

The Final Theory

Rethinking Our Scientific Legacy
(Second Edition)

Mark McCutcheon



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The Final Theory: Rethinking Our Scientific Legacy (Second Edition)

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In loving memory of my mother.

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Preface

“Happy is he who gets to know the reasons for things”

~ Virgil

Science is our tool for uncovering the nature of our universe, and since we seem to inhabit a stable, orderly universe based on solid and reliable physical principles, as our science develops it should bring things more into focus, producing an increasingly clear picture of it all. Yet, in the past century alone, our science has given us quantum paradoxes, relativity mysteries, parallel universes, hyper-dimensional superstrings, virtual particles, dark matter, dark energy ... and the list goes on. Is our universe truly such a bizarre place, or could it be that our investigative tool itself – our science – has simply lost its way? This book makes a firm case for the latter, with clear discussions exposing the flaws in the above concepts and more, while stepping back to take a good look at the scientific legacy we have inherited.

Crucially, our science rests upon the *Law of Conservation of Energy*, which states that everything arises from a pool of continually recycled energy that is never created or destroyed but only changes form – in essence, you can’t get something for nothing. Consequently, all energies and forces must draw upon another underlying source of energy. A universe where isolated energies and forces could be conjured up to act upon the surroundings without draining an underlying energy source would be one of fantasy and magic – not science.

This central energy law encompasses gravity, magnetism, electricity, electromagnetic radiation, strong and weak nuclear forces, and even matter itself via the energy-mass equivalence, $E=mc^2$. As such, it is critically important to note that *science as we know it is entirely an energy-based paradigm*, composed of a patchwork of separate and still rather poorly understood energies, forces and “effects.” And further, many of these everyday phenomena, such as gravity or magnetism, do indeed act mysteriously and endlessly in isolation, with the *physical nature* of such clear energy-conservation violations either overlooked completely, dismissed with flawed *logical* diversions, such as the Work Equation, or abstracted away with purely *mathematical* models. This is our energy paradigm, inherited from a much simpler time, which we

now use exclusively and unquestioningly as the scientific lens through which we view and interpret all observations.

This also means, then, that our scientists' current search for the ultimate understanding – a final Theory of Everything – *demand*s that it be found wholly within this inherited energy paradigm. Yet, as this book clearly shows, this is a dangerously presumptuous restriction to impose on the pursuit of such a grand unknown, and is the reason all such attempts at a final theory have failed – until now. What, after all, is the word “energy” except a legacy catch-all term for active phenomena all around us that scientists have always struggled to understand, and still do today? The experts concede that the nature of gravitational energy remains an open question even today, long after both Newton and Einstein. Light, and all electromagnetic radiation from radio waves to X-rays, is now considered a quantum-mechanical wave-particle paradox. Electric charge and magnetism are essentially first-causes unto themselves, acting forcefully, energetically and endlessly on their own despite the energy transformation requirements of our conservation laws. The “strong and weak nuclear forces” are actually *models* of forces that, should they turn out to exist as advertised, also act forcefully, energetically and endlessly without the required underlying energy transformation – forces proposed to explain observations that otherwise contradict today's atomic theory. And the velocity of light is mysteriously linked to the very passage of time, via *Special Relativity* theory, while unexplained “dark energy” and unseen “dark matter” have been fast-tracked into our science in an attempt to account for vast discrepancies between astronomical observations and the equations of *General Relativity* theory.


So, does all the order around us truly arise from such bizarre law-violating phenomena, or are our inherited science paradigm and its dedicated community of practitioners unwittingly separating us ever further from a true understanding of our universe, and perhaps even the meaning of it all? This book first demonstrates that our science is a fatally flawed inherited *energy paradigm*, then presents a sweeping new scientific paradigm that redefines our various “energies” in terms of a single overlooked principle in nature that gives a much more sensible scientific explanation of the observations around us. This new understanding arises from a *literal* interpretation of the thought experiment Einstein developed into his far more abstract *General Relativity* theory, and answers the question: if the legacy term “energy” is actually just a centuries-old placeholder for an unknown at the heart of it all, *what is this unknown?*


To be sure, there have been many explanatory attempts from scientists and laymen alike, with the wilder and more scientifically questionable proposals of late arguably coming from *within* the official scientific community itself. Rather than scientists questioning current theory when observations strongly suggest it, instead quite imaginative proposals emerge that often attempt to explain observations by inventing new *unexplained* phenomena – for further investigation. This often becomes de facto “science” if it creates enough controversy or intrigue to continually feed the science media and attract funding. The recent meteoric rise of “dark matter” and “dark energy” into our science provides an excellent case study of this process, where observations would otherwise suggest a rethink of current gravitational theory or cosmological assumptions. In such cases the failure of the current theory and the viability of the unexplained new phenomena invented to salvage it are completely glossed over despite the classic *scientific method* requiring that *any* theory refuted by experiment or observation be simply considered *wrong* and in need of a rethink. This now commonplace disregard for the classic scientific method and appetite for scientifically unexplained inventions as explanations has led to the increasingly troubled state of our science.


Although these many ongoing explanatory attempts all recognize that something major is wrong or missing in our science, they all, fatally, either lie firmly *within* our troubled energy-based legacy or depart far from anything scientific – and often both. This has now resulted in all claims to a final theory being immediately tarred with the same brush, all equally tarnished and stereotyped from the start. While this is understandable after so many have cried “Wolf!” it is important to remember that in the original parable there eventually really was a wolf. So, too, in our quest for the Theory of Everything, if our universe is actually the rational and comprehensible place it would seem, particularly when not viewed through the lens of the past century’s more fanciful science, then there really should be a sensible, sweeping, clarifying final theory awaiting discovery. And indeed, within these pages lies the first truly comprehensive, entirely alternate and fully parallel scientific view of our universe and the world around us to break free of our troubled energy paradigm and qualify as this final scientific understanding.


A Note on Format


Although this book is intended for both scientists and non-scientists alike, it does represent a sweeping re-think of our complete body of scientific knowledge today. Therefore, in order to help organize the discussions, as well as to quickly identify key points and their significance, summary boxes or icons will accompany key sections or phrases as follows:


NOTE

Highlights a key point in a discussion.


NEW IDEA

Introduces a new idea for consideration.


WATCH FOR...

• Lists key points in the discussion to follow.

LAW

Reminder of a current law of physics in Standard Theory.

VIOLATION

Indicates a physical law violation in a current scientific belief.

MYSTERY

Indicates an unexplained mystery in a current scientific belief.

ERROR

Indicates a logic or math error in a current scientific belief.

EXPERIMENT

Presents a thought experiment or real-world experiment.

**OPTIONAL
MATH****(x, y)**

Indicates that math follows, but is optional reading which is explained in either the preceding or following section.

Introduction

“The greatest discoveries of science have always been those that forced us to rethink our beliefs about the universe and our place in it.” ~ Robert L. Park

We are all born into this universe and live out our lives within its laws and principles. From the inescapable law of gravity extending across the universe to the fundamental principles behind the tiniest atoms, our lives are immersed in the laws of nature. As intelligent beings it is natural for us to wonder about the world around us, and as children of this universe it seems reasonable that we might arrive at an understanding of it all – that this understanding is very much our birthright.

In fact, to many it may seem as if we have already arrived at this understanding, with only a few loose ends remaining. Isaac Newton gave us an understanding of gravity as an attracting force in nature, and from there many others have contributed to our understanding of light, electricity, magnetism, atomic structure, etc. This process has finally brought us to a point where science today contains theories that cover every known observation, collectively known as *Standard Theory*. This age of understanding has made it possible to invent radio, television, and computers, even allowing us to build spacecraft that have visited distant planets. Although scientists continue to pursue deeper questions, it may seem that Standard Theory provides us with a fairly comprehensive scientific understanding of our universe. But is this really the case?

How much do we *truly* understand about gravity, for example? Do we know the physical reasons why gravity attracts objects together instead of repelling them away from one another? Newton gave us a compelling *description* of this observation as an apparent attracting force, but provided no *physical explanation* for the existence and nature of this force itself. Does it really make sense that a force holds objects to the ground, and moons and planets in orbit, all with no known power source? Can we confidently say whether or not it is possible to create an *anti-gravity* device, what principles might underlie such a device, or for that matter, even what principles underlie gravity itself? And despite Newton’s concept of gravity, Albert Einstein found it necessary to continue searching for answers, arriving at a very different physical description of gravity, while scientists continue to search for still other explanations. Why is it that we have two very

different physical explanations for the same effect in our science today, and continue to search for still others – and do any of them truly answer our most basic questions about gravity?

Do we *truly* understand light? For centuries debate raged as to whether light was composed of waves or particles. Today we have settled on a belief that somehow light is *both* a wave *and* a particle (the photon) – sometimes manifesting as one and sometimes as the other, depending on the situation or experiment. Even today this remains a very mysterious and poorly understood claim arising from a theory known as *Quantum Mechanics* – a theory readily described by its very creators and practitioners as bizarre and paradoxical.

Do we *truly* understand magnetism? We know that two magnets will repel each other if both of their north poles or south poles face each other, but can we truly explain this? If we try to hold these two magnets together against this repelling force our muscles will tire as we continually expend energy, but the repelling force from within the magnet does not. Is it reasonable that an apparently *endless* force from within magnets will continually battle any external power source in this manner, eventually exhausting them without an equivalent weakening itself? In fact, there is *no identifiable power source at all* within these magnets to support this endless force from within. Do we even know what magnetic fields are, or have we simply discovered how to create them and learned to model their behavior with equations? Are we confusing practical know-how and abstract models with true knowledge and understanding?

A closer look shows that solid answers to these and many other questions about everyday occurrences are not to be found in today's Standard Theory. Science has managed to *model* our observations rather well, but many of these models lack a clear physical explanation. Newton worked out a *model* of gravity as an attracting force but couldn't tell us *why* it should attract and *how* matter does this endlessly simply by existing; and we still lack these answers three hundred years after Newton and a century after Einstein. We also have equations that *model* magnetic fields, and theories that describe their obvious observed behaviors, but we have little clear physical explanation for *why* they behave as they do, leaving mysteries such as the apparently endless energy emanating from within a simple permanent magnet.

Many scientists do recognize that we still lack a deep understanding of our universe, which is why there are ongoing efforts to further our knowledge using high-energy particle accelerators and powerful space telescopes. The hope is that these investigations will lead to a

key breakthrough in understanding – perhaps through the discovery of a currently unknown fundamental particle or principle, or some new type of energy or observed cosmological phenomenon. It is expected that if such a key fundamental discovery is made, it will have a ripple effect that runs through the patchwork of often poorly understood theories in our Standard Theory today, ideally transforming them into a single clear theory that simplifies and truly explains everything. This much-hoped-for theory is known by physicists as the *Theory Of Everything* – and is considered the ultimate goal of fundamental research in physics today.

A key expectation of the Theory Of Everything is not only that it will finally explain all of physics – gravity, light, magnetism, etc. – with a clarity and simplicity that is unknown today, but that it will do so via *one single unifying principle* that has so far eluded us. Once found, this theory is expected to provide a clarity and understanding akin to turning on a light to see the contents of a room at a glance, where current theory is like a flashlight in the dark, giving only disconnected glimpses here and there. And, as demonstrated in later chapters, this flashlight-in-the-dark approach has also cast looming shadows that have produced highly misleading illusions over the past century – most notably *Special Relativity Theory*, *General Relativity Theory*, and *Quantum Mechanics*.

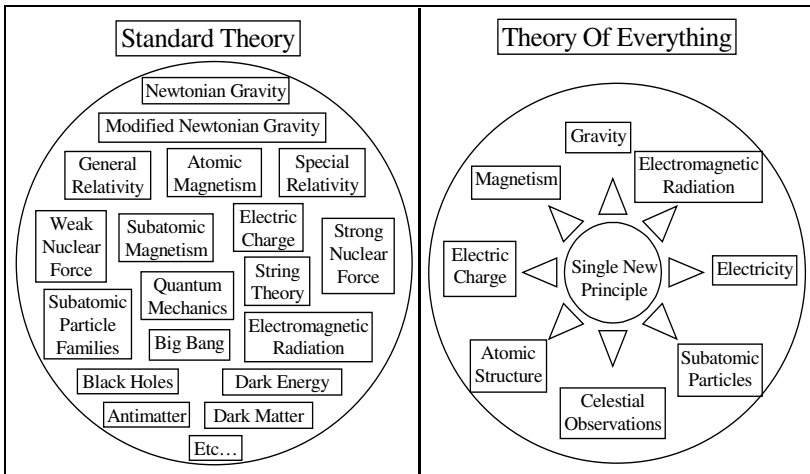
A less comprehensive form of the Theory Of Everything, called the *Unified Field Theory*, is also often sought to explain and unify everything *except* gravity, since it is thought that gravity may have a very different nature than the other fields and forces once we come to truly understand them all. Both theories are sought-after by physicists around the world today, with the ultimate goal being the arrival at an understanding that explains all the forces of nature *including* gravity – i.e. the all-encompassing Theory Of Everything.

Although this formal definition of the Theory Of Everything has taken shape within the last century, it has actually been the ultimate goal of science ever since the earliest times; even medieval alchemists were, in their own way, searching for this ultimate understanding of the physical world. Some of Newton's many contributions to science were his descriptions of gravity, light, and the mechanics of moving objects, while Einstein provided quite different descriptions of these phenomena, with additional ideas about energy, mass, space and time. Both of these scientists were essentially in pursuit of the Theory Of Everything, whether or not their efforts were formally presented as

such, as are many scientists who pursue basic research in an attempt to discover fundamental truths about our universe.

So far, our efforts have not yielded *the* Theory Of Everything, but rather *a* “theory of everything” known as Standard Theory. Although it isn’t typically represented this way, Standard Theory is indeed *a* “theory of everything” since it attempts to explain every known observation and phenomenon. It has evolved from many hypotheses presented over the centuries, with the most successful ones incorporated as sub-theories *within* Standard Theory. Even such radical and mysterious theories as *Quantum Mechanics* and *Special Relativity* are not considered part of some other “theory of everything” but part of Standard Theory today.

Therefore, Standard Theory is not only *a* “theory of everything,” but it is also the *only* one so far. In order for a new theory to truly form the basis of another “theory of everything” it would have to be based on a new principle that lies entirely outside of known physics – *and* provide a sweeping rewrite of everything in Standard Theory based entirely on this new principle. The figure below shows the patchwork of theories within Standard Theory today, the result of our “flashlight-in-the-dark” approach to science over the past few centuries, as well as the single illuminating perspective of the Theory Of Everything that is expected once the correct underlying principle is discovered.



Today’s Patchwork of Theories vs. the Theory Of Everything

The chapters to follow present just such a new principle in physics, showing that all matter may well possess this important new property

that has so far been overlooked or misunderstood, and developing this principle into a second “theory of everything” for us to consider. This new theory begins with a clear physical explanation for gravity that resolves the many questions and mysteries surrounding it today, such as why it behaves as an apparent attracting force and how it functions without a power source. Planetary orbits, ocean tides, and all other known gravitational observations are entirely explained by this new theory without relying on our current theories of gravity. New insights and possibilities are also suggested by this new theory that are unknown today and would not be predicted by our current gravitational theories.

This same new principle further explains the structure of the atom, as well as the nature of the individual electrons, protons and neutrons composing atoms, with a physical simplicity and clarity that is unknown today. This new perspective on atomic structure shows how the gravity of objects can be directly related to the electricity and magnetism produced by the flow of electrons in wires, since this new principle underlies both atoms and electrons. The apparently endless energy within magnets mentioned earlier is also explained by this new principle, and a clear physical reason is given for why electricity and magnetism are so closely related. This principle also suggests an explanation of electron orbits within atoms that resolves this still-mysterious aspect of atomic theory in our science today.

This same new principle is further shown to explain the nature of light, suggesting a resolution to the age-old question of whether light is a particle or a wave ... or indeed *something else entirely*. Since the mysterious wave-particle beliefs about light in Standard Theory support a sizable portion of the theory of *Quantum Mechanics*, resolving this issue has serious implications for quantum theory. In fact, our current quantum mechanical descriptions of atomic structure, light, and energy are shown to be unnecessary once the new unifying principle is considered. This should be expected of any alternate “theory of everything” since, by definition, it would have to be entirely separate and self-sustaining without relying on any of the patchwork of theories that compose Standard Theory today – of which *Quantum Mechanics* is one.

As might be further expected then, Einstein’s *Special Relativity Theory* is also shown to have serious problems, and is also replaced by this new principle. This means we can now replace the complexities and mysteries of *Quantum Mechanics* and *Special Relativity* with one simple principle that runs throughout our science, dispelling some

long-standing mysterious beliefs such as the speed-of-light limit that we accept as true today. All of the well-known thought experiments and real-world experiments supporting these mysterious theories and beliefs are re-examined and shown to have serious flaws, misunderstandings, or even clearly fatal errors upon closer examination.

Finally, the same simple principle is shown to explain the many mysterious phenomena and particles that have emerged from high-energy particle accelerator experiments in recent decades, such as *virtual particles* and *antimatter*, removing the mystique that surrounds them today. This new explanation of subatomic particle experiments also suggests a new interpretation for the increasing number of new particle types that are being discovered in ever more powerful particle accelerators. It also provides a new perspective on Einstein's idea that matter and energy can be converted back and forth (according to his famous equation, $E=mc^2$). Rather than this mysterious conversion of matter into energy in the explosion of an atomic bomb, or energy into matter when subatomic particles apparently materialize out of pure energy in particle accelerators, this new unifying principle provides a clear, demystifying explanation for both effects. This principle also speaks to many of our celestial observations, suggesting simple alternate explanations for observations leading to today's more mysterious theories about Black Holes, the "Big Bang" creation event, and the recently introduced "Dark Matter" and "Dark Energy".

Logical Fallacies – Twists of Logic that Create “Facts”

It may initially seem unlikely that such a major rethink might be necessary, or even possible, for a science that has advanced and matured for centuries, yet many core ideas in our science were put in place centuries ago when it was far *less* mature and advanced. We have now inherited a legacy of time-honored ideas and beliefs that have become so deeply woven into our science and our thinking that they are often considered unquestioned facts, despite many unresolved problems in plain view.

In our scientific quest for pure objective truth and understanding, various interim beliefs must be adopted along the way – some that stand the test of time and some that do not. In the course of this journey objectivity can sometimes fall by the wayside, with some beliefs arguably receiving more credibility, acceptance or longevity than may ultimately be healthy for science. As evidenced throughout the history of our science, and even throughout our current scientific beliefs and theories as shown in the chapters to come, a prolonged

and widespread sidetracking of science can occur due to a variety of **logical fallacies** that remain unchecked and uncorrected.

This situation often arises because logical fallacies can create the appearance of support for currently accepted or favored ideas that may be heavily invested in or deeply entrenched, without other viable answers at the ready. In fact, such motivations *themselves* demonstrate the widespread logical fallacy known as a **Confirmation Bias**, where only evidence that might support a favored theory is sought and considered. Logical fallacies can cause contradictory evidence to appear as support, observations to be interpreted in ways not justified by the data, and clearly false claims to nevertheless become accepted as fact. As a result, the prevailing scientific beliefs of any era have always been confidently professed, widely accepted, actively supported and staunchly defended – including those now known to be false.

Due to this dynamic the progress of science, and society in general, tends to proceed at a fairly regular pace, punctuated by sizable revolutions in thought as a major belief system is eventually overturned. Realizing our planet is round and not flat is a classic example of such a revolution in thought; changing from an Earth-centered solar system to a Sun-centered one was another; moving from Newton's universe of purely classical mechanics and a gravitational force to Einstein's relativistic speed-of-light and warped space-time physics was another example; and representing energy and the subatomic realm in terms of quantum-mechanical models and beliefs was yet another still. Now a further revolution in scientific thought may even be upon us, as detailed in the pages of this book. There are actually many formally recognized logical fallacies contributing to this pattern of sustained beliefs that are eventually overturned, with the more common of these fallacies identified and referenced in discussions to come. We begin with a demonstration of multiple logical fallacies in a widely cited, Nobel Prize-winning claim of pulsar evidence supporting Einstein's *General Relativity Theory*.

**WATCH
FOR...**



- *Appeal To Authority fallacy*
- *Appeal To Consensus fallacy*
- *Unrepresentative Sample fallacy*
- *Inductive fallacy*

Perhaps the two most prevalent examples are the formal logical fallacies known as *Appeal To Authority* and *Appeal To Consensus*. In the *appeal to authority* logical fallacy the correctness of a claim is based largely on the reputation or perceived authority of those making the claim. The implication here is that the knowledge supporting the claim is not comprehensible to others, setting a dangerous precedent of blind faith in the authority claimant. This situation can arise from a runaway process where a claim from a scientist, organization or journal with a lofty or time-honored reputation may receive more credibility than it might ultimately merit. This can lead to broader scientific and academic acceptance, becoming adopted by government, our educational systems and the science media. This can be a very powerful self-reinforcing system, where each component defers to the authority influence of the others instead of objectively evaluating the merit of the original claim.

In the *appeal to consensus* logical fallacy a claim is judged as more credible and correct largely based on majority or consensus opinion. Although this “safety in numbers” approach is often a fair assumption, the danger here is that the original claim itself can be largely or even completely unexamined or unquestioned by the vast majority of its supporters, all of whom are looking to each other for confirmation. In consensus appeals other minority views are often dismissed, presumed to be less informed, less educated or less intelligent if they are at odds with the current consensus view, despite history demonstrating that prevailing consensus views often change significantly over time. Scientific consensus appeals typically consist of majority agreement within a loosely defined scientific community, general acceptance within the academic community, and public opinion fed by the science media via documentaries, popular science magazines, books and websites, as well as newspaper and television science news stories. This can also be a very powerful self-reinforcing dynamic, where the correctness of the original claim is simply assumed – a foregone conclusion that is widely accepted without question.

Both *appeal to authority* and *appeal to consensus* are considered logical fallacies, not because authority or consensus opinion are necessarily incorrect, of course, but because incorrect claims can be powerfully upheld largely or even solely based on authority or consensus. The power of this effect can further influence many to simply defer to perceived authority or prevailing consensus, further reinforcing a claim that may actually be highly questionable. When this occurs we are left with little more than an elitist, faith-based belief system, corrupting the

ideology of solid objective scientific advancement and understanding for all.

Many beliefs in today's science have their share of authority and consensus supporting them. Students defer to the authority of textbooks or teachers; teachers defer to their curriculum requirements, degrees or professors; and professors defer to the prevailing academic consensus or to the authority of noted institutions, journals, experiments or luminaries such as Newton or Einstein. The same views are embraced by the science media and delivered to the general public, which can be a powerful force in any democracy, influencing and supporting government, academic and educational priorities and funding. And while all of these elements certainly deserve due consideration and respect, they are also all part of a very powerful and often largely unquestioned self-reinforcing system running throughout society that is neither infallible nor immune to authority and consensus fallacies.

ERROR



Logical Fallacies in Pulsar Claim

Numerous logical fallacies can be seen in the widely quoted cosmological claim that signals from the rotating double star system, binary pulsar PSR 1913+16, confirm *General Relativity Theory* – a Nobel Prize-winning authority claim, in fact, which few might be inclined to question, creating a further consensus scenario. Yet is this *General Relativity* confirmation claim truly a solid scientific fact, or might it be a powerful *authority / consensus* fallacy?

First, since various discussions in this book raise serious questions about *General Relativity* itself, it is then questionable how thoroughly this claim of *General Relativity* confirmation has been investigated and opened to skeptical inquiry.

Secondly, in addition to possible *authority* and *consensus* fallacies, this claim further demonstrates the concept of an ***Inductive Fallacy***, where an original statement, even if true, does not justify a much farther-reaching conclusion. Upon closer examination this example actually boils down to a claim that *General Relativity Theory* can be used to accurately model the observations of pulsar PSR 1913+16. The *inductive fallacy* here is that even if this claim holds up under skeptical inquiry it does not justify the much farther-reaching conclusion that the actual physics behind this observation, and, necessarily, the

operation of our entire universe, is confirmed to be that of Einstein's warped space-time theory of gravity. A truly objective scientific viewpoint could only consider such a grand, sweeping conclusion regarding *General Relativity* from this singular remote observation to be pure speculation and conjecture awaiting far stronger evidence.

But the types of logical fallacy that can be demonstrated by this example do not end here, with the further appearance of an ***Unrepresentative Sample Fallacy***, where a minority observation is incorrectly considered representative of the majority, typically because doing so supports a preconceived notion or desired belief. In particular, roughly 100 binary pulsar systems are now known, making PSR 1913+16 only a tiny *one-percent sample* of observations. And, one of the main reasons it is the most widely cited and uniquely awarded pulsar-based support for *General Relativity* is precisely because it fits Einstein's theory far better than the remaining *ninety-nine percent* of pulsar observations. Given this, one might even consider the known binary pulsar sample to date as a *lack* of support for *General Relativity*, if not even evidence *against* it, rather than the opposite representation it has been given in our science.

So, although a powerful *authority* and *consensus* appeal supporting an *inductive fallacy* derived from an *unrepresentative sample* does not necessarily mean this confirmation claim for *General Relativity* is a fallacy itself, the presence of these elements in any claim should certainly give us cause for thought. Indeed, many claims that are considered solid scientific fact today are shown throughout this book to be highly questionable if not even verifiably false, often supported by one or more logical fallacies. As history demonstrates, science can become seriously sidetracked when conjecture and hypothesis are vaulted to accepted scientific fact on weak evidence or questionable logic that may appear to support a currently favored theory or belief. Our understanding of the universe can be stalled or even sidetracked for centuries once *confirmation bias* sets in and beliefs become exempt from rigorous scientific scrutiny and objective skeptical questioning. As shown in the above example, and in many others throughout this book, there are dozens of well-known fallacy categories that can lead us astray if we are not careful.

It should also be noted that the alternate scientific explanations presented throughout this book do not constitute a string of proposed new theories *within* Standard Theory, but belong to a new and *entirely alternate scientific theory* – an alternate “theory of everything.” This parallel explanation of our universe provides answers to the many

questions and mysteries in our science today with a clarity that allows even non-scientists to truly comprehend our universe – and does so via one simple unifying principle that is consistent with all known experiments and observations.

It is worth noting that this last point is a claim that cannot be made even of Standard Theory today. That is, as shown in each of the following chapters, within many of our everyday experiences lie unanswered questions, unexplained mysteries, and even clear violations of our most elementary laws of physics when explained with Standard Theory. Therefore, as it stands today, our current body of scientific knowledge is not merely lacking some answers, but is actually a *fatally flawed* “theory of everything.” While it is possible that our ongoing search for answers will be able to resolve these flaws and turn Standard Theory into the much-sought-after Theory Of Everything, it is equally possible that the answers can only be found from a completely new perspective. It is suggested that the new theory presented in the following chapters does not merely provide an entirely alternate way of viewing our universe, but that it is the only one to meet the criteria of the Theory Of Everything for which science has been searching for centuries. We now begin the journey toward discovery and understanding of this new scientific principle with an exploration of *gravity*.

- 1 -

Investigating
Gravity

*“It is impossible for a man to learn what he
thinks he already knows.” ~ Epictetus*

The Theory of Gravity

Gravity – One of Four Basic Forces in Nature

Gravity is one of the most fundamental and familiar forces of nature. As such, before discussing gravity in particular, it is important to clarify what the forces of nature are considered to be and how they relate both to Standard Theory and to our ultimate quest for understanding. Although Standard Theory is a composite of many sub-theories, some of which were diagrammed in the previous section, most scientists believe the search for the Theory Of Everything is a quest to understand and unify what are currently considered to be the four separate fundamental forces of nature:

- ***Gravity*** – the familiar attraction between all matter, first described formally by Isaac Newton.
- ***Electromagnetism*** – the closely related phenomena of electricity and magnetism, as well as electromagnetic radiation such as radio waves and light.
- ***Strong Nuclear Force*** – a powerful, short-range force thought to be holding atomic nuclei together. Atomic nuclei have many positively charged protons in close proximity, which should strongly repel each other and cause the nucleus to fly apart according to the theory of *Electric Charge*. Therefore, the concept of an attracting *Strong Nuclear Force* between nearby protons in the nucleus was introduced to explain how the nucleus is held together in apparent violation of *Electric Charge Theory*.
- ***Weak Nuclear Force*** – another nuclear force, considered much weaker than the *Strong Nuclear Force*. Phenomena such as the random decay of populations of subatomic particles (i.e. radioactivity) were difficult to explain until the concept of this additional nuclear force was introduced.

It is currently believed that these are the four fundamental forces in nature, and that, in essence, they are merely different manifestations of one single underlying force or principle that has so far eluded science. To discover this underlying force or principle would be to arrive at the Theory Of Everything since, at a glance, it would show the single underlying cause for every observation, belief, and theory in science today. Such a unified understanding is expected to transform the patchwork of separate abstract theories in Standard Theory into a

much simpler, coherent whole that shows a true *physical* explanation for everything, sparking a scientific revolution.

The new theory discussed throughout these chapters suggests that while this vision is the proper intuition, there are several reasons why success has eluded us so far. First, since we obviously lack the deeper understanding that we are seeking, we cannot even be certain we have properly characterized the fundamental forces of nature. If, for example, our theory of *Electric Charge* is an improper model of the true underlying principle behind many of our observations, then our current model of proton behavior as positively charged particles that always repel each other may not be an accurate description of the nucleus of an atom. Instead, it may be perfectly natural for protons to cluster together when in the nucleus of an atom, according to an undiscovered principle in nature that has been misunderstood and represented as a “positive electric charge” upon protons. In that case, the further concept of a “*Strong Nuclear Force*” keeping the nucleus from flying apart would be a completely unnecessary fabrication, and our attempts to find a unifying theory would be based in part on forces that are misunderstood or do not even exist at all. So our current goal of unifying these four fundamental forces may be based on such flawed assumptions from the start.

Secondly, much of our current and largely mathematical approach to finding a unifying theory may be straying from the original spirit and purpose of the quest. The goal of a new and deep physical understanding of our universe may be in danger of merely becoming an exercise in mathematical manipulation of our current equations. Since arrival at this deep physical understanding is expected to yield a common mathematical framework for all the forces of nature, it is often assumed that if we simply pursue this mathematical end result directly – using our current models – we will achieve this deeper understanding. However, this approach may be unsound since it assumes we have correctly identified the fundamental forces of nature and simply need to rearrange our mathematical models. Yet, if this turns out to be an incorrect assumption, then such an approach would only achieve a largely meaningless mathematical link between flawed models of the physical world. This approach also risks trivializing our search for deeper *physical* understanding into a mere *mathematical* exercise that brings no deeper meaning. This approach may provide some useful insights, but it may also result in little more than contrived mathematical relationships between essentially the same equations modeling the same limited physical understanding, as

appears may be the case with claims of an “Electro-Weak unification” of the Electromagnetic and Weak Nuclear forces.

For the reasons mentioned above, the discussions of the new ‘theory of everything’ in the coming chapters do not strictly follow the format of a mathematical unification of the “four fundamental forces” in nature. In fact, there is a modest amount of only essential math while these forces are referenced as part of a far more broad and rich discussion of science in clear physical and commonsense terms. The discussions do, however, begin with the first of these forces – *gravity* – showing the numerous problems with our current gravitational beliefs, and leading to an introduction of the new unifying principle behind a new theory of gravity that resolves these problems. Once this new principle is established, it indeed ripples through the rest of Standard Theory in the chapters that follow, not only redefining our concept of the “four fundamental forces,” but also redefining the complete patchwork of theories in science today in clear physical terms.

The Trouble with Gravity

Newton’s attracting gravitational force is undoubtedly one of the most widely taught and accepted theories in all of science, becoming so deeply ingrained in our thinking and science over the centuries that this theory has largely become synonymous with the very phenomenon of gravity itself. It is almost inconceivable today to separate our everyday experience of gravity from Newton’s intuitive proposal of an attracting force emanating from all matter; yet, as shown in the following discussions, Newton’s theory actually contains many unexplained mysteries and scientifically impossible claims. Such problems should prevent any new theory from becoming widely accepted as fact, leaving it only with the status of a proposal or *hypothesis*; however, the compelling nature of Newton’s proposal combined with the lack of a more viable theory has meant that it has largely escaped such scrutiny.

WATCH FOR...



- Newton’s theory of gravity does not explain *why* objects attract one another, but simply *models* this observation.
- There is no known power source supporting the gravitational field that Newton claims to be emanating from all objects.

- Despite the Earth’s gravitational energy holding objects down and the Moon in orbit, it never weakens or drains a power source – in violation of one of our most fundamental laws of physics: the *Law of Conservation of Energy*.
- These mysteries and violations are overlooked today because of a flawed explanation that arises from the improper use of an equation known as the *Work Equation*.
- All effects attributed to Newton’s theory of gravity today are actually based on equations that *pre-date* Newton.
- Newton’s attracting gravitational force is a redundant and superfluous concept, providing no additional usefulness, and having no proven existence in nature or scientific support.

Newton’s Errors and Violations of the Laws of Physics

Gravity has always been one of the most familiar phenomena in nature, and although we have always known *something* causes objects to fall, it wasn’t until Isaac Newton (1642–1727) that we had such a compelling physical and mathematical model of this *something* as an attracting force emanating from all matter. Newton also claimed that this very same attracting force was responsible for the orbits observed in the sky, making our entire universe as comprehensible and predictable as a clockwork mechanism for the first time in history. This was such a monumental achievement in Newton’s day that it set the stage for other models of forces described by equations in similar fashion ever since.

Although today we commonly speak of such forces, it is often overlooked that science still has little or no solid physical explanation for many of them. The legacy of theories and equations that compose our body of scientific knowledge today works rather well, making it easy to forget that these are largely *abstract models* – not solid physical explanations. Newton was the first in a long line of scientists to produce explanatory models for various classes of phenomena, which can be very compelling and useful but cannot be fully explained in physically meaningful and scientifically viable ways even today.

In fact, there was a strong undercurrent of resistance to Newton’s “gravitational force” concept when it was introduced, since it seemed to be an unexplained magical force at a time when solid rational thought was finally beginning to prevail over the mysticism and superstition of ages past. Today, largely as a result of the scientific

acceptance of Newtonian gravity, we have grown accustomed to unexplained forces reaching across empty space to affect objects at a distance in some equally unexplained manner. We have even grown accustomed to the fact that many of these forces (gravity, magnetism, electric charge, etc.) have no known power source. However, in Newton's time such concepts were only known in stories of myth and magic. To philosophers such as René Descartes (1596–1650), it had been a long journey for society to shake off the mysticism of the past and finally enter a welcome era of solid rational thought and debate.

Descartes himself had an earlier direct *physical* theory of orbits that claimed the planets were dragged along by an invisible material, known as the ether, which presumably swirled around the Sun. Although this theory had its own problems, in this era of rationality many considered Newton's notion of a completely unexplained force arising from matter and acting across empty space to be an unwelcome return to the magical thinking of the past. Newton realized this fundamental problem with his theory and never claimed to be able to explain it. However, the compelling intuitive idea of Newton's force, along with its accompanying mathematical model, soon solidified it as an apparent physical reality and scientific fact that grew in acceptance over the centuries, being the dominant theory even today.

It is important to note, however, that although it is generally recognized that Newton's gravitational force lacks a full scientific explanation, the much larger issue – that it *violates the laws of physics* – has gone almost entirely unrecognized. This point will be clearly illustrated, beginning with a reminder of one of the most fundamental and unbreakable laws of physics – *The Law of Conservation Of Energy*.

LAW



The Law of Conservation Of Energy

Energy can neither be created nor destroyed, but merely changes from one form to another.

This is one of the most fundamental and unbreakable laws of physics, serving as a test for the scientific validity of any proposed theory or invention, essentially stating that you cannot get something for nothing. If a proposed theory or device suggests either forceful or energetic interaction with the surroundings it must draw on an existing power source to do so, merely transforming energy from one form to another in the process. For example, the stored chemical energy in gasoline changes to kinetic energy as it is “used up” to accelerate a

vehicle. In accordance with the *Law of Conservation Of Energy*, the chemical energy in the gasoline does not actually vanish, but is converted into another form of energy – the kinetic energy of the vehicle’s motion.

Similarly, the kinetic energy of the vehicle did not simply appear out of nowhere, but was converted from an existing chemical energy source – the gasoline. Although we commonly refer to power sources being *drained*, what we actually mean is that the energy from a given power source is converted into another form of energy elsewhere. This is the law that tells us perpetual motion machines are impossible since they are considered to be devices capable of producing or expending energy continually without draining a power source. There is no such thing as “energy for free” in our science. Free energy devices violate our most elementary laws of physics.

Also noteworthy, once it was realized that energy (denoted by the symbol E) and matter (denoted by m for mass) can change form back and forth, modeled by Einstein’s famous equation, $E=mc^2$, the *Law of Conservation Of Energy* included *matter* as one of the energy forms. The explosion of an atomic bomb, for example, does not actually *create* the enormous amount of energy in its explosion, but is considered to *release* it by converting its original core of matter into energy. Therefore, in all things the *Law of Conservation Of Energy* must be upheld.

VIOLATION



**Newton’s Gravitational Force Violates
the *Law of Conservation Of Energy***

There is nothing in Newton’s gravitational theory stating that the force of gravity weakens as it expends energy. The mass of the Moon exceeds one percent of Earth’s mass and would fly past Earth and off into space if not forcefully constrained in orbit by gravity, according to Newton’s theory. Yet this tremendous continual effort expended by Earth’s gravitational field is not considered to drain the strength of this field at all – millennium after millennium.

Our atmospheric pressure is also the result of gravity continually holding the atmosphere tightly to our planet, creating many powerful effects in the world around us. One stark example is the very presence of water covering 70% of our planet. Lab experiments to simulate the extremely low atmospheric pressure of Mars, which is one-hundredth Earth’s pressure, show that water rapidly boils away even at room

temperature. This means the very presence of liquid water on our planet is continually and forcefully supported by gravity, via atmospheric pressure, again without draining the gravitational field itself.

Gravity also forcefully holds all objects to our planet's surface, and helps to hold our very planet together, creating great pressure and heat at its center. Gravity even drives the fusion of our Sun and every star in the universe, providing the tremendous ongoing crushing pressures necessary to produce and maintain fusion, while also containing this immense explosive power to keep the stars from immediately exploding as supernovas. This has been going on for over 4 billion years in our solar system, yet no known power source is drained to support this tremendous ongoing energy expenditure.

This mystery is further deepened when we consider that not only is there no *drainage* of energy from a power source to support such forceful gravitational activity and energy creation, but there is *no power source at all*. A gravitational force is considered to emanate from within each atom of matter, adding up to the tremendous overall gravity of the Earth, yet we still have no explanation for its endless power source despite having created detailed atomic theories – and even having split the atom. This is a textbook case of an impossible free energy device.

This discussion naturally raises the question of why such a fundamental violation of our laws of physics doesn't generate intense scientific concern, curiosity, and investigation. Why is Newtonian gravitational theory simply accepted and its mysteries left uninvestigated? This question brings a curious mixture of responses. One answer is that science *has* responded to these concerns by accepting a very different physical explanation of gravity proposed by Albert Einstein (1879–1955) known as *General Relativity Theory*, which will be explored further in later discussions. However, Einstein's theory offers no solutions to these problems either, while introducing even further questions. In fact, these violations are not generally acknowledged as the reasons for accepting Einstein's alternate theory of gravity, nor are they even generally acknowledged at all today.

Perhaps more curious is the fact that even though *General Relativity Theory* is generally accepted in academic circles as the proper description of gravity, it is not widely taught or used by engineers and physicists – usually reserved for optional or advanced study and used mostly for purely theoretical applications. Most university science and engineering graduates have little or no formal knowledge of Einstein's theory of gravity despite its official acceptance in scientific circles, and it is not generally used in our space programs. Newton's gravitational

model is by far the main theory of gravity taught in schools and used in space missions today, despite the fact that there was apparently good reason to accept Einstein's quite different gravitational theory into our science. All of this further deepens the mystery surrounding gravity today, so let's take a closer look at these issues starting with the currently unrecognized law violations in our gravitational theory.

Despite the fact that serious law violations and mysteries in Newtonian gravitational theory have just been clearly pointed out in reference to one of our most fundamental laws of physics, science does not generally recognize these violations. How can this be? Why might those who are the most highly educated in physics be the least likely to acknowledge these mysteries and violations?

The answer is that when gravitational theory is taught it is usually accompanied by further instruction on how to dismiss these mysteries and violations by using a concept called the *Work Equation*. And any areas that remain troublesome are generally dealt with by the abstract invention of a reversible "gravitational potential energy" storage and retrieval mechanism, presumed to physically exist in nature.

Although it will be shown shortly that these are fatally flawed explanation attempts that give a false sense of closure on these issues, this fact is overlooked by our educational institutions today since there are no other explanations. Therefore, all properly educated scientists have firmly learned the standard, though erroneous, logical techniques that have been taught for generations to readily dismiss the mysteries and violations of today's gravitational theory. This leads to the curious situation that we find it necessary to continue searching for alternate gravitational theories, such as Einstein's *General Relativity Theory* and others, yet Newtonian gravitational theory is still widely accepted and used by scientists and educators, making this issue worth a closer look.

ERROR**The *Work Equation* – A Flawed Explanation**

Physical labor often involves moving objects from one place to another, and the more force required and the further objects are moved the more energy must be expended in the process. The *Work Equation* is merely an attempt to describe this fact using a simple equation – originally designed to model and quantify situations where energy is used to do work, such as steam engines that burn fuel to do something useful. This equation is written as $W = F d$, or *Work* (W) equals *force* (F) times *distance* (d). So, the more force required to move

an object, and the further the object is moved by that force, the more Work is done in performing this task.

The *Work Equation* can be a very useful tool in analyzing and quantifying the amount of Work done by a given process or machine, and has served engineers well for over a century. However, serious problems arise when its use is extended beyond its original intent. In particular, over the years physicists have transformed the *Work Equation* from an engineering tool for quantifying Work done, turning it into a generic “work detector” that tells us whether or not any *energy* is required to explain a given event. This is such a subtle yet dangerously misleading transformation of purpose that it needs to be clarified with an example:

Consider the situation where an object is simply too heavy to move despite all efforts to push it. There is no question that one could expend a tremendous amount of effort and energy attempting to move the object yet never actually manage to move it an inch. This applies whether we push with our muscles, a fuel-burning internal combustion engine, or an electromagnet powered by electricity.

However, *misapplying* the *Work Equation* as a generic “work detector” in this situation gives the result that *zero* Work was done. A tremendous amount of force was applied to the object over time but the object moved *zero* distance, and since *Work* equals *force* times *distance*, the *Work Equation* dutifully calculates that zero Work was done. If this were blindly taken to mean no *energy* was expended we would have a bizarre paradox of a sizable drain on a power source to attempt to move the object, yet *no energy expenditure*.

Of course, this is a serious misapplication of the *Work Equation* that brings nonsensical results, yet this is precisely the logic used to justify Newton’s gravitational force, as we will see shortly. The *Work Equation* is only designed to help define and quantify situations such as those where a force clearly moves an object through a distance, but is not meant to function as a generic “work detector” that tells us whether any energy was expended by an arbitrary event.

Now, to complete the improper transformation of the *Work Equation* from a simple engineering tool to a generic “work detector,” it has been extended from its original form of $W = F d$ to its current form $W = F d \cos(\theta)$. The additional $\cos(\theta)$ term is the *cosine function*, which transforms any angle from 0 to 360 degrees into a value that lies between -1 and 1. Therefore, the original *Work Equation* is now multiplied by a value between -1 and 1 based on the angle (θ) between

the direction of the applied force and the direction the object actually ends up moving.

This rather odd modification means that if the object simply moves in the direction it is pushed, which is the usual case, this zero-degree angle between force and movement results in the Work calculation being multiplied by 1, since $\cos(0) = 1$. This means nothing changes from the original *Work Equation* when force and movement are in the same direction. However, if the object somehow oddly moved *sideways* despite a forward push applied to it, this 90-degree angle between force and movement means the resulting Work calculation must be multiplied by 0, since $\cos(90) = 0$. Therefore, the Work done in this scenario would be calculated as zero. This *modified Work Equation*, $W = F d \cos(\theta)$, is said to calculate the amount of *useful* Work, since only the amount of Work done in the direction of the force is considered to be desired and therefore useful Work.

This is how the *Work Equation* is taught today, which now sets the stage to explain why the previously mentioned violations of the laws of physics by Newton's gravitational force cause no particular concern for most scientists. The issue of objects being held to the planet's surface by a force that has no known power source is easily dismissed by simply noting that such objects do not move. If an object doesn't move there is no Work done according to the *Work Equation*, and therefore presumably no energy is expended and no energy *source* is required. A serious law violation in physics suddenly vanishes due to blind application of a borrowed engineering equation, widely taught to students as a valid justification for dismissing this otherwise unexplainable observation. In today's science objects can be forcefully held to the floor, walls or ceiling with no particular concern for how this force operates or how it is powered.

In similar fashion, the *modified Work Equation* is used to justify the tremendous energy required to hold our Moon in orbit, again with no known power source. Since the Moon is actually traveling *past* the Earth in a straight line but is continually constrained in its orbit by the gravitational force pulling it *down* toward the planet, this is considered to be a situation much like an object that slides sideways when a force pushes forward. The angle between the direction of the Moon's travel *past* the Earth and the direction of gravity pulling *down* is the same 90-degree angle as in the earlier example of the sideways-sliding object, meaning the *Work Equation* must be multiplied by zero. This gives the result that the gravitational force does zero useful Work and thus

presumably expends no energy in constantly constraining our Moon from flying off into space, ending the search for a power source.

Once again, it would appear that a serious violation of the laws of physics suddenly vanishes. Yet, a person constantly struggling to constrain a heavy, speeding rock into traveling in a circle on the end of a rope might disagree with this zero-Work, zero-energy abstraction for orbits. And one of the reasons for this disagreement is that it is an error to even state there is a 90-degree angle between force and movement here. Without gravity's *pull* the Moon would of course travel further and further from our planet as it coasted past and *away*, just as a person constraining a circling rock on a rope must pull *back* to fight being pulled *forward*. So a gravitational force would actually pull the Moon *back* toward our planet to continually constrain it from otherwise moving *away*. And this continual gravitational pull would actually be in the *same direction* as the continual movement of the Moon back into its orbit. So even according to the *Work Equation* abstraction continual Work *is* performed by gravity, requiring a continual energy drain from a known power source.

Finally, there is the situation where objects fall straight down. Surely the *Work Equation* would have to give a non-zero result here since movement is in the same direction as the downward pull of gravity. Indeed, the *Work Equation* does calculate a positive amount of Work, which should mean energy has been expended by the gravitational force, requiring an energy source within the Earth that is drained by an equivalent amount if this event is to remain within our laws of physics. Since there is no such energy source known to science, we must either admit that gravity cannot be scientifically explained today, or arrive at some further justification.

Indeed, an additional logical abstraction *has* been invented for this type of situation to avoid the search for a power source. In order for an object to drop from a given height Work must have been done earlier *against* the pull of gravity to lift it to that height in the first place. Since this upward lifting could be considered *negative* Work from the perspective of the downward-pulling gravitational force, the positive Work done by gravity when the object falls could be considered to cancel with this earlier negative Work. This zero overall Work is then represented as zero net *energy expenditure*, presumably removing the need, once again, to identify the energy source for gravity. This is such a commonly used mathematical technique to try to explain physical situations that it is now even given physical terminology, with the "*negative Work*" now called "*gravitational potential energy*."

Of course, this abstract exercise still implies that the falling object must somehow drain gravity's energy source, whose existence and nature still remain a mystery to science. And no known scientific theory explains how lifting the object earlier would have *charged* this mysterious power source in preparation for this later energy drain when the object falls. This "gravitational charging" is taught only in abstract fashion as *somehow* increasing the Earth's "gravitational potential energy," but is never actually explained or justified in a concrete physical or scientific manner. So the "energy balance" or "energy return" in this logic is an unexplained, invented abstraction that merely diverts attention from the physical law violation that gravity somehow pulls objects to the ground without drawing on any known power source. In fact, a closer analysis shows a number of formal logical fallacies in plain view artificially supporting this flawed explanatory effort in our science:

ERROR**Multiple Fallacies in "Gravitational Potential Energy"****WATCH FOR ...**

- *Persuasive Definition fallacy*
- *Two Wrongs Make A Right fallacy*
- *Traditional Wisdom fallacy*
- *Misplaced Concreteness fallacy*

An object that drops to the ground presumably falls due to gravitational energy. However, it has now been well established that, in violation of the *Law of Conservation Of Energy*, the apparent gravitational force behind this observation draws on no known power source and is not *itself* drained or weakened by this expenditure of energy. Lacking any solid scientific explanation even today, we have instead *mathematically represented* the scenario, borrowing the *Work Equation model* and misapplying it as an apparent physical explanation.

Yet, the *Work Equation* is only intended to quantify energy expenditure in well-understood physical scenarios. But its use for dropped objects constitutes the first stage of a highly misleading two-stage ***Persuasive Definition Fallacy***, where a deliberate defining of terms is performed with the intent to strongly suggest a desired, and often unproven, conclusion. This **first stage** inappropriately borrows the

well-understood physical concept of humans or machines performing actual physical work, involving physically explained forces and energy drained from identifiable power sources. Misapplying the *Work Equation* to the physically *unexplained* falling object scenario, and defining the resulting calculation formally as “Work,” creates the illusion of an equally well understood physical process, when it actually is *not*. Indeed, the unexplainable physical mystery of this everyday gravitational observation is the very reason this *persuasive-definition* exercise was deemed necessary in the first place. Of course, it would have been far more preferable to actually demonstrate a scientifically explained form of energy driving this common event, drawn from a clearly identified, draining power source – had this been possible.

Now, since this use of the *Work Equation* to model a dropped object is purely a mathematical exercise not bound by physical laws and realities, it can also be freely manipulated mathematically, allowing the opposite scenario of *lifting* the object to be considered “*negative Work*.” Crucially, the fact that “negative Work” is a physically meaningless concept (no *literal* “negative force” or “negative distance” exists in nature to multiply and produce “negative Work”) demonstrates the purely mathematical, abstract nature of this exercise.

We now have a *persuasive definition* for two canceling *mathematical abstractions*, creating the appearance of two canceling *physical processes*, simply by calling them “positive *Work*” and “negative *Work*.” Yet, there actually is not even a *single* physically explained process in this entire scenario of dropping and lifting an object – a fact that is even more deeply buried in the **second stage** of this *persuasive definition* fallacy. In this second stage, the canceling abstractions “positive Work” and “negative Work” are *persuasively redefined* yet again, as if they are canceling *physical energies*, namely “gravitational energy” and “gravitational potential energy.” This further persuasive terminology change, from “Work” to “energy,” now even more powerfully masks the fact that neither of these proposed “gravitational energies” has any scientifically viable explanation – again, the very reason this two-stage *persuasive definition* exercise exists in our science in the first place.

This demonstrates how a *persuasive definition* fallacy is used *twice* in a logical progression that turns the physically and scientifically unexplained observation of lifting and dropping objects into an illusory scientifically and physically explained “energy balance” situation. In actuality, the true physical nature of gravitational energy (or “positive Work”) remains a highly contested open question even today, while “gravitational potential energy” is actually the same pure

mathematical invention it was when it was known by its first-stage *persuasive definition* of “negative Work.” There is actually no canceling “energy balance” in this scenario, but only a mathematical cancellation of physically, scientifically and energetically unexplained proposals and abstractions buried under several stages of *persuasive definition* fallacy.

Further, although the *persuasive definition* fallacy is the core mechanism whereby “gravitational potential energy” has been ushered into our science, this alone does not explain the powerful hold it has on our thinking worldwide today. It is actually further supported by numerous additional logical fallacies, the first being a ***Misplaced Concreteness Fallacy***, where an abstract concept is misrepresented as physical and concrete. This is shown in the above discussion, where lifting an object has been abstracted and persuasively defined first as “negative Work,” then further as the more concrete-sounding “gravitational potential energy,” to create a convincing *misplaced concreteness* fallacy. In actuality, lifting already involves well-understood energy expenditure by muscles or machines to raise an object against gravity. No other such falsely assumed concrete physical phenomenon as “gravitational potential energy” is actually needed or even exists here, except by the logical fallacy of *misplaced concreteness* created by this persuasively defined abstract invention.

Additionally, once such an explanation appears to attain such a powerful degree of validation, even further supporting logical fallacies arise quite naturally in its defense. One of these is the well-known logical fallacy of ***Two Wrongs Make A Right***. In this case, we have the *wrong* of a powerful attracting gravitational force acting with no scientific explanation, cancelled by the additional *wrong* of the pure abstract invention of “gravitational potential energy.” Although the well-known *two wrongs make a right* fallacy is generally easy to identify and dismiss, here it is actually applied to two *mathematically canceling abstractions*, positive and negative Work, that have been persuasively redefined as if they are also scientifically explained *physically canceling energies*, which they are not. This intertwining of valid abstract mathematical cancellation and fallacious physical energy cancellation makes this error in logic much more difficult to identify and dispel.

Finally, once a belief becomes truly widespread and entrenched, it often achieves the status of unquestioned fact via the ***Traditional Wisdom Fallacy***, where “everyone knows” a claim or assertion to be true. The “gravitational potential energy” explanation has been authoritatively taught for generations now, supported by the numerous hidden logical fallacies outlined above, now resulting in a further

situation where “everyone knows” this obvious explanation if they are properly educated. It has become *unquestioned traditional wisdom*, relegating any deeper investigation into this everyday mystery as simply unnecessary and uninformed.

“Gravitational potential energy” is only one of many explanatory efforts discussed herein, where logical fallacies have been allowed entry into our science and educational systems, since the alternative would be for the scientific authorities of the day to acknowledge having little understanding of many common everyday phenomena. In this case, this has created the illusion that gravity is well understood and that its actions all around us in everyday life are clearly explained, when in actuality this is not at all the case.

These logical conundrums involving the *Work Equation* exist due to the deceptively subtle yet powerful difference between its legitimate use in situations where a force moves an object through a distance, and blindly applying it as a generic “work detector” for all situations.

In fact, not only is the *Work Equation* widely misused to alleviate concerns about law violations by Newton’s gravitational force, but, in so doing, it attempts to justify the very *existence* of this otherwise scientifically impossible force. After all, any theory involving a force that violates our most fundamental laws of physics is unacceptable as anything other than a purely abstract model of a still-unexplained physical process. It cannot literally be taken as the proper physical explanation, since this is precisely why our laws of physics exist – as a litmus test for such proposed new ideas. The misapplication of the *Work Equation* essentially creates a loophole in the proper application of the *Law of Conservation Of Energy* by dismissing the need for a power source, corrupting the original purpose of *both* of these concepts.

This *Work Equation* discussion shows the type of logic that keeps most scientists and educators from acknowledging that gravity as we know it today violates the *Law of Conservation Of Energy*. However, once the flawed *Work Equation* explanations are exposed and removed, there are simply no excuses remaining for this unexplained force. The rationalists who followed Descartes had good reason to see Newton’s gravitational force as a return to the magical thinking of the past. Perhaps in Newton’s day it was reasonable to expect that future generations of scientists would find a scientifically viable explanation, or even a true power source, for the gravitational force. However, three centuries later we have found no answers, instead turning a blind eye to its violations of our laws of physics by installing flawed logical justifications for this force into our science.

Regardless of its original purpose, the *Work Equation* has now been incorporated into our science in such a manner that most scientists truly believe a zero-value result from its calculation always means there has been no expenditure of energy. As shown in later discussions, this mistaken belief appears repeatedly in our science in many different scenarios, such as magnetic or electrostatic attraction. And the unquestioning acceptance of this widely misapplied calculation technique in gravitational scenarios has led to the logical oversight that gravity need not expend energy to hold objects to the planet, nor to constrain our massive moon in its orbit.

To demonstrate how unscientific this technique truly is, as alluded to earlier, consider a mysterious new force that suddenly accelerates objects off the floor and crashes them into the ceiling, where they remain pinned indefinitely. Such a force would be no less scientifically explained than gravity is today, with no clear physical explanation for how it operates and no known power source driving it. But also, blindly applying the *Work Equation* and its associated logic shows that there is zero Work done by this force since objects remain pinned to the ceiling, just as gravity pins objects to the ground. Also, since the objects obviously must have fallen to the ground earlier, even their rise to the ceiling is of no concern since this is merely an “energy cancellation” or “energy balance” situation that requires no further investigation. So, as with gravity today, this must mean there are no particular mysteries to ponder with regard to this new force. Yet, of course, despite the *Work Equation* explanation attempts, a great many scientifically unexplained mysteries remain, both with this hypothetical new force and equally with our familiar gravitational force.

EXPERIMENT



“Gravitational Potential Energy” Fails Physical Test

As shown above, the very notion of “gravitational potential energy” is an *illusion* – completely defunct as a *physical* concept. This fact is clearly demonstrated in many common processes, such as *siphoning*.

The siphoning process is another mysterious “energy-for-free” situation when viewed from today’s energy-based science paradigm. Energy is required to empty a pool filled with water, of course, whether by laborious manual effort lifting it out bucket by bucket or by some other energy-driven process such as a powered pumping system or Sun-driven evaporation. A pool of water cannot otherwise simply empty *itself*; that is, unless a fluid-filled hose runs out of the

water, up over the edge of the pool and is released below the water level outside the pool. In this case the pool water will run *uphill* through the hose to drain outside the pool, *continuing undiminished* until the pool is completely empty. There is no human effort required, no powered pump and indeed no fuel requirement or energy expenditure at all in this active removal of *any* amount of water from *any* sized pool. Explanation attempts typically involving “gravitational potential energy,” sometimes with additional appeals to influences such as atmospheric pressure, crucially fail to provide an explanatory power source or energy balance for this active and powerful ongoing process.

This experiment clearly demonstrates the fallacy of the “gravitational potential energy” abstraction often proposed to explain many situations where gravity clearly acts powerfully yet, paradoxically, with no identifiable power source. To fill the pool initially the water would have been lowered down into the pool, simultaneously lowering the theoretical “gravitational potential energy” of the water down into the pool along with it. So it is deeply flawed logic to represent siphoning as a situation where the theoretical “gravitational potential energy” that would have already been *spent* lowering the water into the pool is nevertheless somehow drawn upon a *second* time to lift the water back up and out of the pool. Such a claim is essentially equivalent to stating that the water somehow lifts *itself* out of the pool. Clearly this process could not be driven by “gravitational potential energy” as often claimed, exposing “gravitational potential energy” as a failed superfluous abstraction that leaves common physical processes *completely unexplained* when actually put to the test.

“Gravitational potential energy” even fails the physical test of simple falling objects. An object can be lifted slowly, causing no wind resistance, but there is enough wind resistance as it falls to even completely cancel the accelerating effect of gravity, resulting in a constant *terminal velocity*. This energy loss to friction with the air is a tremendous upset to the claimed “energy balance” between the presumed creation of gravitational potential energy during lifting and its supposed full return after falling. Yet, the failed “energy balance” claim still persists, since recognition of such an actual energy *imbalance* would require an explanation for why gravity never weakens due to such losses, and indeed, how gravity is even powered in the first place.

To be sure, gravity *is* actively and tirelessly driving these processes, as it drives countless events throughout the cosmos. However, it is a logical fallacy to present such mental abstractions as “gravitational potential energy” or the *Work Equation* in place of *physical* explanations

for the apparent gravitational free energy all around us when viewed from today's science paradigm. Not only is there no scientific explanation for how mere lifting could facilitate physical generation, storage and later return of "gravitational potential energy," but, as just shown, even the *logical application* of this belief unravels when actually put to the test in such everyday events as siphoning and falling objects.

This failed yet widespread "energy balance" or "energy return" claim for siphoning shows that "gravitational potential energy" is a *false concept* – a logical fallacy initially invented as "negative Work" by the equally flawed misuse of the *Work Equation*. Such fallacious abstractions misrepresent the true physics of our world, dismissing everyday situations where today's science actually has *no scientifically viable explanation* and keeping us from discovering the true physics of the world around us. And, importantly, this conclusion does not only apply to the isolated scenario of siphoning. If the widespread "gravitational potential energy" explanation actually *fails* when truly tested, leaving a common gravitational observation completely without a scientifically viable explanation, then it cannot be selectively re-introduced as a proposed valid physical explanation for other gravitational observations.

This state of affairs exists because we very much *want* to believe in a gravitational force acting at a distance, reaching out of the planet and pulling objects downward. For centuries it has been the only reasonable explanation we have had, and it is still the only compelling and intuitive physical explanation for falling objects and orbiting moons even today. The official position in science today does state that another explanation exists in Einstein's *General Relativity Theory* of "warped four-dimensional space-time." But, as we will see, this theory also has its own serious problems, and also does little to address our everyday experiences, seeming far off the mark compared with Newton's intuitive gravitational force concept. And indeed, as shown in the next chapter where the new principle is introduced, gravity *can* be explained in a simple, intuitive, and scientifically viable manner – but without appealing to either an unexplained force or an abstract and equally problematic "warping of space-time." It is simply today's unquestioning adherence to an energy-based science and its related conservation laws that necessitates inventions and abstractions such as "gravitational potential energy" or the *Work Equation* to try to explain away glaring inconsistencies in the world around us.

So far, we have seen a number of questions, mysteries and even violations of physical laws surrounding the concept of a gravitational

force. We have no answer for why it attracts rather than repels, we know of no power source within matter that would produce this force, and it acts forcefully and energetically without diminishing in strength or draining a power source – an “energy-for-free” scenario that violates the *Law of Conservation Of Energy*.

In addition, there is yet another troublesome issue with Newtonian gravity to consider – that of its speed of travel through space. We begin with a reminder of our currently accepted universal speed limit, the speed of light:

LAW***The Speed-of-Light Limit***

Neither matter nor energy can travel through Space faster than the speed of light.

This is a currently accepted law in our science today, stating that the speed of light in the vacuum of empty space represents an absolute upper speed limit on all objects and also on the speed of propagation of all fields and all forms of energy through space. According to this law, nothing known to man can travel faster than light. This is an idea that Einstein proposed as part of his *Special Theory of Relativity*, and which currently stands as an unbreakable law of nature in our science.

VIOLATION**Newton's Gravitational Force Exceeds Light Speed**

Newtonian gravitational theory comes with no speed limit. A common example of this is to imagine our Sun suddenly vanishing. While it would still appear as if the Sun were present for roughly eight minutes as the last rays of light eventually made their way to Earth at light-speed, the Sun's gravitational field would vanish immediately along with it. The Earth would not experience eight additional minutes of the Sun's gravity constraining it in orbit, but would *immediately* begin leaving its orbit about the Sun and start drifting off into space.

This is because the loss of gravity from the Sun would be immediately felt at any distance throughout the solar system, and indeed throughout the universe, according to Newtonian theory, since there is no defined propagation speed limit in either Newton's physical description of gravity or his equations modeling it. This faster-than-light transmission of the gravitational force through space – and

indeed even *instantaneous* transmission across *any* distance in our universe – is a great, unexplained mystery in our science today.

This is *one* violation in Newtonian gravitational theory for which a logical justification has *not* been found that allows it to be dismissed or overlooked. That is, unlike the law-violating behaviors mentioned earlier that were justified either via misapplication of the *Work Equation* or the abstract invention of “gravitational potential energy,” this speed-of-light violation remains in plain view. It should be noted that although this violation lacks explanation, a resolution is proposed in Einstein’s *General Relativity Theory*, since one of the key differences with this alternate theory of gravity is that the element of *time* is built into its equations. This provides a description of gravity that allows it to take time to propagate through space, or through “space-time” in Einstein’s theory, proposing a solution to this issue. However, this is only a *proposed* solution since the actual speed of gravity is unknown – no definitive tests have been done to determine it.

In fact, the issue of the speed of gravity is still a very contentious one in our science, and there is often sizable disagreement on how to even go about measuring it properly. Some scientists claim to have proven agreement with Einstein, while others attempting to independently verify such claims typically report that the speed-of-light limit was merely pre-built into the methods and assumptions of these researchers, proving nothing. Further, since results that appear to agree with Einstein tend to be more popular and readily accepted, this version is often incorrectly represented publicly by scientists as if it were proven fact, propagating increasing misinformation and confusion over the speed of gravity for both the general public and scientists alike.

So, we have the choice of Newton’s simple and intuitive theory, which violates the speed-of-light limit, or Einstein’s quite different physical theory, which offers an unproven solution to this violation. Additionally, there is a sizable amount of confusion among both laymen and scientists as to whether Einstein’s theory completely replaces Newtonian gravity or somehow operates alongside it. As a result of this type of interplay between these two theories, we are left with an odd combination of *both* theories in our science today, even though common sense tells us there can be only one clear physical explanation underlying any observation. Clearly either one of these theories must be fatally flawed or *both* theories are merely interim models that have captured one aspect or another of the true and as-yet-undiscovered physical explanation for gravity. It is precisely such

an as-yet-undiscovered explanation for gravity that is proposed in the next chapter, offering a resolution to this odd state of affairs in our science today.

In addition to the above discussions there is yet more evidence in plain view regarding the ocean tides that suggests a serious lack of understanding in today's gravitational theories and beliefs:

The Moon *Cannot* Cause the Tides

**WATCH
FOR...**



- *Coincidental Correlation / False Cause fallacy*
- *Hedging / Ad Hoc Rescue fallacy*
- *Exclusion fallacy*

The fact that the ocean tides rise to coincide with the passing of the Moon overhead has long been considered proof that the Moon somehow causes the daily tides. This belief persists even today, with most scientists and educators claiming tides arise from the Moon's gravitational pull. However, as compelling as this correlation may be, claiming it as a causal *fact* in our science without solid scientific evidence is a ***Coincidental Correlation Fallacy***, where a *coincidence* of events is assumed to prove that one *causes* another. Also, when there is further reason to question the validity of the claimed *cause* itself (i.e. the lack of solid scientific explanation for either an attracting gravitational force or "warped space-time"), this fallacy is also often termed a ***False Cause Fallacy***. And, as the following discussion shows, there is good reason to consider a lunar cause for tides as just such a fallacy.

There is much variation and confusion today in the explanation of the ocean tides, where one tidal bulge rises below the Moon and another on the opposite side of the planet, which we rotate through daily. One common misconception is that the Moon's gravity literally *pulls* the oceans upward as it passes overhead; yet this is physically impossible since such a pull would have to *completely exceed* Earth's surface gravity before having even the slightest tidal effect. Just as our muscles will not even begin to lift an object off the ground until we pull upward with enough force to completely cancel its weight, so it must be for a pull from the Moon before any amount of water even *begins* to rise from sea level. Any weaker lunar force would merely

reduce the *weight* of objects or oceans, but would, of course, still leave objects sitting firmly on the ground and water likewise resting unmoved from sea level in the oceans. So, a direct upward pull on the oceans is *not* a viable physical mechanism for the Moon's gravity to cause the ocean tides.

It is sometimes suggested that even if the Moon did only slightly reduce the *weight* of the oceans this would still allow them to decompress a little and swell to produce the rising tides. But this explanation also fails once we consider today's theoretical distance-squared weakening of the Moon's one-sixth surface gravity across the distance of 220 lunar radii to Earth. Such a 220-squared weakening would mean any gravitational effect on Earth from the Moon would be roughly 300,000 times weaker than Earth's surface gravity. Such a tiny weight-reducing effect would theoretically produce only about a centimeter of decompression swell from a typical 4km-deep ocean – and even then *only* if water were readily compressible, which it is *not*. Considering that water is actually extremely unyielding to compression forces, even a centimeter of tidal swell would be a great overestimate. So, mere weight reduction is another physical principle the Moon's gravity could *not* operate on to cause the tides.

Another proposal, relating to the tidal rise on the opposite side of the planet, is that the entire planet is pulled toward the Moon, and thus away from its oceans on the opposite side, causing these oceans to rise as they are left behind by the planet's motion away. However, there are of course numerous problems with this claim. Even if an Earth-Moon attraction could theoretically accelerate our entire planet toward the Moon fast enough to cause tides on the far side, this effect would simultaneously *squash* the oceans on the other side beneath the Moon, canceling them. Also, the hundred-fold lighter Moon would accelerate toward Earth far faster, with both bodies *continuing* to accelerate toward each other (since the tides are ever present beneath the Moon) until they crashed into one another. Clearly an acceleration effect on our overall planet is yet another physical principle the Moon would *not* operate on to cause the ocean tides.

Still other explanation attempts can be found, though they all ultimately involve variations on the theme of either a direct upward pull or a squashing effect on the oceans, all involving a force from the Moon and all suffering from flawed physics or logic similar to that discussed above. It should further be noted that the numerous failed tidal explanations above apply whether the claimed lunar influence is based on Newton or Einstein's theory of gravity.

In addition to the above evidence against a lunar gravitational influence *causing* the tides, further evidence calling into question the very *existence* of a lunar influence on Earth can be seen in the behavior of our satellites:

ERROR**No Lunar Gravitational Influence on Satellites**

As mentioned above, one certain result of a gravitational force or influence from the Moon would be an effective reduction in the Earth's downward gravitational acceleration on objects as the Moon passes overhead. Such a reduced effective downward acceleration would reduce the drop time of falling objects, in accord with the standard equation used for falling objects, $d = \frac{1}{2}at^2$. As this constant-acceleration equation from Galileo Galilei (1564–1642) shows, objects would fall less distance, d , in a given time period, t , if the effective downward acceleration, a , due to gravity were reduced (i.e. they would fall more slowly).

So it is very significant that, according to today's theories of gravity and orbits, orbiting satellites are in continual free-fall while speeding past the planet – a dynamic often characterized as “falling around the planet.” This means an effective reduced gravitational acceleration on satellites passing beneath the Moon should cause them to fall more slowly, yet they would not be slowed in their *horizontal* speed past the planet. As a result, satellites would pass the planet *faster* than they are falling while traveling beneath the Moon, changing their otherwise balanced stable orbits into unbalanced *rising* ones.

Specifically, a satellite in low Earth orbit, such as an orbiting space station, typically circles the planet in about 90 minutes, which means it travels under the Moon for roughly 30 minutes out of each orbit. A straightforward calculation using the Moon's theoretical $1/300,000^{\text{th}}$ reduction in Earth's gravitational acceleration on objects shows that satellites should rise in orbit by roughly 50 meters after passing under the Moon for this half hour. And, since there are 16 orbits of 90 minutes in a day, this accumulates to an 800-meter rise in orbit *per day*. This accumulation follows from both astronomical observations and from our space programs, where objects boosted to higher orbits remain there even after the boost (i.e. any effective gravity-reducing force or influence) is removed. So each orbital rise beneath the Moon would remain, to be further increased with each return pass. This ongoing rise of nearly a kilometer per day is no small effect, yet despite claims of corrections for even the most subtle and

exotic effects upon satellites there is no mention of such a gravitational influence on them from the Moon – even as tides rise on the oceans below. This constitutes further evidence not only that the Moon *cannot* be causing the tides below – while leaving our satellites unaffected, but that there is *no such lunar influence on Earth at all*.

ERROR**Mistaken Causal Link between Earth and the Moon**

Another factor contributing to the persistence of the belief in a lunar tidal influence is an assumed causal link between a noted slowing in Earth's rotation and a noted movement of the Moon away from us. Although both effects are extremely tiny and have no solid physical connection, they have nevertheless been intimately linked in our science – the assumed result of a physical gravitational interaction between Earth and the Moon. The claim is that the rotation of Earth gravitationally drags the Moon faster in its orbit, sending it further away, while this same gravitational drag simultaneously slows our rotation. However, again, pure assumption based on observed coincidence with no clear scientific explanation merely constitutes a *coincidental correlation fallacy* until sound scientific evidence is presented.

But further, in this case even the original claimed coincidence *itself* is a highly debatable assumption. Most objects in our solar system rotate, and while it would be somewhat surprising if their rotations generally *increased*, a slight gradual *decrease* would be far less surprising as unpowered systems generally lose energy and wind down in our universe. Any number or combination of influences could explain the fairly unsurprising, extremely slight slowing of Earth's rotation (roughly one part in *40 million*), such as the Sun's magnetic field dragging on ours, previous asteroid impacts or accumulation of matter falling from space. Likewise, most objects in our solar system are in orbit, and while we try to idealize them with mathematically perfect models, no practical orbits are likely to be in perfect balance in the real world. Therefore, we might expect all orbits to be at least slightly out of balance, either increasing or decreasing in size, and our Moon's orbit does appear to be increasing very slightly in size, by about one part in *10 billion*.

So, rather than a scientifically unexplained cause-and-effect mechanism linking Earth's slightly slowing rotation and the Moon's minutely increasing orbit, the simpler explanation is that these are two *unrelated* events, each separately proceeding in a fairly unsurprising,

expected manner on their own. Unlike the coincidental passing of the Moon over the tides – a dynamic that is explained in Chapter 3 – in this case there is not actually any true *coincidence* at all. The original coincidence claim *itself* is arguably merely an attempt to support today's favored gravitational beliefs (a *confirmation bias fallacy*), with a further *coincidental correlation fallacy* added to it due to the lack of a solid scientific causation for this presumed "coincidence." In actuality, there is no particular reason to present the Moon's increasing orbit and Earth's slowing rotation as coinciding or linked events at all, and certainly not as solid cause-and-effect confirmation of today's gravitational beliefs.

And so, since we still do not have a universally satisfying explanation for tidal effects, even in today's science, we are left instead with a wide variety of failed justification and explanation attempts. All the common explanations above suggest outcomes that are greatly at odds with observation, such as ocean tides that should be barely perceptible, tidal effects that should behave opposite to observation, satellites that should rise dramatically and continually in orbit, and even the Moon and Earth crashing into each other. Such is the state of today's understanding and explanation of both gravity and tides.

These tidal discussions, and many other discussions to come, further demonstrate a highly troubled feature that runs through much of today's science, namely a ***Hedging Fallacy*** or ***Ad Hoc Rescue Fallacy***, where a flawed explanation is proposed, then switched to a second explanation when exposed, and often even to a third. Typically the additional explanations are also flawed, since there would be no need to create a moving target via such hedging and rescuing efforts if a solid scientific explanation existed in the first place. Further, the use of such techniques has the additional effect of creating a ***Fallacy of Exclusion*** situation, where locking in fallacious explanations excludes other truly viable ones since there already *appears* to be a widely accepted answer.

But when the fallacies are removed we are freed to see, for example, that there are certainly other possible explanations for Earth's rotational slowing and the Moon's increasing orbit. Also, as discussed in detail in Chapter 3, the ocean tides actually *do* have a clear physical cause that has nothing to do with the Moon and that is already acknowledged to exist, based on a rotational dynamic that is *required* to exist within our planet according to elementary physics. However, this effect is also largely ignored or dismissed since we firmly believe the Moon's coincidental passing overhead somehow causes the tides.

The Origin of Newton's Gravitational Force

The discussions so far have largely taken for granted that we are all very familiar with the Newtonian explanation of gravity as an attracting force that somehow emanates from matter; as such, the details and origin of this theory have not yet been addressed. If we could examine the progression of ideas that led to Newton's theory of gravity, perhaps we could identify once and for all either where the overlooked power source may be for this force, or alternatively, how this *fictitious* force came to be invented.

Many models of how the universe might operate were proposed and followed in the millennia prior to Newton; however, since most of them sizably misunderstood the geometry and motion of the solar system and stars, they were often more arbitrary man-made mechanisms than actual descriptions of nature. It was not until Nicolaus Copernicus (1473–1543) published his model of a central Sun orbited by the planets, each with their own orbiting moons, that the true dynamics of nature were correctly identified and widely considered. As a result, it was now possible to present more scientific proposals of phenomena that might actually occur in nature to explain these natural celestial motions. One clear frontrunner in this quest was the notion of an attracting force somehow acting between bodies in space.

The first publication of Newton's *Law of Universal Gravitation* appeared in his famous work, widely known as "*The Principia*" today, published in 1687. In this publication Newton describes his proposed new attracting force, showing how it explains our observations of falling objects and orbiting bodies, and even providing a simple and intuitive mathematical formula for calculating the strength of this gravitational force between any two objects. To arrive at this equation Newton would have had to follow the clues available to him at the time, both from his own experience and education as well as from the available astronomical data of his day. Let's now follow the type of thought processes that would have led to Newton's formal theory of a gravitational force.

At the time, a formal mathematical description of the orbits of moons and planets was already in existence – provided by Johannes Kepler (1571–1630) – based on the astronomical data of the day. Kepler's three laws of planetary motion are very accurate and useful indeed, still remaining as some of the most important tools used in our space programs. Yet, despite this great achievement by Kepler, these laws only provided a *mathematical* description of planetary motion

without explaining *why* and *how* this motion physically occurs. In essence, Kepler's Laws described only the *geometry* of planetary motion, but not the underlying *physical* reasons for this geometry.

Prior to Newton's *Law of Universal Gravitation* there were suspicions that some type of attracting force might be at work, but no one had managed to arrive at a solid theory or justification for such a force. Newton's well-developed theory of a gravitational force finally managed to achieve this convincingly, bridging the gap between Kepler's purely geometric laws of planetary motion and the strong suspicion that some type of attracting force in nature may underlie them. Newton's *Law of Universal Gravitation* is as follows:

LAW



Newton's Law of Universal Gravitation

An attracting force emanates from all objects, pulling them toward one another with a strength that varies with their masses and the distance between them squared.

According to this claim made by Newton, now considered a law of nature, the greater an object's mass the greater its gravitational field strength, which also diminishes rapidly the further it extends out into space away from the object. Specifically, the strength of this gravitational force between any two objects is calculated by multiplying their masses together then dividing by the square of the distance between their centers. Finally, this result is multiplied by a constant, known as the *gravitational constant*, to present it in standard units of force. The resulting equation of the strength of the gravitational force, F , between two objects is written as:

$$F = \frac{G \cdot (m_1 m_2)}{R^2}$$

where m_1 and m_2 are the masses of the objects
 R is the distance (radius) between their centers
 G is a constant, called the gravitational constant

This equation is known as the *Law of Universal Gravitation*. Yet this represented much more than just another equation when Newton introduced it. It ushered a completely new force of nature into our awareness and our science. Far more than a mere abstract model, now an *actual* attracting force apparently emanated from objects – varying

in strength with their mass, which we can hold in our hands, and their distance, which we can measure.

This is a concept that we are now taught as children and have grown accustomed to, but it would have been truly revolutionary when it was first introduced in Newton's day. Some had suspected that something of this nature might exist to explain falling objects and orbiting bodies, but Newton was the first to actually *show* that this force apparently did exist, and to describe it in concrete terms.

Further, it is fairly straightforward to derive today's *Newtonian Orbit Equation* from Newton's *Law of Universal Gravitation*, as will be shown shortly, which very accurately predicts the motions of the planets and plays a central role in our space programs even today:

$$v^2 R = GM, \quad \text{where } M \text{ is the mass of the orbited body}$$

$$R \text{ is the orbital radius (distance)}$$

$$v \text{ is the velocity of the orbiting object}$$

Although such achievements are considered evidence of the correctness of Newton's claims, a closer look exposes serious inconsistencies and problems. For example, as just discussed, Newton's *Law of Universal Gravitation* claims that gravity is due to an attracting force pulling across a distance, and that this force further varies inversely with *distance-squared*. Even Einstein did not question this inverse-square claim, building it into his *General Relativity* theory of gravity. Yet the above *Newtonian Orbit Equation*, which applies to orbits at varying altitudes, not only contains no force at all, but also varies only with *distance* – **not** distance-squared. The dynamics of orbiting objects should be intimately related to Newton's inverse-square force – or at least an inverse-square dynamic of some sort – if even the essence of Newton's claims about the nature of gravity is correct.

Further, there has actually been no solid verification of this claimed inverse-square behavior of gravity at a distance from our planet. Objects even in near-Earth orbit are completely weightless, considered to be in continual free-fall around the planet, so there is no inverse-square weight variation with orbital height. Non-orbiting objects at a distance are also considered to be in free-fall toward the planet, being similarly weightless and also exhibiting none of the claimed inverse-square weight reduction. It would be necessary to perform thrust measurements with rocket experiments deliberately designed to halt falling objects at varying distances from the planet to test Newton's inverse-square law claim.

Such striking inconsistencies in today's gravitational theory will be explored more deeply as the chapter proceeds, including an example

of how widespread Newtonian gravity illusions are created – and how they can be broken.

Nevertheless, prior to Newton's theory of gravity the cause of the weight of objects here on Earth was not only unknown, it was also not necessarily seen as the same cause behind the motion of moons and planets. But now Newton managed to tie it all together with his singular new attracting gravitational force and its associated equations. All of this made Newton's theory of gravity a revolutionary discovery, as well as apparently irrefutable proof of the existence of such a force in nature.

But where did this revelation come from? Somehow we went from a vague suspicion that an attracting force might somehow be at work in the world around us, to a definite statement of its existence and emanation from all objects, with equations detailing its precise behavior both on Earth and throughout the cosmos. How does something like this occur?

The following investigation into this issue will help to clear up this mystery, showing that Newton's gravitational theory is actually a completely superfluous and unnecessary invention based on a logically and scientifically flawed assumption. And further, as a result of this invention, a crucially important non-gravitational equation for the orbits of planets was overlooked and needlessly recast in Newtonian gravitational terms, presented as an entirely new equation – the *Newtonian Orbit Equation* mentioned above and currently in use today.

This may seem to be an extraordinary claim, especially since this is not at all what we are taught about the history of our gravitational beliefs today, but the story of how this could occur is actually quite straightforward and verifiable. To demonstrate this alternate view of Newton's discovery process and its implications, we begin with a story of a hypothetical scientific discovery, a story that parallels the events surrounding Newton's gravitational discoveries. Afterwards we will investigate how this story may relate to Newton's situation specifically, and to the history of our current scientific beliefs about gravity.

The Story of a Hypothetical Scientific Discovery

Let's consider that there is an observation in the sky that has been seen for millennia but lacks a scientific explanation and an equation to model it. We'll call this **Event 1**, which is an important open issue in science that one particular scientist is very interested in, and is pursuing privately...

Private Pursuit of Event 1

While analyzing a table of observation data for **Event 1**, which only select scientists possess, our scientist notices a pattern in the data involving *distance*, noting it as a new **Equation 1** modeling this event.

Our scientist cannot explain the physics of this empirical **Eqn 1**, but notes that **Event 1** is similar in appearance to an **Event 2** in everyday experience having an **Eqn 2** also involving *distance* plus a well understood force. Our scientist decides to merge these two equations into one, creating a hybrid **Eqn 3** that now contains *distance-squared* and an undefined *force*.

Eqn 3 is not particularly meaningful in a physical sense, being an arbitrary mixture of terms from two very different physical events. However, as with any such merger, **Eqn 3** can be used to reverse the steps that created it, producing **Eqn 1** when **Eqn 2** is substituted into it, or **Eqn 2** when **Eqn 1** is substituted.

Public Presentation of Results

Upon going public our scientist does not tell the private story above of a mere empirical discovery of **Eqn 1** from a pattern in the data. Instead, the hybrid **Eqn 3** involving an unidentified *force* and a division by *distance-squared* is presented as a new “***Inverse-Square Law***” with an apparent new attracting force in nature to finally explain **Event 1**.

As apparent proof that this proposed new attracting force exists in the heavens and also in **Event 1**, our scientist publicly substitutes **Eqn 2** from **Event 2** (being only similar in *appearance*) into the new “***Inverse-Square Law***”. This produces **Eqn 1**, which of course accurately models **Event 1**, apparently validating the new “***Inverse-Square Law***” and its claim of a new attracting force in nature.

It is not publicly known that **Eqn 1** was previously created in private solely from patterns in the data, and not from any knowledge or understanding of a new force in nature. Nor is it publicly known that the proposed new “***Inverse Square Law***” (**Eqn 3**) and its new attracting force was further artificially invented by an earlier arbitrary forced merger of **Eqn 1** and **Eqn 2**. This creates the false public appearance that **Eqn 1** is newly derived from a valid new “***Inverse-Square Law***,” physically explaining an age-old observation in the sky via the discovery of an actual new attracting force in nature.

This story shows how a scientist, such as Newton, might erroneously equate an observation, such as orbits (**Event 1**), to a similar-looking event, such as a rock swung by a string (**Event 2**), creating an official looking but meaningless “*Inverse-Square Law*” (**Eqn 3**). The force in the physical string (actually an *undefined* force term in the “*Inverse-Square Law*”) might then create the *assumption* of an actual attracting gravitational force somehow acting across space. So, substituting the rock-and-string centripetal force equation (**Eqn 2**) into the “*Inverse-Square Law*” produces today’s widely known *Newtonian Orbit Equation* (**Eqn 1**), even though this very same equation is easily extracted empirically directly from available observation data. No appeal to an *Inverse-Square Law* or an attracting force is necessary at all, with this whole exercise being superfluous and misleading in our science today. With this overview in mind, we proceed to a detailed discussion of this situation in our science:

Alternate Origin for Newton’s Law of Gravity

Newton’s published derivation for his law of gravity, based on Kepler’s laws of planetary motion, has strong similarities to the variation presented below, which helps provide a clearer picture of the origin of Newton’s gravitational force in our science, addressing issues that still remain a mystery even today.

WATCH FOR...



- Kepler developed three *purely geometric* empirical equations of planetary motion – involving no gravitational force or specific physical phenomenon – which described observations extremely well prior to Newton, and still do today.
- A fourth *purely geometric* orbit equation of great importance was easily identifiable from the astronomical data at the time, yet no formal record exists of this ***Geometric Orbit Equation***
- Newton’s gravitational force equation can be easily created by equating the ***Geometric Orbit Equation*** to that for a rock swung by a string, *inventing* Newton’s force by making the same rock-and-string equality with orbits made by Newton.
- This needless equality between swinging rocks and orbiting planets is seriously flawed, leading to the unexplainable mysteries and violations in Newtonian gravitational theory.

- The **Newtonian Orbit Equation** widely used today is derived from Newton's gravitational theory; however, this only *appears* to give an entirely new and important orbit equation, but is merely a reversal of point 3 above, giving the original **Geometric Orbit Equation** with a slight cosmetic alteration.
- Newton's attracting force is an unnecessary invention with no scientific support, created by equating the pre-existing **Geometric Orbit Equation** with the rock-and-string scenario in a flawed equality to orbits.

The Orbit Equation Actually Existed Prior to Newton

The analysis of the origin of Newton's proposed gravitational force begins with Kepler's three laws of planetary motion. Unlike Newton's *Law of Universal Gravitation* and the Newtonian orbit equation that follows from it, Kepler's laws are *purely geometric*, empirical descriptions of planetary motion based on observations of the sky. They were arrived at prior to Newton's theory of gravity, and make no reference to a gravitational force. These laws are as follows:

LAW



Kepler's Laws of Planetary Motion

- **Kepler's First Law** states that the planets move in oval-shaped ellipses around the sun, with the sun at one end of the ellipse.
- **Kepler's Second Law** states that as a planet proceeds in its elliptical orbit, an imaginary line joining the sun and the planet would always sweep out the same area in a given time period regardless of where the planet is along its elliptical path.
- **Kepler's Third Law** provides an equation that calculates the average distance of a planet from the sun simply by measuring the time it takes to make a complete orbit.

These three laws are very accurate, reliable and central to our space programs today. However, an additional pattern regarding orbits can be readily seen in the astronomical data available to Kepler and Newton, yet it appears to be missing from both *Kepler's Laws* and Newton's gravitational theory. We'll call this purely geometric relationship the *Geometric Orbit Equation*:



The Geometric Orbit Equation

The *Geometric Orbit Equation* is a previously unrecognized, purely geometric equation extracted from patterns in the standard astronomical data, showing that the orbital radius of any planet in our solar system (i.e. its distance from the Sun) times the square of its velocity always gives the same constant value. This would be written as:

$$v^2 R = K$$

where K is a constant with the unchanging value of $1.328 \times 10^{20} \text{ [m}^3/\text{s}^2]$
 R is the orbital radius of the planet
 v is the velocity of the planet

This relationship can be readily deduced from any standard table of planetary data that can be found in most introductory physics textbooks. The constant, K , is the same for all planets orbiting the Sun, but differs for other orbital systems. For instance, the value of K for objects orbiting the *Earth* rather than the sun can be readily calculated as 4×10^{14} by referring to these same tables of planetary data. This value of K for our Earth-based orbital system would apply to the orbit of the Moon, for instance, as well as the orbits of the various satellites and spacecraft about our planet.

This *geometric* orbit equation allows the distance of orbiting objects to be calculated from their speed. It also allows for the planning or alteration of satellite and spacecraft orbits by indicating the speed required to achieve a given orbit, and the required speed change to transfer from one orbital trajectory to another. This type of calculation would underlie everything from fuel planning for space shuttle missions to satellite orbit insertion about Mars. Notably, this *Geometric Orbit Equation* pre-dates Newton as it requires none of his gravitational theory, achieving these results in a purely geometric fashion, as its name implies, *without any reference to masses or gravitational forces*.

The *Geometric Orbit Equation* is the type of important astronomical observation that we might expect to be identified in the time of Kepler and Newton. Yet there is no specific mention of this equation in science, but only the **Newtonian** Orbit Equation shown earlier in the discussion of *Newton's Law of Universal Gravitation*. And, most notably, the existence of this earlier geometric relationship provides an intriguing alternate derivation for Newton's gravitational force and the final form of his *Law of Universal Gravitation*. To see this, we turn to the common analogy for planetary orbits taught in all elementary physics

courses – the presumably equivalent scenario of a rock swung in a circle at the end of a string – an equivalence assumed by Newton.

The Rock-And-String Assumption

The idea of the Moon being forcefully constrained by gravity to circle the Earth seems very reasonable at first, since we are all familiar with the seemingly similar concept of swinging a rock on the end of a string, causing it to “orbit” about us. Of course, this is not truly an orbit since it involves a physical length of string under clear physical tension as our muscles strain to keep the rock from flying off.

This equivalence leads to the odd notion that our Moon’s orbit involves a mysterious attracting force acting across space in a manner that is still unexplained by science, apparently forcefully keeping the Moon from flying off without drawing on any power source. However, since this is the equivalence made by Newton and widely accepted today, we will follow this same assumed rock-and-string equivalence in this alternate derivation of Newton’s gravitational force.

Once this assumption is made, it may then seem reasonable to equate the force required to constrain the rock in its circular path with the gravitational force said to constrain the Moon in its orbit. The *Centripetal Force Equation* to calculate the force, F , required to constrain a rock swung by a string is well known, as it was in Newton’s day:

Centripetal Force Equation (“rock-and-string”)

$$F = mv^2/R \quad \text{where } m \text{ is the mass of the rock}$$

v is the velocity of the rock
 R is the radius of swing (string length)

Equating this with the scenario of gravitational orbits gives the picture of equivalence between all elements involved, as shown in Figure 1-1.

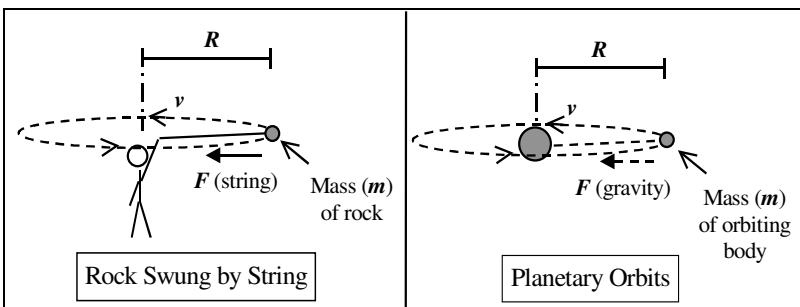


Fig. 1-1 Assumed Equivalence between Rock-and-String and Orbits

At this point, we have an equation for orbits (the *Geometric Orbit Equation*), an equation for a rock swung by a string (the *Centripetal Force Equation*), and an assumed equivalence between them. So then, it should be possible to merge these two separate equations to create one single equation that embodies this equivalence. This can be done by first rearranging the *Geometric Orbit Equation* in terms of its velocity parameter ($v = \sqrt{K/R}$), then substituting this velocity expression into the *Centripetal Force Equation*, resulting in the equation:

Hypothetical Gravitational Force Equation

$$F = mK/R^2 \quad \text{where } m \text{ is the mass of the orbiting body}$$

K is the constant from the *Geometric Orbit Equation*

R is the orbital radius, also from the *Geometric Orbit Equation*

This new equation is a hybrid of the *Geometric Orbit Equation* and the *Centripetal Force Equation*, obtained by making the *completely arbitrary assumption* that swinging rocks are *physically* equivalent to orbiting objects, and not simply similar in *appearance*. This would mean there must somehow be an actual physical force extending out from the planet to pull on objects and constrain them in orbit, just as there is a physical tension force in the rock-and-string equivalent as shown in Figure 1-1. This is Newton's personal theory and now revolutionary breakthrough idea, making this equivalence a critically important step in the development of his gravitational theory. And as we will see soon, this new hypothetical gravitational force equation forms the foundation of Newton's *Law of Universal Gravitation*, and the force, F , is the first-ever occurrence of his *hypothetical* "gravitational force."

NOTE



This new hybrid equation marks the first appearance of an attracting gravitational force in our science.

As noted above, this new hybrid equation is no mere mathematical exercise, but the literal *creation point* for the supposed "gravitational force," and the first point where a force of any kind appears in relation to orbits. Prior to this a description of orbits would have been possible, provided by the *Geometric Orbit Equation*, but in completely geometric fashion involving only velocity and distance, with no

mention of an attracting force emanating from the mass of the orbiting body. Indeed, much of Kepler's work pre-dating Newton operates along these lines. But now we have an equation that implies a gravitational force may be at work, which is somehow directly related to the mass of the orbiting body, m , and diminishes with the square of its orbital radius, R .

While this would be an exciting result for a scientist in Newton's day when this issue was a deep mystery and a very hot topic in science, we must keep in mind that this is still an *unsupported hypothesis* in the derivation so far. We went from a fully functional, purely geometric orbit equation to an equation implying that forces and masses are involved in orbits merely by making a few simple assumptions and mathematical manipulations. This hypothetical force is still just as mysterious as it always was in scientific circles, with no scientific explanation for why or how it springs forth from matter and pulls on other objects. However, this equation does give *form* to this proposed force. Instead of being just a vague suspicion, now it has an equation describing it, an identifiable material source (presumably the mass, m , of the orbiting object), and the characteristic that it diminishes in strength with the square of the distance between the object and the orbited body. Whether or not this is based on pure assumption, it is certainly a very compelling result.

To summarize, at this point we have a hybrid equation involving mass and a force, resulting from the assumption that a rock swung forcefully by a string is equivalent to the otherwise purely geometric orbital observations in the sky. This hypothetical gravitational force equation has the form:

$$F = mK/R^2 \quad \text{– Hypothetical Gravitational Force Equation}$$

(shown earlier)

This equation claims there is an attracting force holding objects in orbit, whose strength varies directly with the mass of the orbiting object, diminishes with distance squared, and is also dependent on a mysterious constant, K , that differs from one orbital system to another. But what could this constant refer to?

Since this new, hypothesized gravitational force presumably emanates from the orbiting object, m , it should then also emanate from the object that is being orbited; therefore, we would expect the mass of the *orbited* body to appear in this equation as well. So then, if we assume that the constant, K , is actually the mass of the orbited body, we have a viable explanation. It seems quite reasonable that this

constant that differs between orbital systems may well be the mass of the orbited body, which is also a constant that differs between orbital systems. So then, replacing K by this second mass, m_2 , now gives our hypothetical gravitational force equation the form:

$$F = m_1 m_2 / R^2 \quad \text{– Hypothetical Gravitational Force Equation}$$

with K replaced by m_2

The only remaining step is to make sure the results from this calculation are expressed in the units of force, and are reasonable values. Currently this equation multiplies two masses and divides by a distance squared, giving the units of $[\text{kg}^2/\text{m}^2]$ – that is, kilograms squared per meter squared. These are not the proper units for a force, and the values that result when using reasonable estimates for the mass of the Earth or the Sun as the larger mass, m_2 , are also millions of times too large to be sensible.

This problem is easily solved by multiplying our equation by a value that reduces the results to within a reasonable range and alters the units into those of a force. This simply involves the arbitrary introduction of a *constant of proportionality* that has these qualities. However, if we now assume that our hypothetical gravitational force equation truly describes an actual attracting force in nature, then this arbitrarily invented constant of proportionality would have to be a true *natural constant*. Although all of this is still only assumption, if true, this constant would become what is known as the *gravitational constant*, G , today, giving the final form:

$$F = G(m_1 m_2) / R^2 \quad \text{– Newton's Law of Universal Gravitation}$$

NOTE



This is precisely Newton's *Law of Universal Gravitation* shown earlier and presented in his *Principia*.

As noted above, this final result is precisely the equation for the gravitational force that Newton presented in his *Principia* in 1687. Although this alternate derivation differs somewhat from that officially presented by Newton, it shows that the origin for his gravitational force can be clearly found in the *Geometric Orbit Equation*.

Given this, we can now evaluate where our current belief in this force comes from, and the firmness of the foundation for this belief. We now know, for example, that there was no advanced knowledge or

understanding of a hidden power source or a physical explanation for his proposed force that led Newton to this belief. Instead, it is simply based on the assumption that the scenario of a rock swung by a string is the literal physical equivalent to that of objects in orbit.

Yet, the rock-and-string scenario *does* have an identifiable power source – our muscles, while the gravitational force in orbits does not. Also, the rock-and-string scenario *does* have a physical explanation for the attracting force constraining the rock – the tension in the string, while Newton’s proposed gravitational force has no clear physical explanation. In short, the assumption that these two scenarios are equivalent is based solely on their similarities in *appearance* as systems involving circling objects, rather than on any solid *physical* equivalence.

Further, there are other physical systems that may have even more similarities to orbiting objects than a rock swung by a string; consider a rock swung by a *spring*, for example. One of the problems with the rock-and-string equivalence assumption is that the rock can be swung faster and faster while remaining the same distance away at the end of the string – the tension in the string simply increases. If this were a true physical equivalence to orbits, gravity would increase its attracting force to constrain a faster moving object at the same orbital distance. However, this does not happen, either in theory or in practice. Instead, orbiting objects that are given more forward thrust move further out into space, much the way the rock would if it were swung faster at the end of a stretchable *spring* instead of a rigid string.

So, as long as we’re making arbitrary intuitive guesses at familiar mechanisms that might be a literal *physical* equivalent to orbits, we would have to seriously consider abandoning the rock-and-string idea for that of a rock-and-*spring*. This is not to say that orbits are the physical equivalent of a rock-and-spring either – this model also has its problems, and is just as arbitrarily chosen since we are merely going on superficial similarities in appearance. Still, as an educated guess it is perhaps more functionally similar to orbits than the rock-and-string scenario upon which today’s gravitational theory is built, exposing the weak and arbitrary foundation of Newtonian gravitational theory.

Interestingly, if we used the rock-and-*spring* model, we would end up with an entirely different version of Newton’s *Law of Universal Gravitation* since the centripetal force equation for the rock-and-spring is different than for the rock-and-string. That is, this difference in the centripetal force equation for circling rocks using springs means that when we substitute the velocity from the *Geometric Orbit Equation* into the *Centripetal Force Equation* as we did before, the resulting expression

for the gravitational force must also differ. Yet this resulting spring-based gravitational force equation would still give a value for the gravitational force, just as Newton's current equation does. And although this value is not directly measurable – not even from Newton's current equation – it gives the *appearance* of an actual force in nature; one whose strength we can even *calculate*, using the concrete attributes of mass and distance.

NOTE



Therefore, the familiar form of Newton's *Law of Universal Gravitation* is not a true law of nature, but merely an arbitrary *invention* based on superficial similarities in appearance between orbits and the completely different scenario of a rock and string.

The preceding alternate origin discussion of Newton's gravitational force shows that the introduction of an attracting gravitational force in orbits was *completely arbitrary and unnecessary*, considering the contributions by the already existing body of purely geometric equations, i.e. Kepler's three laws plus the available *Geometric Orbit Equation*.

But this is a fact that could not have been realized without this alternate derivation since *the Geometric Orbit Equation is unknown to science*, at least in the formal manner presented in this discussion. Instead, we have the **Newtonian** *Orbit Equation*, widely taught and used today, and apparently derived solely from Newton's *Law of Universal Gravitation*. And since this *Newtonian* orbit equation is central to our science of astronomy and our space programs, Newton's theory of gravity is considered to be of immense importance as the apparent origin of this equation.

However, it is now possible to show that the **Newtonian** *Orbit Equation* is simply the effectively pre-existing **Geometric** *Orbit Equation* in disguise. To see this, let's take a closer look at the origin of the *Newtonian Orbit Equation* in common use today.

Invention of the Newtonian Orbit Equation

Throughout the following discussion it is important to keep in mind that the progression from the *Geometric Orbit Equation* to Newton's *Law of Universal Gravitation* that was just shown is unknown to science, just as the formal *Geometric Orbit Equation* itself is unknown. Therefore, the following derivation of today's *Newtonian* orbit equation from

Newton's *Law of Universal Gravitation* is currently believed to be the sole origin and form of the orbit equation in our science.

The fully equivalent and actually more proper *Geometric Orbit Equation* is unknown today, as is the flawed foundation of Newton's *Law of Universal Gravitation* itself just discussed. This firmly cements into our minds Newton's belief in an attracting gravitational force in nature, along with its associated "gravitational constant of nature", G . This powerful belief that a thorough physical understanding of gravity had finally arrived halted any further investigation into the physical nature of gravity for centuries, burying the clue that the true physical explanation behind the *actual* proper constant of gravity, K , from the *Geometric Orbit Equation*, still remained unresolved.

This gives the appearance that the existence of today's *Newtonian* orbit equation, as well as its tremendous contributions to astronomy and our space programs, is owed entirely to Newtonian gravitational theory. However, this homage commonly paid to Newtonian theory is quite unfounded, as will be shown next. In fact, not only did Newton neither know nor require the value of his gravitational constant, G , in his own lifetime, but even today's calculation of it is purely an academic exercise. The value of G itself is neither necessary nor directly used in any Earthbound or space-based mission even today – a fact worth special note:

NOTE



The value of Newton's "gravitational constant", G , is purely academic, being unused directly even today.

The standard presentation of the derivation for the *Newtonian Orbit Equation* in use today begins with the assumption that the rock-and-string scenario is equivalent to orbiting bodies in the solar system – a centuries-old assumption that is simply accepted unquestioningly today. Therefore, since Newton's gravitational force and the rock-and-string centripetal force shown earlier are effectively treated as equivalent physical concepts by today's gravitational theory, the derivation of the *Newtonian Orbit Equation* starts by simply equating these two forces:

$$\text{Newton's Eqn} \rightarrow GmM/R^2 = mv^2/R \leftarrow \text{Rock-and-String Eqn}$$

Here, the two masses, m_1 and m_2 , in Newton's equation are named m and M to signify the smaller mass, m , of the orbiting object and the typically much larger mass, M , of the orbited body. The above equality

immediately simplifies to the familiar form of the *Newtonian Orbit Equation* that exists in our science today, and was mentioned earlier:

$$v^2R = GM \quad - \textit{Newtonian Orbit Equation}$$

Note that although this *appears* to be a completely new and important equation derived from Newton's law of gravity, in actuality it is merely a reversal of the steps performed earlier in the derivation of Newton's *Law of Universal Gravitation* from the original *Geometric Orbit Equation*. That is, where we started with the *Geometric Orbit Equation* and arrived at Newton's *Law of Universal Gravitation* by making the (flawed) rock-and-string assumption, we now have simply used this same flawed assumption to work backwards from Newton's law to the original *Geometric Orbit Equation* again. The *Newtonian Orbit Equation* above looks a bit different from the *Geometric Orbit Equation*, but as we'll soon see, this is only a cosmetic difference in appearance.

This fact is not recognized today since Newton's derivation for his *Law of Universal Gravitation* does not show its origin in the *Geometric Orbit Equation*. Therefore, it *appears* as if the orbit equation we use today is a completely new result made possible only by "solid Newtonian gravitational theory." The mere reversal from Newton's gravitational force equation to a disguised version of the proper *Geometric Orbit Equation* is unknown, lending unwarranted credibility not only to Newton's gravitational theory, but to the assumed equivalence of the rock-and-string analogy as well as the very existence of Newton's attracting force in nature.

A review of the earlier derivation for Newton's gravitational force equation shows that the constant, K , was essentially arbitrarily replaced with the two multiplied constants, GM . Recall that this occurred after assuming K must refer to the mass of the orbited body, M , then realizing that the "natural constant," G , had to be introduced to alter the size and units of the final result. But this switch from K to GM earlier was merely based on an arbitrary and unsupported assumption; as such, it is not only valid but also more correct to return to the original constant, K . Therefore, if we simply continue with the step-reversals that were started above and that led from Newton's gravitational force equation to the *Newtonian Orbit Equation*:

$$v^2R = GM \quad - \textit{Newtonian Orbit Equation}$$

the next step in the reversal is to replace GM with K , giving the original *Geometric Orbit Equation*:

$$v^2R = K \quad - \textit{Geometric Orbit Equation}$$

This means the *Newtonian Orbit Equation* used today, based on the Newtonian theory of gravity, provides exactly the same function as the *Geometric Orbit Equation*, which is readily extracted directly from patterns in astronomical observations without appealing to a gravitational force at all. *Indeed, they are the same equation.* In fact, this explains why the *geometric* orbit equation is unknown today – we already believe we have the proper *gravitational* version, including its reference to mass, M , and the “gravitational constant of nature,” G . Given this, there is no need to even take notice of the obvious, simple, and entirely equivalent geometric form that essentially pre-dates our familiar Newtonian orbit equation today.

Yet, it is this very fact – that a simple and *fully functional* geometric form effectively pre-existed – which is of such great significance, especially since we also widely use Kepler’s three laws in our science and space programs, which also have nothing to do with a gravitational force. Since we can now see that there is no *definitive* physical explanation underlying the Newtonian orbit equation, we are essentially using the purely empirical *geometric* orbit equation when applying Newton’s equation, whether we are aware of it or not.

And so, all of astronomy as well as our space programs operate on a still-unexplained physical phenomenon, with equations that are actually based *solely on geometry* – and *not on Newton’s gravitational force at all*. The apparently insignificant fact that a simple *geometric* orbit equation can be easily identified that parallels our gravitational version is actually not so insignificant at all, but of *great significance indeed*.

NOTE



Though not recognized today, Newton’s gravitational force is actually an unproven, completely superfluous, redundant abstraction, both in theory and in practice.

Despite the previous analysis, the above statement may seem a bit premature since the *Newtonian* orbit equation does involve the *mass* of the orbited body, M , while the *geometric* orbit equation has only an arbitrary constant, K . It might seem that, if nothing else, Newton’s gravitational theory shows that this constant actually refers to the mass of the orbited body, which could prove to be a very useful realization. In fact, one very important result from today’s *Newtonian Orbit Equation* is that it apparently allows us to remotely calculate the mass of distant bodies, such as the planets in our solar system. That is, if we know the speed, v , with which an object is orbiting and the radius of

its orbit, R , we can use the *Newtonian Orbit Equation* to calculate the mass, M , of the larger body it is orbiting. This would tell us the mass of a distant planet simply by observing the motion of its moons, for example, which is precisely how we have arrived at the values we believe to be the masses of the planets today.

In contrast, if we used the *Geometric Orbit Equation*, knowing the speed and orbital radius of orbiting objects would only allow us to calculate the constant, K , for that orbital system rather than the mass of the body they are orbiting. Knowing the value of this constant for a particular orbital system is still very useful for calculating the speed or orbital radius of other orbiting objects in that system, but it would not tell us the mass of the orbited body.

Therefore, it would appear that had we never known of Newton's gravitational theory we would not have been able to determine the masses of our moons, planets, and Sun. And so, it might *appear* that Newton's gravitational theory somehow provides a deeper physical meaning and insight into nature. However, the following discussion shows that this is not the case at all, and that it is merely an illusion that Newton's gravitational theory provides any additional insight or utility beyond what was already possible prior to its introduction.

ERROR

Newtonian Theory Does Not Give Mass-at-a-Distance

Newton's theory of a gravitational force, emanating from planets and across space, calculates a planet's mass remotely since it claims the planet's mass is directly related to the strength of this force. In particular, referring to the *Newtonian Orbit Equation*, $v^2R = GM$, it would *appear* that we only need to note the velocity and orbital radius of an object in order to determine the mass of the body it is orbiting. However, the following discussion shows that it is only an illusion that mass can be determined remotely in this manner.

WATCH FOR...

- Both orbit equations express the same relationship between the speed and the orbital distance of an orbiting object, whether we use the geometric or Newtonian version.
- Today's accepted masses of moons and planets are merely educated guesses based on an unsupported assumption built into Newtonian theory, and are not the verified physical masses we believe them to be.

- The above assumption is that orbits are directly related to mass, which is neither proven nor entirely correct as it turns out, giving rather arbitrary solar, lunar and planetary masses.
- We are still able to use these arbitrary mass values in calculations of orbital velocity and distance since these mass values are typically not used alone, but as part of the expression \mathbf{GM} , which is equivalent to simply using the original constant, \mathbf{K} , in the original *Geometric Orbit Equation*.

We first begin by noting that whether we use the geometric or the Newtonian form of the orbit equation, the function of the orbit equation is to describe the relationship between the velocity and the orbital radius of an orbiting object. This role is equally fulfilled by *either* orbit equation since the *Newtonian* “gravitational” version is merely the original *geometric* equation with an arbitrary cosmetic change in the appearance of its constant, \mathbf{K} . We can arbitrarily change the *symbol*, \mathbf{K} , used in the *geometric* orbit equation to anything we wish, such as the two combined symbols, \mathbf{GM} , in the Newtonian version, but this is ultimately a purely cosmetic alteration that leaves the *form* and *function* of the original equation unchanged. It still provides the same relationship between velocity and orbital radius as always, either way.

However, since the value of \mathbf{K} is easily determined by remote observation of orbiting objects, changing \mathbf{K} to \mathbf{GM} allows us to calculate \mathbf{M} (since \mathbf{G} is a known constant value in science), creating the *appearance* that we can remotely determine the mass of the orbited body. The *possibility* that \mathbf{K} may actually be a direct reference to the mass of the orbited body is an intriguing *conjecture* of Newtonian theory, but one that is both scientifically unproven and also *irrelevant to our orbital calculations*.

This is an important point to note, since today we are under the illusion that we use the masses of moons and planets in the orbital calculations of our space missions. In actuality, we typically do not use these supposed masses alone, but as part of the expression \mathbf{GM} . And as we now know, this expression is nothing other than the original constant, \mathbf{K} , in the original *Geometric Orbit Equation*. The exercise of remotely calculating \mathbf{K} , redefining it as \mathbf{GM} , solving for \mathbf{M} , then later using \mathbf{M} in the expression \mathbf{GM} is merely a winding path of logic disguising the fact that we are still simply using the original empirical constant, \mathbf{K} . The implied existence of a “gravitational force” in this circular Newtonian logic, as well as the supposed remotely-determined mass, are only conjectures at best – and at worst, *pure fictions*.

It is a powerful illusion that our current Newtonian orbit equation, $v^2\mathbf{R} = \mathbf{GM}$, is the true original orbit equation, and that it contains an actual physical mass. This illusion arises because its purely geometric origins are well hidden under a compelling gravitational overlay. All of the previous discussions comparing Newtonian theory with the original *Geometric Orbit Equation* are impossible today, since this equation is not formally known in our science; its existence and significance have been buried for centuries beneath our unwavering and largely unquestioned Newtonian beliefs.

We simply accept the mass of the Sun listed in our textbooks, overlooking the fact that it was arrived at by plugging the known velocities and orbital radii of the planets into our current *Newtonian* orbit equation, which actually calculates \mathbf{K} but disguises it as \mathbf{GM} . We unknowingly accept that this hidden redefinition from \mathbf{K} to \mathbf{GM} is correct, arbitrarily turning a *purely geometric* constant calculated from *purely geometric* observations of our planets, into the solid mass of the Sun. Without benefit of the analysis given in the previous discussions, we could not even know that we are making such an unsupported and arbitrary assumption. We *believe* in Newtonian gravity ... we *believe* today's orbit equation is solely a product of Newtonian theory ... we *believe* the mass in today's orbit equation describes a real mass ... and we are fundamentally unable to contemplate the geometric origins of it all since they are firmly buried beneath these beliefs and illusions.

But then, it is natural to wonder if there remains any significance to the values listed as masses in our textbooks. Even though we may have arrived at these values by making the unsupported assumption that \mathbf{K} is actually \mathbf{GM} , it still seems reasonable that \mathbf{K} must correspond to *some* material aspect of the orbited body. And further, the value of \mathbf{K} does vary between different orbital systems in a manner that seems to reasonably reflect the expected mass differences between the central orbited bodies in these separate orbital systems. So, what are we to make of this situation?

This issue of mass will be more fully understood once the new principle in nature is introduced in the next chapter; however, for now it can be said that today's mass values represent *approximate* masses – essentially reasonable educated guesses. This is because the observed gravitational *effect* that we call orbits (which does not involve a confirmed gravitational *force* unless proven scientifically viable) does indeed turn out to be related to the mass of the orbited body – though not as *directly* as assumed today.

Therefore, our assumption that it is valid to arbitrarily replace the empirical constant, K , with the mass-based expression, GM , turns out to be somewhat justified but inaccurate. That is, despite the fact that Newton's model of a gravitational force emanating from matter cannot describe the true physical reality – for all the reasons mentioned so far – it still is undeniable that our massive planets and Sun *somehow* cause our observations of falling objects and orbiting bodies. So then, since we know that one of the main defining qualities of our Sun and planets is their mass, it would be expected that mass would be involved in our observations of the solar system. And as we will see in the next chapter, mass *is* involved, but only *indirectly*.

As an example of how mass might be *indirectly* involved in observations, just for illustration purposes let's consider a hypothetical scenario where all bodies in the solar system have an attracting magnetic field, and we also have not discovered magnetism yet. In this case, we might tend to think the mass of an object somehow *directly* causes the attraction we observe in orbits, which would mean an object with double the observed attraction must have double the mass.

However, unknown to us, the doubled attraction would actually be due to double the *magnetic field*, which may or may not correspond to double the mass. If, for example, two objects with the same mass but different material composition have different magnetic field strengths then this direct relationship would not hold. An observation of double the orbital attraction may be caused by a planet with only 30% more mass (though of a different material), yet our assumption of a direct relationship between orbital observations and mass would cause us to incorrectly list that planet as having *double* the mass.

This is similar to today's belief that mass is directly related to orbital observations. This direct mass relationship supposedly occurs via Newton's "gravitational force" – a force that has never actually been felt, measured or detected remotely, but whose strength is said to directly mirror any changes in mass. So, if our Newtonian calculations tell us that an orbital observation corresponds to double the gravitational pull, we note the orbited body to have double the mass.

However, the new principle in the next chapter shows that orbits are not caused by a "gravitational force," and that, although the actual cause *is* related to mass, the relationship is not strictly a direct one-to-one correspondence. It shows that while it is reasonable to assume a larger planet with a greater gravitational influence on orbiting objects would have a correspondingly greater mass, this assumption cannot be verified with certainty from a distance; the planet's material composi-

tion would need to be physically analyzed to know for sure. This is analogous to the hypothetical magnetic field example above, where a stronger influence on orbits (a greater magnetic field in this case) would seem to imply a correspondingly greater planetary mass, but could also be due to a different magnetic material composition, somewhat independent of mass.

Another example of this point is demonstrated by a different type of assumption and calculation sometimes used to determine the mass of a body like our Sun. The assumption is that our planet is being forcefully swung in a circle by a pull from the Sun, and so the effective outward flinging force from our perspective – often called “centrifugal force” – must equal the gravitational pull from the Sun in order to maintain a balanced orbit. Following this assumption, it is straightforward to calculate what the effective centrifugal force must be, and thus what the mass of the Sun must be to create an equivalent gravitational force at this distance, based on Newton’s gravitational force equation.

Here again though, the resulting “solar mass” is actually the product of a string of unproven assumptions. It is an assumption that the Earth is forcefully swung about in this fashion, that a resulting centrifugal force exists and that a counteracting pulling force somehow emanates from the Sun. Finally, it is also an assumption that this presumed pulling force is properly captured in Newton’s proposed equation. It is even arguably more accurate to say that these are not only *unproven* assumptions, but *verifiably false* assumptions. That is, not only have the discussions so far cast serious doubt on Newton’s gravitational force and equation, but also, such a combination of inward pull toward the Sun and outward fling effect away would certainly cause a stretching tidal bulge along a line between the Earth and Sun. Yet as the Earth rotates daily through this line no such tidal bulge follows the Sun as it passes overhead.

For all these reasons it was stated earlier that today’s accepted masses of the Sun, planets and moons of our solar system are only educated guesses – not true mass measurements. Some values may be close, while others may be far off the mark. This has not been a problem for most orbital calculations since, as mentioned, we typically use these mass values in the expression GM , which simply returns us to the empirical constant K in the original *Geometric Orbit Equation*, and makes the actual individual mass value irrelevant. However, it is important to understand this mass issue for other reasons. For example, planetary geologists cannot gather a proper understanding of planetary formation, composition, and geology if the assumed mass is

far from the actual mass of the planet. Also, theoretical fusion reaction calculations for our Sun include mass in their calculations, and it may well be crucial to have the correct mass value for our Sun in order to properly understand the physics of fusion itself.

ERROR
Newtonian Gravity Illusion in *Satellite Orbit Equation*

Although it is extremely important to be aware of the arbitrary invention of Newton's gravitational force and theory detailed in the above discussions, this can also be demonstrated more succinctly in the following example. It presents another orbit equation frequently used for satellites, but unlike the proper *Geometric Orbit Equation* and its cosmetically altered form as the *Newtonian Orbit Equation*, this equation arises from a flawed model of satellites forcefully swung outward on a string to cancel the downward pull of their weight.

The main feature that sets this "*satellite orbit equation*" apart from the other two orbit equations is that its final form *appears* to contain Newton's actual gravitational force, \mathbf{g} , varying inversely with distance-squared, as Newton claimed. However, the analysis in this example will show that this is actually an *illusion* created by erroneously starting with the rock-and-string abstraction for the orbiting satellite – a common error discussed earlier. Additionally, even the seemingly obvious fact that falling or orbiting objects experience a downward-pulling weight is a common but unproven assumption; the force of an object's weight is actually *only* experienced while in contact with the ground – and for very good reason, as will be seen in the next chapter.

The resulting satellite orbit equation still produces the correct satellite calculations since circling objects can often still be accurately *modeled* by a rock-and-string abstraction regardless of the actual underlying physics. The additional unproven abstraction of a counteracting weight forcefully pulling down on the orbiting satellite from a distance then completes this engineered *model* of circling satellites, giving the correct orbit *calculations*, as designed into the model, despite the flawed rock-and-string physics. These are the main points to watch for as the example proceeds.

It is also important to note that since the satellite orbit equation derivation below is based entirely on misguided abstractions, the resulting equation likewise contains superfluous and misleading abstractions – most notably Newton's gravitational force term, \mathbf{g} , which is tellingly *absent* from the two other functionally identical orbit

equations. The precise nature and implications of the misleading hidden abstractions within the satellite orbit equation are difficult to see without the following analysis, which achieves this by later deriving the equation from a very different and revealing angle:

Two Routes to Inventing the Satellite-Equation Illusion

A commonly used equation for calculating satellite orbital velocities can be arrived at by equating the assumed downward force of the satellite's weight in free space (mg) with the presumed upward "centrifugal force" as if it were swung on a string, as discussed earlier:

$$mg = mv^2/R \quad \text{where } m \text{ is the mass of the satellite}$$

g is the force of gravity
 v is the velocity of the satellite
 R is the radius of orbit

This equality of abstractions simplifies to the satellite orbit equation:

$$v^2 = Rg \quad - \text{satellite orbit equation}$$

As a starting example, consider a theoretical orbit at ground level. In this case R would be one Earth radius and g would be the known force of gravity at ground level of 9.8 m/s². It is important to stress that this gravitational force value has only ever been felt, measured and verified to exist for objects in contact with the ground (weight); it is pure assumption that a satellite in weightless orbit above the ground would experience any such pulling force at a distance. Nevertheless, using these values in the above satellite orbit equation accurately calculates the velocity of such an orbit.

At a more practical height above obstacles and atmosphere, choosing two Earth radii for R would put the satellite at twice the distance from the Earth's center (one Earth radius above the ground). According to Newton's *Inverse-Square Law* of gravity, the gravitational pull on the satellite at twice the distance is one-quarter as strong, giving a theoretical value for g of 2.45 m/s². A correct orbital velocity calculation using these values would certainly *seem* to confirm both the existence of Newton's force at a distance and his claim that its strength weakens with distance-squared. And, once again, the correct velocity of a satellite at this height is indeed accurately calculated with these values in the satellite orbit equation. Further, as we might expect, all velocities calculated by this equation are identical to those calculated using the official *Newtonian Orbit Equation* already discussed:

$$v^2R = GM \quad - \text{Newtonian Orbit Equation}$$

The calculations from both equations would, of course, have to be identical since they both calculate the velocity of the same satellite. But a closer look shows something rather odd. Unlike the satellite orbit equation, the *Newtonian Orbit Equation* has no term that weakens with distance-squared, nor even any mention of Newton's gravitational force at all. In fact, the only variable in its velocity calculation is the altitude of the satellite, R ; the other parameters are merely fixed *constants* – the gravitational constant, G , and the mass of the Earth, M . How is it possible that one equation has a gravitational force term, g , that must be recalculated at every new altitude in accord with Newton's *Inverse-Square Law*, while the other equation has no such force or height-dependent inverse-square term at all, yet gives the *exact same results*?

The answer is that these two equations are actually the *very same equation*, and that the inverse-square gravitational force term, g , is a completely superfluous *illusion*. The earlier initial abstract step above of equating weight (mg) with centrifugal force created an *apparently* new satellite orbit equation, which is really just the *Newtonian Orbit Equation* encumbered with unnecessary and misleading cosmetic creations. It is difficult to see past these superfluous creations since the usual abstract derivation and resulting final form of the satellite orbit equation create a very compelling, self-contained and self-consistent *illusion* of an inverse-square gravitational force. But this illusion can be broken by looking at the situation from another angle:

We start by re-deriving the satellite orbit equation – this time beginning with the *Newtonian Orbit Equation*, and slightly rearranging it to give:

$$v^2 = GM/R$$

If we then arbitrarily multiply both the numerator and the denominator on the right-hand side by R , this gives:

$$v^2 = R (GM/R^2)$$

This already nearly completes the transformation of the *Newtonian Orbit Equation* into the satellite orbit equation. This multiplication does not technically change the equation since multiplying by anything both top and bottom is merely a multiplication by 1, but if we examine the grouped terms in brackets above there now appears to be an inverse variation with distance-squared. These bracketed terms also evaluate to the known surface gravity of 9.8 m/s^2 when we substitute the value of Earth's radius in for R (a historical consequence of the values

specifically chosen for the fixed constants \mathbf{G} and \mathbf{M}). A group of terms that evaluates to the known surface gravity of Earth and varies inversely with distance-squared seems to fit the bill for Newton's gravitational force, \mathbf{g} . So, replacing the bracketed terms with the variable \mathbf{g} then gives:

$$v^2 = \mathbf{R} \mathbf{g}$$

This, of course, is *precisely* the satellite orbit equation created by equating weight with centrifugal force in the usual derivation shown at the start of this section. We can now see why this equation gives the same result as the *Newtonian Orbit Equation*, since it *is* actually the *Newtonian Orbit Equation* merely rearranged and multiplied by 1 (in the form of \mathbf{R}/\mathbf{R}). But how did these completely superficial additional operations manage to transform the simplified *Newtonian Orbit Equation*, which tellingly has no gravitational force and no distance-squared variation, into an apparently new equation that now has *both*? This was actually achieved by some mathematical sleight of hand in the above re-derivation to clearly demonstrate the creation of this illusion – the very *same* illusion that was created behind the scenes by the abstract equality used in the original satellite-equation derivation at the start of this section. The only difference is that arriving at the satellite orbit equation via the above exposed sleight-of-hand method allows the illusion to be broken and its precise nature revealed, as we will now see.

There was actually no particular need to multiply the simplified *Newtonian Orbit Equation* by 1 in the first place, and more to the point, certainly no reason why this had to be done in the form of \mathbf{R}/\mathbf{R} . In fact, since there is already a legitimate \mathbf{R} -term in the equation, representing distance, care should be taken *not* to select \mathbf{R} for the arbitrary undefined symbol used in this multiplication so it is not confused with the legitimate distance parameter, \mathbf{R} . And, of course, this confusion is precisely what *did* occur above.

Now, instead, to accentuate that we are arbitrarily multiplying by 1, and are further arbitrarily choosing an undefined symbol divided by itself to do so, let's use a properly identified generic unknown, \mathbf{X} , instead of \mathbf{R} . So, redoing the multiplication with \mathbf{X}/\mathbf{X} this time gives:

$$v^2 = \mathbf{X} (\mathbf{GM}/\mathbf{XR})$$

Now it is clearer that we have introduced an undefined parameter that does not (and should not) merge seamlessly into the equation. Yet the earlier choice of \mathbf{R} for this symbol was actually just as arbitrary and

undefined, becoming cosmetically confused with the *actual* distance parameter, R , and inappropriately merging into the equation. This created the *illusion* of an equation having a distance-squared term (R^2), yet without changing the resulting calculation from the simpler *Newtonian Orbit Equation* we started with because the new R -terms, top and bottom, ultimately cancel out in the calculation process.

This is similar to the fact that the straight-line equation, $y = x$, is actually the same as the “curve,” $y = x^2/x$, which is, of course, not actually a curve in x^2 , but the same straight line involving only x when properly simplified. Although it is still easy to see that the extraneous x in both numerator and denominator cancel out, this is not as clear if we define $1/x$ as z , turning $y = x^2/x$ into $y = x^2z$, hiding the x denominator so it does not as clearly cancel the x^2 term.

The important point here is that if we are using an *unsimplified* equation it is possible to create all sorts of illusions, such as an apparent curve from a straight line – or an *inverse-square force where there actually is none at all*. As demonstrated above, just such an illusion was invented by deliberately creating and manipulating an unsimplified form of the *Newtonian Orbit Equation* to give precisely today’s satellite orbit equation, in the process exposing the hidden fact that this is the true nature of this satellite equation in today’s science. The typical (invalid) abstract equality shown in its initial derivation at the start of this section actually creates this illusory unsimplified equation behind the scenes, making it extremely difficult to realize this without the above analysis. This type of mathematical sleight of hand is not uncommon in our science, appearing again in a discussion of Einstein’s *Special Relativity* derivation in Chapter 5.

This discussion demonstrates once again that all of today’s gravitational equations suffer from the same problem – needlessly complex and misleading abstractions that create a compelling Newtonian gravity illusion while hiding the true underlying non-Newtonian physics. Also importantly, these same core illusory features of Newtonian gravitational theory were retained and incorporated into Einstein’s *General Relativity Theory* as well, continuing and compounding the erroneous assumptions, illusions and abstractions.

The above analysis exposes the superfluous abstractions that are effectively added to the *Newtonian Orbit Equation*, creating a functional but misleading “gravitational force” based satellite orbit equation. But, because this originally occurred via the abstract route of equating the satellite’s assumed weight in free space with a presumed effective centrifugal force, it was not possible to identify the resulting mislead-

ing abstractions and illusions without the above analysis. And, of course, even the simplified *Newtonian Orbit Equation* itself was earlier shown to be a misleading and superfluous cosmetic alteration of the singularly correct, purely empirical *Geometric Orbit Equation*.

Despite all of the preceding discussions demonstrating that orbits are not ruled by Newton's mass-based gravitational force, there can still be some compelling illusions that appear to support Newton's theory. One such example from our space programs is the need to include the mass of our spacecraft in all trajectory calculations – even down to the diminishing weight of the fuel as it is expended or the additional weight of rock samples carried back from a distant moon or planet. If the mass of our spacecraft is an important consideration in the accuracy of our current trajectory calculations, doesn't the success of most missions validate our Newtonian calculations and beliefs?

The answer is that the mass of the spacecraft is only important to the *inertial* calculations of the mission – not the *orbital* calculations. Inertial calculations involve efforts to forcefully alter the trajectory of the spacecraft using a fuel burn. Just as the mass of a football player is of crucial importance to any player attempting a tackle, the mass of the spacecraft is of crucial importance to know how much fuel to burn to push it into a given maneuver. A more massive spacecraft requires a longer or more powerful fuel burn, just as a heavier football player is harder to tackle. This is merely a classical Newtonian *inertial* calculation (not a *gravitational* one), given by Newton's equation, $F = ma$ (*force equals mass times acceleration*).

The fact that such mass-based *inertial* calculations are crucial to any space mission lends unwarranted credibility to the illusion that mass is further useful and necessary in our orbit calculations. Orbits (which form the basis of all spacecraft trajectories) are still completely described by the *purely geometric* equations of Kepler and the *Geometric Orbit Equation*, which do not involve mass or force. Just as all objects fall at the same rate regardless of mass, they also follow orbital trajectories completely independent of mass, as orbits are considered just another form of continual circling free-fall in today's science.

Does the Evidence Support a Gravitational Force?

Despite the fact that Newton's concept of a gravitational force violates our laws of physics and is unnecessary to describe orbits and spacecraft trajectories, it is still credited with explaining many other facets of life on Earth. For example, the reason objects have weight here on Earth is supposedly because a gravitational force emanates

from our planet and pulls them down, forcefully and continually holding them in place in proportion to their mass and giving them their mass-dependent weight. Even though we have no scientifically viable explanation for this constant pulling force, it would certainly *appear* as if such a force existed, nonetheless.

Yet, we have always known that *something* creates this effect, even before Newton arrived on the scene, but it wasn't necessarily considered to be an attracting gravitational force from within the planet. It could have been due to the Earth's magnetic field, or some type of downward force from above, or any manner of other ideas. Einstein even pointed out that the effect of gravity on Earth is completely indistinguishable from being continually accelerated upward on a platform in space.

So, the weight of objects was simply an experience that was undeniable and commonsense – no one expected objects to fall *up* when they were dropped – but the underlying cause could have been almost anything. We design spring-loaded measuring scales that we deliberately calibrate to properly weigh objects, but this is merely a device that takes advantage of this obvious *weight effect* all around us. Our mechanical scales are not actually based on a firm understanding of the physical cause of gravity, but rather, on a *spring* principle that takes advantage of whatever is causing the *weight effect* around us.

Even the science of calculating how a projectile, such as a cannonball, flies through the air is not actually based on Newton's mass-dependent gravitational force, though it is often represented so today. As mentioned earlier, Galileo provided a very useful constant-acceleration equation for falling bodies or flying cannonballs, but a quick look at this equation shows no particular reference either to mass or to a gravitational force:

$$\mathbf{d} = \frac{1}{2}at^2 \quad - \text{Constant-Acceleration Equation}$$

This equation essentially states that the vertical distance, \mathbf{d} , that an object falls as it is either dropped or shot through the air is determined by a constant downward acceleration upon it, \mathbf{a} , multiplied by the square of the time, \mathbf{t} , that it takes to hit the ground. It is worth noting that this equation is a *purely geometric equation* involving *no physical masses or forces*, merely embodying the obvious fact that objects in free-fall experience a constant downward *acceleration effect*. It does not state the *cause* of this effect any more than the cause for the weight of objects was universally settled upon prior to Newton. This observable and measurable downward *acceleration effect* on Earth is the same for all

objects *no matter how massive they are*, and can easily be measured to be 9.8 m/s^2 and substituted directly into the above equation to give:

$$d = \frac{1}{2}(9.8)t^2$$

We typically use the symbol, g , for this measured *constant-acceleration effect* upon earthbound objects, giving us:

$$d = \frac{1}{2}gt^2$$

The symbol, g , is widely taken to mean the acceleration due to gravity (9.8 m/s^2), in reference to Newton's proposed gravitational force; but that interpretation, of course, is only an assumption.



Equal Acceleration Regardless of Mass

As mentioned above, whatever the cause may be for the *acceleration effect* of falling objects, it manages to accelerate all objects with equal ease at the same rate and with no noticeable stresses upon them. This is true whether they are as light as a golf ball or as massive as an ocean-liner. If a force were at work here, it would have to be quite a *mysterious and unprecedented force indeed* to achieve such a feat.



The "Gravity Shield" Mystery

Another ongoing mystery surrounding gravity is the idea of a "gravity shield." After all, by using various materials we are able to insulate against electricity, electric fields, magnetic fields, light, radio waves, and radioactivity, so why not the gravitational field as well? Since science has never had a clear understanding of gravity, it has been impossible to either conceive of or rule out the possibility of developing some material or device to shield us from gravity.

Such an invention would allow an object to levitate in mid-air simply by inserting this gravity shield between the object and the ground. If the attracting force of gravity cannot reach up past the gravity shield, then any objects above the shield should float and not be pulled downward. Such ideas have surfaced repeatedly over the years (and continue still), being shrouded in secrecy and mystery, and drawing short-lived interest and funding, until ultimately fizzling out.

In Summary

The preceding discussions have shown that while Newton's proposed gravitational force is a very compelling and intuitive idea, it is *rife* with problems. As a *model* of the true, and as-yet-unknown, underlying cause for many observations it has proven very useful – which is the purpose of any model or equation – but things become very problematic and mysterious when the model is taken as the literal reality. And, as was also shown, Newton's model is not even strictly necessary, as everything from falling apples to orbiting moons can be dealt with equally well with purely geometric equations. This model is part of our scientific legacy from centuries past, and as such, it sits largely unquestioned in our science today despite the fact that it clearly is not a scientifically viable theory.

We have tried applying logical patches, such as the misapplied *Work Equation* or the abstract invention of “gravitational potential energy,” and have even invented entirely new theories, such as *General Relativity Theory* – but to no avail. We have been unable to find true scientific justification for Newton's gravitational force, yet have also been unable to develop a truly viable theory to completely replace it. As a result, Newtonian gravitational theory remains our main, most compelling, and most widely taught explanation for falling objects and orbiting bodies, despite being a fatally flawed theory in our science.

The reason Newton's gravitational explanation was so revolutionary when it was proposed is that it was thought to have finally provided a *physical* understanding of the underlying cause for these observations – something mankind had wondered about through the ages. However, if an attracting gravitational force is *not* a viable scientific explanation for the underlying cause, then what is? An answer to this question that provides a clear physical explanation for gravity and resolves all of the mysteries and violations mentioned so far is provided in the following chapter, where a new principle in nature is presented – *one that has been overlooked so far in our science.*

