvantaged people). Anyone, even the most un-informed or least formally educated, if they read the text enough times (provided that they read the whole book FIRST [this, reading the entire text first, is critically important, and includes, *in particular*, reading the short Glossary*, hopefully *before and after* reading the chapters], then rereading it [easier the second time]: rereading the long paragraphs

* - Reading the Glossary is essential, because **many of the definitions contained in the Glossary vary greatly from definitions of the same terms found elsewhere.**

if necessary, repeatedly, and, of course, reading the footnotes – they are important), should ultimately grasp the ideas and concepts underlying the two physical theories (relativity and quantum mechanics), upon which all theoretical physics is built. To put it bluntly, anyone can, at least in summary fashion, learn and understand just what this book is trying to teach – again, ANYONE. And 'anyone', includes the reader. Should modern culture ever recover from the folly of its misplaced arrogance and its achievements somehow manage to survive modern perils, then someday school children will begin their studies of geometry using relativity (by simply understanding how light's speed never changing explains gravity), and initiate their explorations of science with at least a conceptual introduction to the ideas that underlie quantum theory (like the discrete nature of waves, or the lack of paradox in quantum theory, or, perhaps most notably, nature's necessity for life to observe it and why, as well as the fallacy of and lack of meaning existing in alternatives).

In short, if you can read, you can understand the content. Convinced that it is really possible to gain an actual understanding of theoretical physics, it only remains to be adequately motivated to make the appropriate effort by investing the time it takes to learn. Doing so one begins to understand why these theories are, indeed, why they must be, true. In other words, if the reader does indeed accept, and in so doing, 'believes' in their heart that it is truly possible to really understand the two theories (faith in one's own capacity for understanding is an absolute must), accepting what they reveal about the nature of reality, then the reader need only 'want' badly enough, to spend the time necessary (which may vary from individual to individual) reading, slowly and carefully, and, most importantly, taking the time necessary to think, contemplating thoroughly the concepts that the words reveal (haste fails). By taking the time required, and by understanding that it is indeed possible for anyone who can read to do so, one can begin to understand the very foundations upon which all real science is ultimately based, and thus realize that any science that is not consistent with physical theory either someday will be, or instead, be recognized as having never been a 'real' science (as truth's pursuit), in the first place.

So, in order to begin to develop a true understanding of physical existence, we must make one, tremendously important step. That step is to ignore everything (which means precisely that, 'everything') that we might intuitively believe or presume being true about physical existence. We must ignore our intuitive beliefs and assumptions (unless they agree with working theory), because that is precisely what one absolutely must do in order to genuinely grasp the principles that underlie nature. Indeed, the history of physics is a history that, at each step, and with each of its new achievements, demonstrates that our conventional, intuitive notions are far less than truthful; that is, except for a single such notion that all of us can hardly avoid having, namely the notion of how two straight lines can be perpendicular to one another.

In ignoring ALL the other intuitive notions that we might have, we can start with this single notion of perpendicular, and build upon it. By understanding this simple, commonplace concept, one has the necessary foundation to imagine geometry (as an organized labeling system for a set of distances and directions). And, utilizing, by imagining, geometry alone, one can understand in general though nonetheless unambiguous and most importantly accurate terms, just how these theories (relativity and quantum mechanics) work, and precisely what they say about the character of nature and those things constituting its phenomena.

Now, in ignoring every last notion we might have about physical reality – except, of course, the single notion of perpendicular – we must replace such notions with altogether 'new' ones. This, however, is not as

simple as it might, at first, seem to be. For, upon incorporating new notions into our thinking, we must start thinking in what may be wholly unfamiliar ways. Unavoidably, this is what we must do (that is, think in what may be wholly unfamiliar ways), in order to think in the altogether new ways that we must in order to begin building a 'true' understanding of nature, because that is exactly what learning theoretical physics is.

Thinking, in completely new ways altogether (ways which may flatly contradict 'old' and very fundamental ways) is the price that we pay for understanding. We MUST be willing to pay this price, or we will understand little at all; our intuitive notions, just like our preferences for how the world 'should' or 'must' work, will stand between us, and what is genuinely true about nature, no less than they did throughout the history of our physics – until about a century ago, with the discovery of two very, very important sets of ideas: the Theory of Relativity, and the Theory of Quantum Mechanics, both of which are the subject of this book.

Finally, there is one last thing that the reader should also consider, especially if one is not so convinced that an understanding theoretical physics is as easy to gain as is stated, or should one lose their motivation to finish reading the whole book first. (Skip parenthesis if necessary; and remember: grasping relativity is the biggest conceptual step that one must make.) But, if all else fails and interest wanes, then (provided that you have made it through the first chapter, which is only five pages long) go to the final chapter (page 110), read it first, and then start reading the chapters in reverse order. This non-sequential, reverse order happens to be an equally valid order – provided one reads the entire book. There is no need to grasp details upon the first reading; it is only to realize that there is a whole and complete picture, a grander picture that spans more than just the three dimensions that we see at any given moment. Physical existence extends far, far beyond any conventional notions that we might have about natural extent, and is so much richer than any imagination could ever conjure that no imagination can, except through a single means: the most rigorously disciplined thinking attainable, that of natural science, the human pursuit of natural truth. Although time, thought, and effort must be made to begin to understand nature as science does, the view, once attained, is absolutely stunning to all who behold it, and again, as stated, all (again, meaning anyone) can.

Author's Note Regarding Prerequisite Education (One Needs Very Little Beyond Knowing How to Read): If, at this point, the reader still finds that they still mistakenly believe that a summary understanding of theoretical physics is beyond their capacity for acquiring, then they should flatly, be assured, that in reading these words and understanding what they mean, the reader is clearly demonstrating that it is not – while believing otherwise assures such being the case.

The fact that one needs no prerequisite training for understanding is best demonstrated in the very author's lack of formal education in the subject. Though the collaborator held graduate degrees in both physics and mathematics, the author completed only a single (first) semester of calculus, and never took any physics course whatsoever, not even in the public high school from which he proudly never graduated formally.

So, should the reader believe their self unfit to learn the ideas described because they believe that they lack prerequisite understanding, they need only consider that the author's lack of it clearly renders any such

belief false. Again, the author never attended any formal instruction beyond books, that available on the Internet, and some amazing tutelage from a handful of conscientious, brilliant, and extremely well educated advisors. The reader can be assured that if he or she has understood what they have read so far, then they are fully capable of learning and understanding the fundamentals of theoretical physics that are described herein, no less than the author (eventually) did too (although a dictionary may be required - be sure to take the effort to have one at hand and most importantly USE IT, anytime that it is necessary). The understanding that is gained is really worth the effort that must be made (by both reading and thinking deeply) to acquire it, unquestionably. And this understanding of nature once gained, can last an entire lifetime; constantly enriching that life in altogether new ways that themselves may be capable of being understood only upon possessing these new ways of thinking, thereby compounding the rich benefits gained even that much more as well as in ways that are certain to surprise anyone who is genuinely intellectually curious about how nature truly operates at its most fundamental foundations and why. Indeed, understanding nature accurately and deeply can be a source of abundant joy for anyone whose wish is to simply take pleasure in finding their self existing, as anyone cannot help but do, by simply finding oneself being alive.

To the unpracticed, this can be very dense reading, so a great deal of patience may be required, especially for those unaccustomed to scientific approaches. A genuine effort may need to be made; but, it is strongly recommended that the reader please try to make that necessary effort, so that they can eventually come to enjoy the depths that theoretical physics explores and the rich beauty it so elegantly reveals. Never cease forgetting that anyone who can read can come to understand it accurately, provided they really want to, and are equally sincere in accepting the validity of its most revealing conclusions about the character of our existence, by understanding that this validity can be physically demonstrated, irrefutably.

Regardless of what those outside science (and, human nature and ambition being what it is, a small compromising minority lying within it being compensated by others outside) might try to promote for the sake of their own wholly personal agenda a distrust in science, do not worry about questions of validity. Within genuine science, there flatly exist none regarding that of either relativity or quantum theory. The confirmation of the standard model of particle physics by the detection of the Higgs boson eliminates all doubt. Theoretical physics (to the depth that it is covered in the text here) is irrefutably true scientific fact. It's just as true as cell phones, lasers, televisions, computers, communications satellites, microwave ovens, and any other technology at all that is dependent on or based upon anything electronic (including by implication, almost any modern biological innovation whatsoever) are, because theoretical physics is precisely the reason why such 'practical' tools even exist at all.

To state matters, as clearly and accurately as they can be stated, without theoretical physics, NONE of the aforementioned – not a single one, with no exception – would even exist, except as science fiction fantasy, but unquestionably, not in actual fact in any physically real way. Luckily, we do have theoretical physics in our modern world – at least for now – because enough people recognize its absolute importance in keeping our modern world modern, by keeping it civilized, through a widespread understanding of modern science and of its unprecedented impact and influence upon our progressively smaller and ever more fragile world.

EXPLAINING NATURE...

“To prefer mystery over understanding is to prefer ignorance over wisdom.” –Unknown

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THE INFINITE PATTERN

Explaining Nature

by Chongo in collaboration with José

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