Axioms is a work that explores the true nature of human knowledge, in particular the fundamental nature of deductive and inductive reasoning. It begins by embracing Hume's Skepticism and Descartes' one "certain" thing, and then looking for a way out of the solipsistic hell this leaves one in in terms of "certain" knowledge. Indeed, to the extent that philosophy in the past has sought to provide *certain answers* to virtually any question at all, philosophy itself proves to be *bullshit* – all philosophical arguments ultimately come back to at least one unprovable premise, usually unstated, and can be refuted by simply asserting "I don't agree with your premises."

The way out is to *give up* the idea of certain knowledge. All non-immediate knowledge of the world is based on these premises, which are *unprovable assumptions*, or *axioms*. To understand the world around us, we have to begin by making all sorts of assumptions – such as the assumption that there is a real world out there to be understood in the first place, and that the rules that govern it are structured and understandable. The rules of thought, logic, and mathematics that we use to structure this understanding are themselves only methodologies for deriving contingent truth based on unprovable axioms, and changing the axioms underlying any mathematical or logical argument often changes the *equally valid* conclusions.

Axioms

by

Robert G. Brown

Dedication

This book is dedicated to the giants of mathematical and scientific philosophy upon whose backs it stands: Plato, Hume, Descartes, Gödel, Bayes, Shannon, Cantor, Cox, Jaynes, and many more, too many to count, actually. I do wish to explicitly acknowledge Cox's *The Algebra of Inference*, Jaynes' *Probability Theory: The Logic of Science*, and MacKay's *Information Theory, Inference, and Learning Algorithms*, which collectively establish what is very likely "the" rigorous basis for knowledge expressed as a contingent degree of belief and many of its connections to worlds both concrete and abstract.

It is also dedicated to my philosophy professor and guru at Duke, George Roberts, who had an enormous impact on me as I pursued an "invisible" philosophy major at Duke to accompany my physics major (invisible because at the time Duke had no way of acknowledging the completion of a Bachelor of Science in one discipline and a Bachelor of Arts in another).

Finally, it is dedicated to my good friends and colleagues in the Duke Physics Department, especially Richard Palmer (for teaching me about Jaynes, Bayes, maximum entropy, and complex systems in general way back in Statistical Mechanics in grad school) and Mikael Ciftan, who has been as a second father to me for nearly thirty years now.

No book is written in a vacuum. I have been extraordinarily fortunate to have had the support and encouragement and love of many, many people over a lifetime. My family, my friends, my colleagues (who are also my friends) on the beowulf list, and my many, many students: This book is for you all.

Notice

Although this book inevitably contains a certain amount of mathematics and science (often expressed as "natural philosophy" or "mathematical philosophy", it is *not* intended to be a mathematical or scientific treatise. Indeed, its basic subject is not physics but metaphysics, our basis for knowledge itself rather than any particular thing that we "know" (or rather *think* that we know) about the world. It is written to be as accessible as possible to as general an audience as possible. So don't be intimidated – you can read this, and understand it, even if you aren't terribly good at "math".

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Preface

The work in your hands is, I would like to emphasize, *not* a scholarly work. I'm sloppy about references, for example – sometimes they are there, sometimes they aren't. Often they will be in the form of a "wikinote" like this one[1] . For example, when I misquote (say) *The Hitchhiker's Guide to the Galaxy*, I assume that we share some cultural context there and that you'll recognize that "42"[2] is the answer to it all, the reason for Existence itself (and know where it comes from). And hopefully laugh. Putting a wikinote on things like this is a form of hedging my bets, so to speak.

It *is* intended to be:

- Fun to read. Maybe even funny in parts (unusual for philosophical works unless they are written by Terry Pratchett[3]).

- Educational. Not quite textbook quality educational, maybe, but there's a lot of historical stuff and many True Facts inside. Some of which might even be true (but don't count on it).

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[1]Wikipedia: http://www.wikipedia.org/wiki/Wikipedia. This is a *Wikipedia* reference. In an online or active version of this book, this footnote becomes a working "hot link" to a useful Wikipedia article. For people reading a paper copy, I can only hope that either you are already amazingly literate, well read, and know offhand all about that of which I speak, or that you read this book somewhere near a web browser.

By the way, it should become clear from my frequent use of this as a Universal Resource that in my opinion Wikipedia is well on its way toward becoming the crowning achievement of human civilization – literally an online, free repository for all non-encumbered human knowledge, such as it is.

[2]Wikipedia: http://www.wikipedia.org/wiki/42. See? All human knowledge. Try looking up "42" on Encyclopedia Brittanica and it will laugh at you and return all sorts of irrelevant facts from World War II.

[3]Wikipedia: http://www.wikipedia.org/wiki/Discworld. Author of the *Discworld* novels and a perfect master of all that is in this work and then some. In fact, Terry Pratchett could be the world's greatest living philosopher. Scary, that.

- Shocking and Scandalous. Well, not really. I hardly ever refer to sex outside of memetic intercourse and occasional references to Frodo Baggins' sexual history (or lack thereof). Nevertheless, if you are a True Believer in almost *anything* you'll probably be both shocked and scandalized when I argue, hopefully persuasively, that True Belief (as opposed to contingent belief) is in fact rather silly.

Mind you, there are occasional pockets of math and logic to wade through in the text below, and it *is* more than a bit hard on proselytic religions of the highly organized and militant sort that seem to be a source of violent misery in much of the world today. In case you have any personal doubts about whether or not you can manage the math, let me summarize the entire book right here, right now. If you can understand the following, you can cope with the set theory and probability theory or even skip it and it won't matter. If you *agree* with the following, you can probably even skip buying the book!

But please don't! If you do, I don't make any money, and *my* goal in writing it is to *save the world* and bring about an age of world peace and understanding, and incidental to this, to make money.

Anyway, here it is, the fundamental truth about what any conscious mind knows of the Universe and everything in it:

- Everything that we "know" of the world in which we live outside of our immediate, real-time experience of our own sensory inputs is known by *inference*. Inference is basically seeing "something" happen in a certain pattern or association and thereby arriving at a strong belief that it will happen again in that pattern or association. Inference requires some sort of memory, or at least a list (set) of "things" to be organized by means of inference.

- Inference is not a logically sound basis for absolute knowledge. In order to arrive at any conclusion on the basis of inference, we require a dazzling array of *axioms* (unprovable assumptions) to establish a rigorous (or non-rigorous) basis for inference. This is true even for mathematics, where the dependence of conclusions on axiomatic premises is obvious from the beginning.

- All non-immediate knowledge is therefore *contingent* knowledge and cannot be proven to be absolutely or undoubtedly or unconditionally true. The sensory stream you are experienc*ing* at this very instant is *empirically* real and undoubtable – it is what it is – but your *memories* of previous experiences of any sort are doubtable, and your organized perceptions of the past or expectations of the future are all based on inferential processes and hence *might* be true, or accurate, or correct, but are not *provably* any of these things.

From which we can draw the following two very important conclusions:

- All "knowledge" beyond our immediate sensory experience is based on faith, as the word faith describes a belief in something that cannot be logically substantiated. The innermost core of reason is unreasonable. It is therefore silly for "scientists" of any sort to deride faith as a basis for knowledge – it is the basis of *their own* system of knowledge as much as it is that of any religious fundamentalist. One cannot even argue about which axiomatic system is the "best" one to believe in without meta-axioms to help you value-order axiomatic systems!

- The fundamental freedom of humankind is the freedom to *choose one's personal axioms* – the freedom to choose what they believe as the core of their *personal* faith to establish a basis of inferential knowledge, a value system, and a religious view. This freedom *must* be tempered by humility: since we *know* that our beliefs are unprovable, we must respect the right of others to have different ones and must strive to build a society upon a minimal set of consensual beliefs that "work" without expecting them to be absolutely right or absolutely wrong.

- Philosophy is *Bullshit!* Philosophy is the study or love of knowledge or wisdom. Well, we just concluded that true inferential knowledge is impossible, leaving us with contingent knowledge based on assumptions that it is literally impossible to *sanely* argue about – they are assumptions! It is nevertheless *important* bullshit. If we can agree on a *practical* set of axioms upon which to base a *practical* society, freely acknowledging that they are not absolute truth but instead are contingent truth, plausible assertions, reasonable assumptions that in the end work out pretty well (and agree to be tolerant of each other where our personal axioms don't agree instead of strapping on bombs and heading for the nearest crowded street) we might just be able to bring about a golden age.

Ultimately, this is a book about *freedom*, the pure intellectual freedom to *choose* what you want to believe. This is the real deal: If you choose to believe as a matter of personal faith that the world is 6011 years old and was created in seven days as a primary axiom and thereby *reject* the standard for contingent inferential truth that this work will advance as a really good idea (and that leads one *inevitably* to very different conclusions) well, no one can tell you that you're *wrong*, only that your system of reasoning is massively inconsistent without a few million axiomatic band-aids. If you're good with that, well, it is your choice (at least, in a society that practices religious freedom).

However, you in turn must recognize that your belief is literally insane to someone that has as fundamental axioms the ones that support science and contingent inferential knowledge based on observation, someone that has any sort of "minimalist" axiom (such as Occam's Razor) for logical consistency that rejects what I will call "fairy hypotheses" below. You are free to believe whatever you want, but you are *not* free to force your beliefs down the throats of others (not even your own family) or to insist that your beliefs should be adopted by society as a whole when they manifestly don't "work" (are inconsistent without the aforementioned infinity of band-aids).

Personal intellectual freedom to this extent *is* scary; to get you to where you are more or less forced to acknowledge the truth of it I'm going to perform memetic surgery without any anesthetic but a bit of laughter and a sense of open minded wonder, and blast away without mercy at scripture-based religions, most political systems, and a substantial chunk of the philosophical traditions of both East and West. Using nuclear weapons and asteroids falling from space, by the way, to utterly *obliterate* them beyond any hope of resurrection, whereever they assert that they are *true* (as opposed to plausible, or implausible as the case may be).

Living without these socio-memetic crutches *will* be scary, at first, until you realize that you can *still* believe in things, as long as you understand that you are *believing* in them, that underlying every instant of your awareness is an act of faith and a miracle, that you have no *right* to expect others to believe as you believe. East can actually meet West as you recenter your self to a state of perfect knowledge *of the moment*, the state that Zen generally refers to as "Enlightenment",[4] and then playfully and with compassion choose what to believe on top of that.

[4]Wikipedia: http://www.wikipedia.org/wiki/Satori. Or "satori" – where in proper Zen Buddhism satori is a word that perhaps better translates as "transient epiphany", an experience of deep understanding that may well last but a moment before life reaches out and drags you away to deal with kids and TV remotes. We'll shoot for something that lasts a bit longer, but be satisfied with what we can get.

True Zen[5] , of course, holds that Enlightenment is an experience that cannot be conveyed with words, and then of course uses all sorts of words in the form of "Zen stories" and detailed instructions on how to meditate *just right* to attempt to convey it with words, which is actually kind of funny all by itself. For example (to convey it in words) the general idea is that if you can ever completely stop your mind's unstoppable verbal activity while remaining *completely aware*, Enlightenment can happen as an *experience*, but one that hence *by its nature* cannot be conveyed in words.

If you find this confusing, don't worry. Many Zen stories read like a shootout in the Wild Wild West – this or that would-be Zen pretender goes head to head with a leather-slapping top-gun Zen Master and tries to prove how Enlightened he is by not proving it in the most elegant possible way. Of course that usually means that he is *trying* to prove it, as the *real* Zen master artfully refrains from pointing out even more eloquently while whacking the offender on the head with a handy blunt instrument (a "Zen blow"). The loser generally becomes the devoted student of the winner in hopes of eventually achieving *real* enlightenment and maybe one day getting to whack students of his own. Heady stuff, and great fun, actually[6].

Alas, I personally disagree with the basic premise and think that words are *essential* to the process of Enlightenment. There is empirical evidence that wolf-children raised without language cannot achieve Enlightenment[7]. As a work dedicated to the basic metaphysic of existential reality, this book attempts to guide you directly to a state of *Western*-style Enlightenment using the incredible power of *language* (and a certain amount of axiomatic set theory) to convey *just the right degree of self-contradictory confusion* while telling you with incredible clarity just what you *do not know*. Which is *almost everything*, in a sense that is made axiomatically precise, actually.

In deference to the East, it does include a minimal number of obligatory

[5]Wikipedia: http://www.wikipedia.org/wiki/Zen. This is one place to learn a bit about Zen, if you like. Alan Watt's lovely book *The Way of Zen* is another.

Please understand, however, that however much we will talk about some of the "philosophy" underlying Zen practice, this is *not* a work on True Zen. Or even Fake Zen. It is a work on philosophical existential metaphysics, the fundamental basis of knowledge itself. Pretty serious satori, as far as that goes.

[6]Especially the student whacking part, which, as a professional educator with students who often blow off doing the massive amounts of homework I assign, I cannot help but admire.

[7]Or even understand that they should *try*. Or not try, since another precept is that if you try you won't succeed – Buddha succeeded only after he *stopped trying*. The key thing is to not try *just right* after spending years of your life trying to not do the things that I cannot tell you don't work. Or is that one too many negatives? Damn...

haiku-style koans and funny (Zen) stories, sometimes accompanied by that odd whack on the head. To ensure that these guaranteed-politically-correct whacks are *really* odd (and are equally guaranteed not to cause any lasting injury and hence provoke lawsuits), they are performed not with my knuckles or a hard and unforgiving blunt instrument as they might be in a Zen monastery but are self-administered with a banana.

You do have to provide your own banana.

Introduction

This book is all about what we "know" and how we know it. There are two distinct qualities of "knowledge" – that which is known from direct experience, which in its purest form can be reduced to that which we are experienc*ing*, in the present tense, only, by means of our senses. Then there is everything else: that which is inferred on the basis of what is remembered, that which we are "thinking". Note well that this knowledge is *also* a form of experiencing, but is nevertheless distinguished, in our sensory experience, from *direct* sensory experience. Provided, that is, that we haven't ingested large quantities of hallucinogens or aren't mentally ill, either of which *does* tend to blur the line a bit.

The first kind of knowledge is extremely limited but very "intense". It is confined to a narrow band of real-time sensory data including your visual input (currently the lines on this page), perhaps some sounds in the background (your children fighting over who gets the TV controller while you "relax" with a book on axiomatic existential metaphysics), the sensations from nerves in your skin (the touch of your clothing, the floor, a chair, the breezes on your cheek) and elsewhere (the pangs of hunger, the tingle that reminds you that you will soon need to pee), tastes in your mouth (perhaps stale coffee mixed with mint toothpaste if it is the morning, perhaps a swig of beer if this is the evening), and various smells (the not-unpleasant scent of your own sweat, a hint of mildew, some flowers).

Actually, there is quite a *lot* of information coming in through your senses in a *steady stream*, and it is hard-wired into your brain in such a way that information arriving from there can co-opt your entire "self" in an instant, for example when you get whacked on the head by a flying TV controller and experience *pain*. Just sitting in a state of awareness of sensory input *only* is a Zen exercise for quieting the "mind", whatever that might be. The fact that it *is* a Zen exercise[8] suggests that *almost always* you exist in a state where that direct sensory stream

[8]And not a terribly easy one at that, at least if you try to maintain this state of outer awareness for more than a few seconds at a time.

is at least partially tuned out in favor of a different aspect of your experience of awareness.

This aspect is related to "thought" in its most general and embracing definition. It includes memory, imagination, processing of symbolic information, the process that leads to *deliberate action* (as opposed to the kind of reflex action that jerks your hand back from a searingly hot stove, something that may not even make it up to your brain before it occurs). Among other things, it is the kind of "experience" that you are undergoing as you read these words.

Note well how readily *something* as ephemeral as the direct visual sensory impression of a string of tiny black marks on a white page that bear *no resemblance to anything you actually experience in your sensory stream* create *echos* of sensory experiences as you read them. If you are a good reader, reading about the sensual delight of smooth, creamy chocolate ice cream being sucked off of a spoon to slide slowly down your throat in a midnight foray to the kitchen creates within you an *indirect* sensory experience, not exactly memories but neither pure fantasies, that are *more real* to you for the moment (in the sense that they were the focus of your "experiencing" self) than your *direct* sensory experience. The latter was doubtless fairly mundane and uninteresting – at least compared to the experience of eating ice cream[9] – unless of course you got hit on the head by a flying TV controller thrown by an unruly child while you were reading.

This second kind of experience is far more *mathematically complex* than the first. It is intrinsically *self-referential*, for example: while reading this sentence about what you are thinking while reading this sentence, you are inevitably thinking about what you are thinking about as you read the words that describe the process[10]. Experience of this sort includes many distinct kinds of things that are not a part of your immediate sensory stream. Some of these appear to be echoes of that sensory stream from the past – memories – as you bring to mind that the *last* time your kids were fighting in this particular way a trip to the emergency room ensued where the youngest one got stitches. Some appear to be things that have never been a part of your sensory stream but strongly resemble it nonetheless as possible "future memories" – perhaps you *imagine* going *again* to the emergency room in a few minutes when one of your children's

[9]OK, fine. Put down the book and get yourself a bowl of ice cream and then come back. After all, your brain consumes 1/3 of your total calorie input every day, and you're about to use yours a *lot* so a little extra sugar, chocolate, and fat can't hurt.

[10]Sorry, but there will be a rather lot of this sort of thing in this book. Can't be helped. This book is about *what you know*, and cannot be read without thinking about what you are thinking about. Computers (as purely logical entities) tend to get trapped instantly into *infinite loops* by this sort of recursion; humans don't. Something to think about...

heads encounters the sharp corner of the coffee table as happened in the past, or you imagine even more creatively that it *might* occur in the next few minutes even though it never has before, unless... (the possibilities continue, endless and ever-changing as "imagination" probes a rich space of possibilities indeed).

A large part of this "self-awareness" that ultimately directs most of your voluntary actions is a very complex process that occurs where memories of the past and imaginings of the future meet in the now in *parallel* with your actual sensory stream, mixing with it in subtle ways. It constantly compares alternatives – between the now of our actual experience and the memory of our experience a short time before, between the now of our experience and our imagination of *many* possible future *conditional* experiences and makes a steady stream of *choices* that direct your *actions*[11].

Note that in order to compare alternatives one requires a means of *ordinal sorting* – a system of *valuation* where you compare the *volitional cost* of acting in any given way (including doing nothing) against the projected probability-weighted *outcomes* of those action choices. That is, you have to at some point decide that a state of TV-controllerless peace and quiet, unaccompanied by any reasonable chance of trips to the ER and blood on your carpet, is *worth* the effort required to "redirect" your children's energies as forcefully as necessary. Emotions (as a very fundamental part of that ordinal sorting mechanism) and value systems (at a higher level) thus play a *crucial role* in directing self-aware actions.

A large part of Zen practice is to train your mind to focus your attention (whatever that might be) *strictly on the stream of sensory experiential knowledge* and to *quiet* the internal voice and evaluation process associated with the second kind of sensory experience, which invariably involves *memories* both past and future/conditional and the *emotional weightings* that sort those experiences out according to some scale. Note that this does not reduce your level of *awareness*, it only seeks to eliminate the essentially *self-generated* (and hence self-referential) part of it that is not actually instantaneously present in your sensory stream. In order to make this possible, a great many of the "rules" of sitting zazen (meditating) focus on eliminating the need to act as *self*, since action inevitably requires the constant comparison of possible futures against the memories (true

[11]Such as getting up and swatting your children on the bottom – with a banana – and removing the TV controller from their greedy little hands so you can actually concentrate on reading this book and avoid all possibility of emergency room trips and stitches. There. Isn't that better? Nothing like a Zen "clearing blow" to guide young and chaotic minds... and help them learn to act in ways that don't have a significant risk of injury.

and false) of our past where it *merges* with the ongoing sensory experience of the now, muddying and fragmenting the latter.

A large part of *human* practice, however, is to be able to *function* while embedded in the middle of the constant whirl of life. A state of perfect experiential wordless, unstructured clarity is a wonderful thing to be able to achieve, but then you get hungry, you have to pee, one of your children comes in bleeding profusely from a coffee-table induced scalp wound, and the phone rings. It is meet and fitting[12] that we do *not* sit passive through all of these things, to starve, to void our bladder on the living room sofa, to let our child bleed to death while his or her sibling, holding the all-precious TV controller, watches soft core pornography on the Playboy channel[13]. Yet it is very difficult to act volitionally without embracing a huge amount of *structure* that is anything but clear. This *is* the basic paradox of human existence (and, of course, of Zen).

Our human lives are "bound to the wheel" in a way that can only – perhaps – be severed by dying or being in a coma on an IV drip and a catheter. We cannot sit passive within the stream of information provided by our senses; we must participate (or die, or be cared for as a "broken" human being). Note that Zen practice also acknowledges this in many ways – "Before enlightenment, chop wood and carry water. After enlightenment, chop wood and carry water"[14] . Enlightenment is "nothing special"[15] – it is really just the ongoing process of smoothly integrating those two distinct components of our experiential stream of awareness into a single state of ongoing clarity that is *still capable of functioning* at that point where past memory meets future imagination in the presence of and as a part of the experience of the now. To get there one must – one way or another – untangle that knotted skein of assumptions and beliefs that form the *structure* underlying your volitional acts, smooth it out, and rejoin it to the

[12]At least it is meet and fitting according to an axiom-based, unprovable, value system that we have yet to overtly select or describe. You may disagree. Your brain may also be (mis)wired in such a way that it doesn't do terribly well on the ordinal sorting and emotional thing so that for you there *isn't* much difference between being hungry or full, having healthy safe children or children dripping with their own blood. If so, evolution will eventually sort this sort of thing out...

[13]Or even hard core. I actually couldn't tell you what kind of pornography is on the Playboy channel because naturally I've never visited it. Maybe it just shows tastefully done short videos involving puppies and butterflies and fully clothed Amish farmers.

[14]Wikipedia: http://www.wikipedia.org/wiki/Koan. This link (at the bottom) has a whole lot of links to online Koans, or "Zen Puzzles". Most of them are really pretty silly, but there they are. The "best" collection of Koans and commentary that I've thus far found is "Zen Flesh, Zen Bone", a collection of four primary Zen and Pre-Zen collections with commentary, by Paul Reps and Nyogen Senzaki.

[15]Yes, this too is a quote from an ancient Zen Master.

process of experiencing the now. Easily said, not so easily done.

I will assert that the state of clear focus, fully aware of one's sensory stream yet able to act without departing from it, is a good state to be in without making any attempt to "prove" the assertion (or even to define what a "good state" might be). Obviously, an external symbolic proof or demonstration of such an ill-defined statement is impossible – hence the notion that Enlightenment cannot be spoken. However, the *experience* of the truth of this statement is nearly *universal*, so if you are older than perhaps five or six years of age and not actually mentally handicapped, you almost certainly *know* that it is true even if you have never before articulated it and cannot explain exactly how you know that it is true. It is the state of being happy, being content, being in tune with the complete process of being, itself. Nearly everybody is in this state at least some of the time, nobody (not even the most "perfect" of perfect masters) is in it all of the time because even the Buddha sometimes gets hit on the head by a falling fruit[16].

The degree of success an individual enjoys at being "happy", however, is strongly tied to the *structure* of the nubbin of awareness that one calls "self", that which sits passively at the heart of it all while acting. In order to function, to participate, to direct our *actions* as they appear to be fed back through our sensory stream, we need two distinct things:

- A set of *beliefs* (called *axioms*) that help us organize all of our sensory inputs (even complex external ones like words in a language and complex internal fed-back ones such as memories and our imagination) into an ordered hierarchy of sets and relationships that we identify with an "external reality"; and
- A set of *logical rules* for *reasoning* about those sets and relationships on the basis of our beliefs.

There also is, as noted above, an *emotional* component to our awareness and decision making that can be thought of as being *pre-verbal* or *non-verbal* axioms – a brain system that strongly influences our hierarchical organization of events, memories, future projections, and action choices by assigning them *values*. These "intrinsic" axioms are very difficult to volitionally alter as they often arise out of pure biology or our very early social conditioning to the extent that we do not even realize that can be changed and are not necessarily absolute truth.

Together, beliefs (conscious or unconscious) and reason form the basis for our *personal philosophy* – the *personal* operating system we use to translate our

[16]See: http://www.phy.duke.edu/~rgb/Poetry/hot_tea/hot_tea/node9.html.

sensory input into actions. This book is all about philosophy, and hence spends a lot of time closely examining beliefs and logic and how they work together (sometimes badly, sometimes well) as the center of our selves. We cannot act without them, and yet most people spend most of their lives as *unaware* of them as they are constantly unaware of the totality of their sensory streams.

Of course, one of the primary truths explained in great detail within this book is that *philosophy is bullshit* – in the specific sense that *all philosophies are systems of beliefs* and hence subject to *doubt*, a doubt that can even (with suitable axioms) be *quantified* in the case of science or parts of mathematics. The basis for all "rational" action is itself fundamentally *irrational*, and often is confused and self-contradictory as well.

Bullshit or not, though, philosophy is *important*, important for entirely practical reasons. Indeed, most of the failures of the human race can in some sense be traced to "bad philosophy" and most of the successes can be traced to "good philosophy". The *history* of the human race over the last three or four (or thirty or forty) thousand years is largely one of the co-evolution of successful philosophy and the human species itself. Even though a philosophy, like a computer's operating system, is at heart an artificial construct and at best is likely to have a few bugs (sometimes fatal ones), humans, like computers, simply won't function without one and even come "pre-programmed" with enough of one to "boot up" the rest[17].

The book is organized into three distinct parts. The first addresses Logic (in philosophy and mathematics and computer science) as a formal system – where philosophy and logic come from historically, a bit of set theory, a bit of logic, some nifty stuff worked out over the last 100 years or so by mathematicians, logicians, and philosophers working together. If things go as planned, you'll finish reading this part metaphorically dangling by your feet over the Pit of Existential Despair. Everything you thought you "knew" should suddenly seem doubtful. In fact, you should come to the shuddersome realization that you *know* pretty much *nothing*, whatever you have chosen to *believe* in the past.

The second addresses Philosophy per se – in particular many of the *philosophies* of the past – the famous (or infamous) conclusions, often based on "Pure Reason", of many of the world's greatest thinkers and how (at the very least) the notion that you can prove *anything* about the external world by Pure Rea-

[17]For a variety of excellent reasons that I'll go into later, computer metaphors abound in this work. If this is a problem for you, well, it's *too late* to take the book back. You paid for it and have read this far. Might as well finish it anyway. Right?

son is just plain wrong. This is by no means an original conclusion, but it is a conclusion that nearly every philosopher (or religious figure, or politician, or spouse) chooses to *forget* the first time they have some really clever "logical" argument that leads to a conclusion that they (usually for reasons that are more correctly linked to the biochemistry of the brain than to logic) wish to advance. The proposition that *Philosophy is Bullshit* will be self-consistently developed as something that is unprovable but true anyway. It will also be shown quite explicitly that *both* "science" *and* "religion" are bullshit – that both of them require certain beliefs in the invisible and unprovable. Perhaps even, at heart, some of the *same* beliefs. Both are fundamentally matters of *faith*, for all that science is developed with a greater degree of self-consistent mathematical rigor from its axioms.

The third focuses on Axioms themselves – first on "meta-axioms" that are (if you like) axioms about axioms, axioms about axiomatic systems of reason themselves as abstract (e.g. mathematical or logical) entities, axioms about how we as individual humans might best choose the *particular* axiomatic system that we use to interpret and interact with the sensory stream that our "selves" call "the Universe" so that it makes sense and works for us. In the process we will discover that the *true meaning of free will* is the *freedom to choose our axioms*[18] . This part of the book will end with a kind of "axiom bazaar"[19], where you can (possibly for the first time ever) actually look at the axioms associated with specific religions, political and ethical philosophies, and science side by side and (with a suitable meta-axiomatic basis) compare them.

Finally, in the conclusion we will talk a bit about "the point of it all". *Why* it is important for you, as an individual, to *deliberately* choose your axioms instead of merely accept the ones your biology, your parents, your religion, and your society force-fed you as you were being "booted up". Why it is important to maintain an *open mind*, one that *doubts* its own beliefs and adheres to them only as long as they work for us and are not too inconsistent. Why it is *very* important to tolerate the choices of others where they *differ* from your own at least where their choices do not directly affect you and yours. Why it is critically important for the human species on a global basis to work thoughtfully towards an axiom

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[18] Wikipedia: http://www.wikipedia.org/wiki/Free will and determinism. Of course, because this is itself an axiom and therefore a free choice you can always choose to believe that you are *forced* by biology, physics, or invisible fairies to believe that your choice of beliefs is determined and not free.

It's entirely up to you.

[19] Or perhaps, if you prefer, "axiom bizarre", because there is something *strange and wonderful* about choosing what we believe.

set with sufficient commonality that we can live together fruitfully in a global society with a minimum of conflict even as it tolerates diversity.

In order to choose a sane and fruitful future path for Humanity on this planet we must come to fully, deeply understand the true nature of *knowledge* (self and otherwise) and *freedom*. With knowledge we can see where we are, where we have been, and (to some extent) where we will go if we make various choices. With freedom we can *make* those choices deliberately both for ourselves and for our collective society instead of having an *in*sane path forced down our throats at the end of a gun.

Together, knowledge and freedom (seasoned with a bit of "common sense") equal wisdom[20]. To become wise, as a society and as individuals within that society we must begin by being rebels, by challenging nearly all of the "knowledge" that has been passed down as absolute and unquestionable truth from our so-often-mistaken ancestors.

So let's get started...

[20]Yes this is all a bit sentimental, and some of you are probably making gagging motions as you read this. Don't worry though – later I put down *very precisely* what I consider wisdom to be, quoting an actual luminary or two. At that point you're supposed to smack yourself in the forehead and go 'So *that's* what he meant by knowledge and freedom, yeah.' Probably won't happen, but hey, I try.

Part I

Reason and its Limitations

Chapter 1

Wanted: Answers to some Big Questions

1.1 Primate Philosophy

Humankind has, from the earliest glimmerings of sentience on, endeavored to answer certain questions. What time is dinner? *What's* for dinner? Who caught dinner? Now that dinner's over, who wants to have sex?

These questions are all survival oriented, and are driven by brain structures that are common to nearly all air-breathing vertebrates. Deep within our lovely primate brains, instead of an "inner child" beloved by fiction and movies we have an *inner reptile*, and all sorts of very basic survival "instincts" (and a lot of higher order behavior that revolves around them) ultimately originates in our *reptile brain*[1] [2] .

These were not the only questions being driven by inherited[3] brain struc-

[1]GIYF: reptile brain cortex In all GIYF links, you'll have to look for some likely links (ones that aren't obviously fiction or sexual solicitations) and click-n-read.

[2]Wikipedia: http://www.wikipedia.org/wiki/Brain. In this specific case, between Google and Wikipedia you should learn that your *reptile brain* is one of the *oldest* (in evolutionary terms) parts of your brain, the part that controls your physical anatomy and very basic survival functions like eating, sleeping, fear of death, aggression, and sex. Your reptile brain is where a lot of your basic cold animal hungers reside – the ones you share with snakes and lizards. It is very, very selfish. Your limbic (emotional and judgement brain) and neocortex (language and logic and higher abstact thought) are layered on top of the reptile brain quite literally like layers of icing on a jello cake.

[3]Wikipedia: http://www.wikipedia.org/wiki/Phylogenetics. I'm linking this article early because we will frequently have good reason to talk about phylogenetics, especially the notion that

ture, of course. Early primates were first and foremost *mammals*, and mammals had long since developed a *cortex*[4] . This is a part of the brain that tends to control a variety of emotional and social activities such as the nurturing impulse towards children, instincts to form social groupings for mutual advantage, and the beginnings of higher brain function. Proto-humans were equally concerned with their "tribes" and achieving reproductive dominance therein, social grooming, fighting with neighboring tribes over territory and food supplies, and group foodgathering activities, all of which were basically more advanced versions of activities observed in a variety of reasonably advanced mammals in addition to primates.

Once the inner reptile was being satisfied on a moderately regular basis for at least a fraction of the proto-human population, once they were firmly established in a successful tribe/family group and had reproductive and social status, we can imagine that in that warm lull that follows a full belly, satisfying sex, and a round of playing with the children, proto-human minds used some *newly developing* layers and sections of the of *primate* cerebrum[5] (neocortical regions that *dramatically* increased their ability to process information, solve problems, invent and manipulate tools, and *communicate abstractly* within their tribal cultures) to consider less evolutionarily important, but nevertheless intriguing, issues.

I wonder what those little bitty lights up there in the night sky really are? I wonder what would happen if I sharpened the end of this stick and poked it into a mastodon? I wonder how the fire comes *out* of chunks of cold rock struck together without consuming them but consumes wood to ash? I wonder how I'll

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ontogeny recapitulates phylogeny. This nifty-sounding sound bite basically refers to the observation that for the *most* part, the development of individual organisms from a single (fertilized egg) cell to the finished product recapitulates the stages the same organism went through in the process of evolving. This makes sense – the theoretical mechanism of evolution enables a species to *add* something that enhances survival, but there is no real mechanism for it to *take something away* unless it actively and negatively affects survival. This is directly visible in our DNA, which contains many inactive segments that are basically "fossils" that once, perhaps, performed important functions.

[4]GIYF: mammal brain cortex Also check out the previous Wikipedia article on the brain. Basically mammal cortex is the next set of cortical layers out from reptile cortex – the neocortex. Note that describing cortical layers and brain structures as "mammal" or "reptile" is a somewhat simplistic view of brain evolution and function, especially in humans, but is nevertheless a useful one for my purpose here.

[5]Wikipedia: http://www.wikipedia.org/wiki/Telencephalon. The cerebrum is more properly called the *Telencephalon*, and contains the various cortical layers and regions. As one ascends the phylogenetic/evolutionary scale from reptiles to humans, the most striking change is the systematic addition of layers of cortex-based processing systems with neuronal connections to and from the phylogenetically older structures within.

get dinner tomorrow – could the stick help? I wonder if instead I'll turn out to *be* dinner for something else – could the stick help here as well? I wonder what happens to my *awareness*, the lights, the fire, the stick, if I turn into dinner for a sabertooth?

With these questions, humanity really began. That which differentiates humans from chimpanzees or gorillas (as much as anything else) is having the brain structures and ability to self-program those brains to *reason* symbolically, to *imagine and communicate*, to indulge in *philosophy*. Early humans were able, for example, to imagine their own deaths, to teach their offspring things that were *far more complex* than the relatively simple behaviors that were directly encoded into their brain at the *hardware* level. Humans became humans when they could self-program and pass on successful programs to their children, in a manner of speaking, *much faster* than was possible by waiting for *genetic* evolution to manage it.

What were these early "programs"? What mechanism produced them? I would argue that the programs in question are composed of *memes*[6] , the macro-scale informational equivalent of genes, and that the process that developed them was a *genetic optimization algorithm*[7] applied by nature simultaneously to both the genetic and memetic inheritance of proto-humans. This isn't really a going to be a *focus* of the current work, but I do think that this gives one valuable insights into much of what follows because (as we will see) many memes are also *axioms* and structure the way we think, especially think "higher thoughts" in philosophy, religion, politics, science and mathematics. Later we'll discuss memes in a bit more detail, but for now let us hold onto the thread of our story.

The early philosophers who asked these early questions also embarked on a long, error-fraught process of *answering* them. Some questions had answers that conferred a *significant advantage* on an individual or a social group that possessed them. It turns out, for example, that sharpened sticks *are* useful for killing all sorts of prey animals more efficiently than unsharpened ones, that fire can be controlled and used for defense, for offense, and to prepare food in healthier ways, and that a language was very, very useful for perpetuating the ever-increasing number of memetic discoveries produced by these early Einsteins. Given a strong survival advantage associated with the use of language, intelligence, and memetic inheritance, the brain structure that supported all of this rapidly co-evolved in these early primates.

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[6]Wikipedia: http://www.wikipedia.org/wiki/Meme. This is not a terribly original argument on my part, of course...

[7]Wikipedia: http://www.wikipedia.org/wiki/Genetic Algorithm.

I personally think that it is pretty safe to conclude from any sort of look at all at human history and prehistory that individuals that were intelligent and articulate enough to be *educated* and in turn to *educate others* (and the social groups to which they belonged) survived more often than those that were not as humans succeeded in passing on *memes* as well as genes to their offspring. Since even today memory is an important component of education and intelligence, we can assume that the rise of human language and intelligence corresponded with a vast increase in the quantity and quality of human memory.

Individuals with *imagination* and who were able to master *sequential inferences* based on observations of what amounted to cause and effect in their environment (stored in those improved memories) did better still. In the process of passing information on from generation to generation some of the information was *changed*, accidentally or deliberately. Some of those changes produced improved survival rates, others not, and the improvements thereby spread via the differential this created between competing social groups.

We can speculate that one of the earliest advantageous discoveries was that of *extended tribal groups* or *societies*. Of course social groupings are actually fairly common in the animal kingdom for a variety of reasons, but in the case of developing humans one of the most important reasons (possibly after the fact) was to facilitate the invention and preservation of non-instinctive learned behavior.

Societies are powerful vehicles for *memetic sex*, also known as *social intercourse*. Studying the relatively few stone age cultures surviving still today (and examining what traces pre-historical stone age cultures left behind), we can be reasonably sure that the earliest tribal groups were originally little more than extended familial groupings. These small groups frequently encountered one another and exchanged members or memes by means peaceful or otherwise, as happens with primate groups today. Thus memes and genes from one tribe or family group were carried to another. Tribal units themselves became "superorganisms" engaging in memetic sex in a hostile world – precisely the right conditions for the genetic algorithms that drive evolution to occur.

This sort of memetic "crossover" was doubtless then, as now, very fruitful. Sometimes two or more memetic ideas would get together in the right tribal member's ever more powerful brain and produce a *new* memetic idea (or more advanced version of an old one), an idea that carried still more survival potential. Tribes with fire *and* sharpened sticks found that fire *hardened* the sharpened end and turned them into primitive spears. Tribes that chipped rock pieces into sharp splinters found that those splinters made even better ends for their spears than fire-hardened wooden ones[8]. Individuals discovered that certain grass seeds could be harvested, dried, and stored to be eaten when other food sources were scarce, and it was they and their offspring and their tribe that survived famine and went on to found new tribes or otherwise propagated the information between surviving tribal groups.

Not *all* of the questions that were thought up, of course, had useful answers, but cultures that thought up *many* questions and did a fair job of answering at least some of them outperformed ones that were less curious or tried to sit back on their laurels after their last advance. Unlike genetic evolution, which often takes a very long time to make significant changes in a species, memetic and genetic *co*-evolution conferred such a *large* advantage on the most successful that the species itself and the memetic superorganisms improved quite rapidly. When written language appeared to permit memetic "sex" to span human generations and tribal cultures, it positively *raced* along, and it continues to do so today.

Throughout most of unrecorded *pre*-history, individuals and their tribes rarely had time to turn their less technological but still very interesting speculations into anything more complex than systems of *metaphysical beliefs* – religions – capable of providing mythopoeic[9] answers to an entire class of very basic questions that arose in the process of performing *memory-based inferences*, specifically, identifying *causes* and *effects* (or at least systematically repeatable *correlations* between behavior, environment, and outcome). In case you are wondering how we *know* this given that they were pre-historical, we'll, okay, maybe we don't. We can infer it on the basis of such evidence as they left behind, or on the basis of what they *didn't* leave behind. One thing that they left behind was themselves, and from their graves we can see that they treated the dead with love and respect when they weren't eating them. We can find early art that at least appears to portray "gods" or "goddesses" although honestly it is difficult to prove that this is what they are and maybe they're the prehistoric equivalents of SpongeBob SquarePants[10] instead.

These memetic systems of metaphysical beliefs were usually framed in a socially constructive way – one that reinforced tribal structures that were increasingly more complex and divergent from the simple primate/mammal extended

[8] A process that led, step by small step, to the discovery that mounting multiple nuclear warheads on rocket-engine driven spears worked *really, really well* and could kill off whole *species* of animals or entire *continents* worth of competing tribes.

[9] A nifty word that means "giving rise to mythical narratives" in case you didn't know.

[10] Wikipedia: http://www.wikipedia.org/wiki/SpongeBob SquarePants.

family/tribal groupings that hold to this day in primate species that failed to become philosophers and discover the advantages of memetic co-evolution. Just as the genetic "discovery" by collections of clumped cells that differentiation and functional specialization led to advantages (a process that ultimately carried those cell clumps from being tiny blobs of a few identical cells to where they can do things like type these words into a computer), so did the discovery that organizing tribes into leaders, warriors, workers, childbearers worked much better than monkey-style tribes where every monkey took care of itself and its immediate family in a very simple social hierarchy. Structured memetic social superorganisms began competing (in the Darwinian sense) where before competition was primarily individual and familial and relatively unstructured[11].

In the process of all this, the connection between questions, answers, and survival advantage was very nearly hard coded into the human brain structure at the genetic level. Humans sought answers to *all* questions, and their monkey curiosity was rewarded time and again for at least some of the answers they found in the only currency that mattered: survival and reproductive success for themselves *and their social groups*. Some of the questions that arose in the perfectly natural course of their increasingly human affairs were the *really big ones* that survive, unanswered, to this day:

- Where did *everything* come from?
- What happens to me and my loved ones when we die?
- How should I behave in my society?

Let us look at some of these questions and see how they, in particular, fit together.

1.2 Big Questions, Big Answers

Early humanity was not terribly constrained by *reason*. First of all, it hadn't really been invented yet – it was still co-evolving with the brain structures that support it. The early answers to these many questions were therefore relatively unconcerned with logical consistency, rationality, scientific verifiability – they were often as not *stories*, verbal histories that themselves evolved into part of the

[11] This point of view is advanced in a number of contemporary speculative works, notably in *The Lucifer Principle* by Harold Bloom. I strongly recommend it.

memetic baggage of each culture that was passed down from parent to offspring along with their genetic inheritance.

In the *short* run these histories nearly always had survival value as they were the *memory of the superorganism*, which needed to be longer than the memory of any of its members to cope with long term fluctuations in the superorganism's environment (such as drought, war, famine, disease) as well as to guide it in the quotidian business of tribal survival. However, just as is the case with genetics, some of this memetic inheritance was or rapidly became "junk" – of no particular use to individual or tribal survival, but conserved nonetheless along with the useful part. We can easily imagine that (just as is the case with genetics) some of the junk memes gradually mutated to where they *did* perform survival enhancing functions, *social* functions, at the same time that they satisfied that basic hunger for seeking causes and stimulating all of that brand new brain tissue with 'ideas' that might one day bear fruit.

These mutated histories, freely enhanced with imagination and fiction and self-serving insertions, became the myths and legends of the tribe, many of which persist to this very day as a blend of history and mythopoeic narrative that *still* serves to bind huge embedded superorganismal groups together. With or without *rational rules of thought* to guide the selection process, these stories were heavily connected to the notion of *cause*, as the world in which individual and tribe lived has always provided differential rewards in terms of survival and reproductive success on the basis of how effectively the "magic" of its underlying causality has been mastered.

Note well that there is something startling about the discovery of causality and its close friend, induction. Inductive reason in general is a deductive *fallacy* – in fact the one labelled *post hoc, ergo propter hoc*. Loosely translated, this means: "after this, therefore because of this". It may be more familiar in the words of a common litany taught in any good course on statistics: *correlation is not causality!* Just because you always see two events in close proximity, with one following the other in time, does not *logically* mean that the former "causes" the latter. Which is a shame because, as we shall see, correlation is all we've got. Ever.

It's even more of a shame, because one can start with a tiny handful of very plausible axioms and derive induction as a *quantitative* system of contingent probabilistic logic, and show that deductive logic is a limiting case of this system, one that is effectively never realized in nature. In other words, as a means towards knowledge of the real world, it turns out that it is *deductive logic* that is the "fallacy", in that deductive truth is forever beyond our grasp. When we use it we are basically using inductive logic where we really really believe that our premises are true and assign them a prior probability of being true that approaches 1. But more on this later, when we treat the amazing work of Richard Cox and E. T. Jaynes.

Evolution, on the other hand, doesn't give a rat's furry ass about "valid" or "invalid", or more properly "conditional truth". All it cares[12] about is whether or not a behavior improves one's chances at survival and reproduction, and humans, dogs, cats, and chimpanzees that for whatever reason acted as if correlation *is* causality tended to outlive those that didn't. Indeed, we rank the "intelligence" of animals almost exclusively on the basis of how well they recognize this basic principle at a level beyond instinct (so that they can *learn* from their experiences).

So *behaving* as if induction works and the environment is causal have *always* been favored by natural selection at so very many levels. We are literally evolved to look for causal (or at least associative) patterns and form generalizations *even though doing so is completely irrational* from a deductive point of view. By golly gosh it *works* though, even in subjects like *mathematics* where we are traditionally (and badly) taught that inductive reasoning of this sort is supposed to play no role[13].

This is beautifully illustrated in, for example, G. Polya's superb two-volume series entitled *Mathematical Induction and Plausible Reasoning.* Polya makes the compelling point that nearly all nontrivial mathematics, however well it is deductively supported by theorem and proof today, got its *start* from induction – looking at patterns among numbers, for example, formulating a hypothesis, then attempting to prove the hypothesis correct.

Wait a minute, that sounds a lot like *physics!* And of course, physics *did* start up pretty much all of calculus and a slew of other branches of modern mathematics. Polya shows that induction historically has been a key component of the invention of *abstract* mathematics such as *Number Theory* where one "observes" the properties of numbers "empirically" and then form a conjecture, and that

[12] OK, OK, yeah, sure, evolution doesn't care about *anything* because it isn't a sentient causal agency, it is a process. This is an anthropomorphizing metaphor, because evolution, in spite of having absolutely no "intelligence", is perfectly capable of bringing about changes *as if* it cared about them. It really is a hell of a metaphorical watchmaker, for those teleologists out there, and indeed is directly responsible for every single watch that has ever been discovered in the middle of a desert...

[13] As opposed to "proof by induction", which is a common methodology for stepping over an unbounded set to prove an assertion. This sort of "successor" induction plays a key role in the axiomatic development of arithmetic, as we shall see.

even today there are many famous conjectures that appear to be *inductively* true but cannot (yet) be *deductively* proven.

To return to our muttons, it seems likely that causal associativity and induction were the primary forms of reason used through much of prehistory (and continue so even today, supported at the hardware level in all animals capable of "learning" at all) and that deductive reasoning, with its insistence on "truth" and reliance on *symbolic forms*, is a very recent addition to the human repertoire. Symbolic reasoning requires *different brain structures* than non-symbolic inductive reasoning of the sort that makes your cat connect spraying your legs with cat-urine as you sit there arguing with your children over the proper use of TV controllers with being chased out of the house by an enraged primate or that permit rats to learn that pressing the *left* bar yields cocaine while pressing the right one only produces only boring old food. These abstract symbolic reasoning brain structures (which are empirically a mix of cortical hardware *and* memetic/symbolic software) have simply not been around all that long even in humans.

One function of this symbolic reasoning system is to *compress information* in a sense we will discuss in some detail later. A single, very short semantic assertion such as "fire burns" enables one to reason correctly and in survival-enhancing ways about a huge range of specific instances of occurence of "fire". Encoding it thus symbolically permits this knowledge to be passed on to offspring or others of one's tribe where it can be reinforced by non-fatal experience (as any parent who has ever worked on communicating "Stove hot – don't touch!" to their questing two-year-old well knows). It also permits the whole concept to be symbolically manipulated and adjoined to other symbols to where one can eventually make sense of:

- fire burns my hand if I incautiously stick it into a fire
- fire burns pine wood quick and hot and oak more slowly
- fire burns the steaks – cook them over coals with a minimum of flame, while marinading with a mix of wine, olive oil, garlic, soy sauce, and curry well mixed
- fire burns by means of an oxidation process that converts a molecular fuel into e.g. carbon dioxide and water while releasing the surplus energy of the rearranged chemical bonds as heat and light
- fire burns evidence quite nicely as these changes are generally *irreversible*

As these strings of meaning-compressing symbols got longer and longer they became *stories*, stories that represented rather complex experiences. They became "recipes". Yes, if you take the little one-line recipe above and whomp together the ingredients (and a bit of this and that added by your own sense of monkey-curiousity-play and personal taste over time) and slap a steak so marinaded over hot non-flaming coals and avoid burning them for just long enough to render them cooked rare, you will have a tasty treat that just barely might increase your survival rate, at least if you are feeling suicidally despondent and a single really delicious meal is enough to help you past the crisis. And as you do, the steps semantically outlined in the recipe becomes the "cause" of the feast (and your ultimate survival) – a few words compresses a wealth of experimentation and experience into a simple story or magical spell.

The big questions listed above therefore got *big answers*, answers told in easily remembered stories that reinforced the very *idea* of everything having a cause even where the cause could not (yet) be divined by anything like a systematic or rational process. Mere association was considered enough, and even associations that were *rare* occurrences or *fictional* occurrences were often interpreted in terms of occult rules of causality[14].

Causes naturally form temporally correlated associative chains (a fundamental principle of modern physics, as it were – straight out of the textbooks, if they are good ones), and with their greatly enhanced personal and tribal memory and growing left-brained capacity for temporal/sequential processing[15] early humans could *encode* experiences semantically and hence *perceive* those associative chains over many steps, over very long time scales.

On the other hand, the Universe is a *frighteningly random place*. Many things that happen occur just once and never happen quite the same way again. Indeed, in some fundamental sense *everything* that happens is *unique* in this way. Evolution created beings with brains that craved associative proximate causes, then gave them data in which those causes were partially hidden by this uniqueness and complexity and randomness. At this point we have a very good understanding (subject to many axioms, of course) of the *fundamental properties* of the causal chains that make "everything happen". More to the point, for

[14] Occult in *both* the sense of hidden *and* magical, more often than not.

[15] Wikipedia: http://www.wikipedia.org/wiki/Lateralization of brain function. Here you will learn that your brain has two distinct halves, separated by a membrane called the *corpus callosum* that mediates communications between the two. The left brain is predominantly analytic; symbolic language and associated sequential symbolic reasoning seems to be dominant. The right brain is instead associated with emotion, visualization, imagination, and the formation of long term memory.

roughly fifty years now (since the work of Cox) we have a sound axiomatic basis for the mathematics of induction, for the laws of *probability and statistics* in a universe where every event is fundamentally unique. We can now systematically *quantify* the apparent randomness even as it occurs in a presumably deterministic causal chain[16].

That doesn't make it any less frightening! The world (as we know it) could end in the next few minutes because our Sun, for reasons that are perfectly well founded in the science of stellar dynamics (if only we fully understood that science and had access to all the requisite information about solar state), could just plain explode, or not even bother to explode but merely engage in a prolonged 'hiccup' of (say) 100% increased solar output for a few days, long enough to sear the planet's surface bare of most life. Or if you want something even more implausible and random, consider being hit by a gamma ray burst from a nearby star of sufficient power to significantly damage the biosphere[17] . Our *ignorance of state* and the impossibility of prediction of essentially chaotic phenomena leave us vulnerable, and we *still* seek "higher cause" explanations for bad things that happen (in human terms) as a consequence of sheer bad luck.

Humans tended to extrapolate the patterns they observed in the causes they could recognize, and saw themselves and their own relatively deliberate mastery of the environment and their near-random volitional capriciousness as the "model" of a causal agency that could explain all of those unexplainable occurrences in terms of deliberate volitional acts. The cause of *everything* was therefore imagined to be an active intelligence much like their own. That is to say, capricious, selfish, jealous of its power, as likely to blast you with a lightning bolt or cause a bear to pop up out of nowhere and maul you as it was to reward you with plentiful food, good sex, and tribal power and status.

Thus was born the notion of deity as a cause of the otherwise unexplained. This is not at all to suggest that this notion of deity was homogeneously implemented across all cultures – far from it – only that all cultures adopted *some* sort of deity as at least *part* of their explanation for Everything, and that as time passed it was further adapted to serve as a direct support of the tribes idealized social structure. The basic rule is – if you can infer a consistent proximate cause for classes of events, that's fine. Fire burns, cave bears eat people. Where this explanation is inadequate (or even where it is) invoke the "God C(l)ause" – Aunt Mabel got eaten by a cave bear (even though she was particularly careful about cave bears) because it was *God's will.*

[16]For example, in the branch of physics called *statistical mechanics.*
[17]Wikipedia: http://www.wikipedia.org/wiki/Gamma ray burst.

In the animal kingdom, social groups of mammals often have a *hierarchical structure* where individuals within the group obtain *status* by one (usually competitive) means or another. Nonhuman primate tribal groups are often led by a dominant "alpha" individual of either sex, although some research now suggests that females were in the past more commonly tribal leaders than males. The same research suggests that females were historically one of the driving factors behind the formation of primate tribal social groups in the first place, as they stand to benefit more from the protection and support of other tribal members during the extended vulnerable time of child bearing and child rearing. The social hierarchy extended beyond just the alpha individual, of course, and was a dynamic thing where the location of individuals on the the hierarchical scale of tribal status and reward was constantly being challenged and negotiated.

When the human notion of diety was introduced, it was thus perfectly natural to extend this tribal hierarchy by a notch:

$$\text{god(s)} \rightarrow \text{alpha} \rightarrow \text{tribe itself} \rightarrow \text{tribe member} \rightarrow \text{outsider}$$

Unsurprisingly, the deities introduced as often as not strongly resembled humans, only bigger, better, more powerful, and far more bloodthirsty. In fact, they resembled nothing so much as a human tribal leader (again, of either sex) on steroids, with all the powers humans *wished* that they had over their environment and other humans.

This placed everyone in the tribe above humans in other tribes, and sorted out the tribe itself so that its alpha individuals were closest to deity. This made everybody feel warm and secure because just as the weakest member of the tribe had some expectation of protection from the alpha leadership, so did they have some expectation of protection from the ills of life thought to be due to the gods.

This *particular* social hierarchy dominated humankind for thousands of years. Hierarchies like this that explain humanity's place in the universe relative to everything else are sometimes referred to as "grand paradigms", and this particular one is called the *classical paradigm*[18]. Over the years it shifted from its probably matriarchal or mixed roots towards very definitely and overwhelmingly patriarchal paradigm for the last three or four thousand years.

Many cultures extended the human hierarchy even further on the god side and invented tribal ranking/status systems among the gods, so that some gods were more powerful than others. Some cultures similarly extrapolated human conflict over to the god side and created detailed myths concerning wars between good

[18] Just in case you cared.

gods and bad gods (devils) (making it perhaps easier to explain why bad things happen as there are bad gods to blame them on). A few cultures abandoned the notion of gods plural for God singular, but still maintained the extrapolatory picture of that God as a warped version of a human tribal alpha – God the King, basically. Gods and godly conflicts and godly capriciousness formed a sufficient explanation for all sorts of random, bad events or otherwise unexplainable neutral or good ones in human lives without giving up the notion of *causality* that otherwise proved so fruitful where proximate causes could indeed be identified.

It also gave societies a *powerful memetic tool* for reinforcing social behaviors – bad things inevitably happen to *everybody*, of course, but they also don't *always* happen. People inevitably violate *some* of the behaviors expected by the society, but don't *always* do so, at least in a stable and powerful society. It became very simple to tie social misbehavior to pain and suffering inflicted "by the gods" as a punishment, and to tie social rewards both now and in the hereafter to proper social behavior. Naturally, one can always find correlated pairs to *support* this explanation, and the many exceptions were chalked up to the well known capriciousness of the gods.

This sort of schizophrenic presentation of God as sometimes-arbiter of social behavior through suffering and natural disaster continues to this very day. People afflicted with (say) cancer are *blamed* for having the disease. Disease is viewed as a *punishment* for real or imagined sins; the fact that the disease is not healed by a miracle is because the afflicted individual manifestly lacks the perfect faith required to be healed, fails to make a large enough donation, was known to be an unfaithful husband or wife. By connecting the effect (disease) with a false cause (failing to worship the right god in the right way by giving the right tithe) considerable social control is exerted on tribal members.

After the two hurricanes in 2005 that devastated New Orleans it didn't take the bible-thumpers long to suggest that the *real* cause of the hurricanes wasn't a bathwater warm Gulf of Mexico with low atmospheric shear (helped out by a silly butterfly in Brazil somewhere that beat its wings just right a few years ago) – no, it was clearly a result of the direct will of God, deliberately directed at New Orleans *because* of the sinful nature of its inhabitants. They were being punished. Of course if that were *consistently* God's behavior, every community in the world would be nothing but a pile of ash, the preachers themselves would in most cases be *struck dumb* for all of the horseshit they've unloaded on the world, and sinful behavior of any kind would have been bred out of the human species long since out of sheer evolution in action. The temptation to exploit natural disasters and disease for the gain of a superorganismic religious entity to which one belongs is clearly very strong.

However, our instinctual need to make sense of the random and uncontrollable is a very powerful one. Even though we as humans pretty much understand what really causes hurricanes and cancer (and can to a tremendous extent predict the course of either one), the explanations are long and complicated and involves all sorts of things *most* people can't be bothered to, or aren't capable of, understanding. "God's will" as an explanation is much simpler and we may even have an evolutionary tendency to accept this sort of thing *as* an explanation. As we shall see in later chapters, this explanation can never be *dis*proven as an explanation for absolutely anything, making it difficult to convince anyone who chooses to believe in it that they are wrong[19].

Back to our story. The greatly enhanced brains with powerful memories tied to imagination-driven analytical units capable of symbolic/memetic reasoning and social intercourse produced, as a side effect that is still not understood (and that this work will not explain, although it will certainly indulge in some idle speculation just for the fun of it), an *awareness of Self* that at least appears to be far beyond that of any other living thing on Earth[20]. This awareness, as we will explore in later chapters, is at once *incapable of conceiving of its non-existence* (because this is literally a self-contradictory process, as Descartes noted) and yet *forced to conclude on the basis of observation that it is limited in temporal scope.*

That is to say, humans die, but while we are living and conscious we cannot, really, imagine the state of not being conscious. At best we might remember "being unconscious" as discontinuous boundaries within our memories. We can "remember" not always having been alive as our personal memories only extend back so far while our *tribal* memories and inferential extrapolation of causes suggest that the world was around long before we were. If we have an accident, or surgery, or take drugs that leave us truly *unconscious* for an extended period of time, that period of time *does not happen* for us.

This is (for those who have experienced it) a deeply disorienting and disturbing process – one minute you are there, in a hospital, counting backwards as you

[19]Although I've been tempted on a few occasions to "argue" with a two-by-four upside the head when some sanctimonious scoundrel has added a healthy does of religious guilt to the burden of someone with cancer. Neither does it explain why God would do such a *horrible* thing as to inflict a hurricane-driven drowning or death by cancer on an innocent little child, although religious dogma does its best by transferring the blame, somehow, back to the rest of us.

[20]Unless cats and dogs *really are* superior beings decended from space aliens who genetically engineered us to take care of them and provide them with a near-idyllic life, but then lost their awesome psychic powers and found themselves at our mercy. Or is that just a movie plot?

are anesthetized and the next it is hours or even days later. You have been *dead* (in the sense that your awareness was suspended) for that entire period but you cannot *remember* being dead because of the contradiction – it becomes a "blind spot" in your memory, inferred because of the lack of continuity in memory that is somehow deeper than the dream-filled process of sleep.

Faced with the *existential crisis* of unavoidable and yet inconceivable death, humans have ever sought to find an "answer" that would permit them to reconcile the two and cope with the very real and immediate pain of the death of loved ones, with illness, with injury, and above all with the mix of steady progression of an aging process leading to inevitable death and the myriad of ways death could randomly seek one out in the meantime. As a purely evolutionary reptile-brained instinct, nearly all volitional animals have a built-in urge to survive,[21] but in humans the ability to *conceive of the inconceivable* that came with the ability to build self-referential symbolic maps raised that urge to the level of a positive mania.

Deity, as a cause for everything, rapidly became a cause for death as well, or at least deity was assigned two attributes that helped humans cope with death's omnipresence and inevitability in their lives. The first was immortality – the self-aware cause of All Things clearly had to be temporally persistent over the same time scale as the existence of All Things, and awareness/self/soul cannot, as noted above, truly conceive of its own mortality anyway. The second was the ability to *create and preserve* the human awarenesses so that *they* were immortal as well. Once again, this was hardly done in a homogeneous way – every tribe and every society in the ancient world came up with its own mythopoeic solution to this existential dilemna – but as time passed certain memetic patterns with social *side effects* proved more enduring by conferring a greater survival benefit on social superorganisms that were based on them.

Recall that social superorganisms were in the process of co-evolving significant memetic structure that required their "cells" – individual humans – to behave in very odd ways compared to the way that they would have behaved in a state of asocial nature when stripped of all memetic overlay. This process did not conflict with the process of genetic evolution – it superceded it and became a major driving evolutionary force in and of itself.

Two critical conditions were required for memetic evolution to become a

[21] "Survival is good" is one of those built in axioms, or *instincts*, that is hardwired into the brains of pretty much anything that *has* a brain. It isn't irresistable – suicide and altruistic sacrifice both serving as evidence that this is so – but it is pretty darn strong.

significant factor. The first is that proto-humans had to be organized in extended hierarchical tribal structures and gain a significant evolutionary advantage thereby. The preservation and exchange of behavioral and cultural memes requires proximity, numbers, and generational overlap. The existence of a social hierarchy within these tribes, along with a challenging and constantly varying natural environment, both favored the development of new cortex to facilitate social interaction and cope with the challenges of the natural environment as tribes with better social organization and problem-solving skills were more successful than their neighboring competitors when presented with the same challenges.

This advantage was then in a position to *grow dramatically* along with primate intelligence when the latter reached the critical point. We can speculate that the critical point involved the invention of *language*. There exist other social animals that can make tools (in some cases instinctively). There exist social animals that *invent* tools in what appears to be an empirically driven reasoning process. There are even social animals that teach their young, preserving toolmaking memes across generations and giving them a relative survival advantage compared to other social groups that haven't learned to make the tool. However, there are no other toolmaking animals with anything like a true language, even a very primitive one[22].

Language is the DNA of memetic evolution. Without language, toolmaking and social transmission of knowledge can only be transmitted by physical example and visual contact. Neither of these suffice to transmit anything but the most primitive tribal memories, condemning each generation to rediscover many things – or not, and perish in the attempt. Once language advanced to the point where abstract symbolic representation of the world was possible, one didn't need an actual sabertooth tiger to be present to discuss the best way to run from sabertooth tigers (or fight if need be). Language also enabled all sorts of degrees of *cooperative behavior* to be developed between members of a tribe to everyone's mutual benefit. Suddenly (we can speculate) there appeared *memetic rules* for a social hierarchy that one way or another made the survival of the social and familial group itself come *before* individual survival and not after.

Note well: some people object to this sort of picture on the basis of a "selfish gene" picture of evolution that has every individual always doing that which makes their own personal probability of survival to reproduction maximal. That's silly. First of all genes aren't selfish, individuals are. Sometimes being selfish is

[22] I can hear you thinking "Aha! But what about X! *They* have a true language and use tools..." for some value of X, say, bees, or maybe chimpanzees. To which I can only reply no they don't and if they do, who cares. You get my point.

a big win. Sometimes – frequently, actually – it gets you killed. Game theoretic studies of things like the Prisoner's Dilemma[23] show that in fact it is startlingly easy to come up with scenarios where nonselfish behavior is maximally selfish[24] and that in fact they tend to occur in a *social context* where there is a *memory.*

Second, this is a highly naive view from the point of view of pure empiricism. After all, this sort of thing – collective/cooperative organism evolving out of previously competing organism – has happened before *many times*, beginning when two extremely primitive cells stuck together when dividing and proved to be more robust and likely to survive together than either would have been alone. They had lots of little dicellular children until one day one of their children turned out to be quads. The many times removed descendant of those cells, up to fifty trillion or so and still counting, is now typing this document and calls the many times removed descendants of the cells that *didn't* stick together and become more complex "germs".

Finally, memes are quite powerful when it comes to determining human behavior – they are clearly *more* than powerful enough to absolutely dominate human evolution. Consider the evidence of what feral children can accomplish with nothing but their DNA versus what children raised on memes can accomplish, all things being equal. Consider the tens of millions of humans that die every century engaged in self-sacrificing behavior such as fighting in the military or entering a burning building to save a child. Face it, a selfish meme theory trumps a selfish gene theory every time.

All of which leads us to conclude that at some point the first "human" sociomemetic superorganism was born, and once born it simply blew away all competition in the form of less organized tribes and the challenges of nature alike! This was a startling development! The significant transmission of memetic information between generations within a tribal social structure, however, provided a *powerful secondary mechanism* for the development of cooperative behavior, just as it does in repeated play (with a memory of the history of betrayals) of the prisoner's dilemma!

By the time humans had evolved to where complex social groups were a necessary survival advantage, and language had appeared on the scene to facilitate memetic evolution, the state was set for rapid discovery. However, it is probable that initially "reason" per se had very little to do with the discovery process, which was likely almost entirely empirical and associative. Successful

[23]Wikipedia: http://www.wikipedia.org/wiki/Prisoners Dilemma.

[24]Er, I think. How did that go, again?

ideas that were "accidentally" discovered or discovered using very simple reasoning processes were preserved, of course, conferring advantages on the tribe that developed them. Deity explanations reinforced the tribe and encouraged the growth of ever more complex social structures, but only at the expense of the incentive to seek more complex proximate causes. For a while memetic/brain co-evolution (although immensely faster than the previous million years or so of mostly genetic evolution) was still random and quite slow.

Memetic evolution is capable of occurring through a *non*-random mechanism that is very *different* from that used in genetic evolution in certain key ways. In particular, there exist systematic ways to extend successful memetic knowledge that don't require crossover and exchange (although they still can benefit from them). Again, however, mankind awaited a kind of critical point discovery that would tip the balance. That discovery was the discovery of reason.

1.3 The Advantage of Reason

Note well that the entire previous section or two said very little indeed about the role that reason played in the development of the *answers* to the big questions that are, after all, the subject of this chapter. That is because it was *not* much of a factor for most of the last million years or so – genetic and memetic co-evolution was the powerful driver for turning monkeys living in the moment into philosophers that are *capable* of reasoning and *value* reasoning and can develop *systems of reasoning*. Such reason as there was was very primitive – a seeking of and naming of primary causes in an inferential associative chain that we *lacked the means* to systematically analyze.

Lest you think that this is not true, recall the previous observation that induction does not necessarily lead to truths. This is especially true when analyzing observations: "correlation is not causality". *Post hoc ergo propter hoc* is a *fallacy*, not a well-reasoned argument. Just because things are correlated does not mean that one is the cause of the other, yet sometimes, of course, it *does!* In fact, correlations of one sort or another, in the form of systematic observations revealing systematic situational behavior, is the only thing that our human brains have had to work with while working out things like physics, chemistry, biology, and so on.

Let's see, we have correlation, we infer causality. How do we find reason in all of this? Reason is deductive. Without it, on the other hand, how do we make progress organizing our causal hypotheses? Somehow we need both, but they belong in different realms – one a realm of conditional certainty (which isn't certainty at all, as we will see) and the other a real of at best probability (note, not certainty either). Hmmm, a bit of a bootstrapping problem – how can you invent reason – without the help of reason? Through induction?

Fortunately, our brains had help.

The underlying mechanism of evolution provides its own sort of "reason" as it picks out solutions that "work" (survive) from the sea of ones that "don't work", but the function that it optimizes isn't "truth" per se but "superorganismal fitness" – survival of the social group (and possibly the individual) associated with a given set of memes. There are obvious places where the two are congruent – pretty much all of natural science, for example, where a superior mastery of science and engineering and reasoned warfare has provided overwhelming superorganismal advantages – and equally obvious places where the two are not, as distinct social groups are organized around completely different and conflicting religions that cannot all be "truth" and that seem to convey about the same degree of survival advantage.

It is only in the *very recent past* that reason (in the form of formal philosophy, mathematics, and science) has emerged as a significant factor in the co-evolution of memetic superorganisms. It literally could not emerge until the *human brain* and *human language* had co-developed to the point where the language could *semantically* encode formal reasoning processes, and it *did* not emerge until a *written* language had been invented that was capable of precisely preserving symbolically encoded statements for timescales spanning generations[25,26] .

The very earliest symbolic philosophers immediately noticed that the results of the system that they developed were *relevant* to the needs of both individuals and the superorganism of which they were members. Doubtless they extended and formalized verbal reasoning processes that had proven fruitful even before being symbolically encoded, but the ability to symbolically encode the arguments and "save" them for incremental analysis permitted *much longer* chains of reasoning to be carried out than one could hold in one's mind alone.

[25]I personally would argue further that for *most* humans the human brain is *still* only borderline capable of engaging in true analytical reasoning without the amplification of intelligence inherent to using symbolic reasoning on external media. With the possible – and note well that I say possible – exception of transcendent supergeniuses such as *Ramanujan* who did not apparently require paper and pen or clay and stylus or sand and stick to work out complex symbolic proofs, even the brightest physicists and mathematicians are crippled without the ability to do algebra on paper.

[26]Wikipedia: http://www.wikipedia.org/wiki/Ramanujan. A lovely article that otherwise has nothing to do with our current discussion.

Much of this development was conducted in a sort of *memetic competition* with the prevailing religious superorganism, which *already* had developed answers to many of the same questions that were now being systematically addressed with memetic tools that were *more powerful* than language and cultural mythology alone. Two interesting things occurred almost immediately in the context of this competition. First of all, philosophers armed with symbolic reasoning attempted to tackle once again questions of all sizes, from everyday questions concerning the best way to build things to the *super-ultimate why* (SUW) question – the why of existence itself, the why of *Deity* if you consider Deity to be the reason for existence, the limit of the infinite chain of why questions that underlie any analysis of cause[27].

Second, the very act of asking what could be the cause of Deity and the reopening of *many* questions that already had memetically prescribed answers within a politico-religious system triggered the defenses of the superorganism that had co-evolved along with the entity itself. These defenses (which will be discussed in detail) can be thought of as very similar to the system of antibodies and immune cells that exist in most organisms – they differentiate between genetic "self" and genetic "other" and act to preserve the one while terminating the other with extreme prejudice. This is not a *reasoned* process – it cannot be, as a considerable portion of this work is devoted to making clear.

As it happens, though, reason has proven to be *too useful* to be eliminated by the allergic reaction of the prevailing religion of any given superorganism, however fervently and passionately that reaction has been pursued. Superorganisms where reason *was* successfully suppressed in favor of a politico-religious meme set have gradually failed when confronted with similar superorganisms where reason was treated more liberally in a process that continues to this very day. Over the course of time, the progress of reason has advanced so rapidly that it has overtaken the ability of various superorganisms to absorb the changes and retain social identity, leading to strong internal conflicts within those superorganismal cultures. This too is a major focus of this book.

Before we get there, though, we need to *examine* reason itself, and try to understand just what sort of beast it is, where it came from, how it has been formulated historically at its deepest levels and where that formulation is or isn't technically correct. We need to understand the *Laws of Thought* as one of the original codifications of the reasoning process. Ultimately we need to understand the essential role played by *axioms* in constructing systems of reason

[27]The SUW question and question chains are quite familiar to any parent of small children, as is the actual, rationally unprovable answer: "Because!"

that are capable of "explaining" anything at all and the *strict limitations* that a need for axioms places on the conclusions of the process. Since we are talking about knowledge derived from *abstract symbolic processes*, all of this needs to be done in the context of what it means to "know" anything at all.

Great fun, actually. We therefore leave the questions behind for a moment and look instead at the ways we might *rationally* try to find some *answers*.

Chapter 2

The Laws of Thought

2.1 Making a Living as an Early Philosopher

Philosophy, as we see, necessarily co-evolved with religion and politics in society. To survive, early symbolic philosophers rapidly learned to focus on the dirty job of answering "unanswerable questions" that had fallen through the cracks of the prevailing religion and hence didn't provoke a short trip to a stake surrounded by highly flammable material (or to an altar to have your heart ripped out, or to a prison cell where you would die of disease and malnutrition forgotten by all other humans, or...). Philosophers learned that religions didn't usually care about *geometry*, for example, and that geometry was useful. It was also fun to work on (for those people with the right kind of brain) and got a lot of attention as a kind of "truth" that didn't seem to depend on any particular *things* observed in one's sensory stream while still seeming to *describe* many of them.

Occasionally a particularly brave or stupid philosopher would take a stab at something more metaphysical (such as trying to invent an explanation for what everything was made of) or humanistic (such as working out social ethics on a "rational" basis). History contains many examples of philosophers who discovered the hard way that this led to a choice between voluntarily drinking hemlock or being burned at the stake to protect common folk from your heretical views and as an example to anyone foolish enough to believe that anything but the *currently accepted* system of social ethics and religious memes was the right one *beyond question*[1] ,[2]

That is, to make a *living* at being a philosopher (and not get killed), it was soon found to be necessary to *invent new questions* that could actually be answered and that looked “interesting” in some way. One had to do so while creating the *illusion* of answering, or at least working on, the really hard ones, the big questions, all without offending the local political power (usually a King) or provoking the prevailing religious hierarchy by directly contradicting scripture. Indeed, to be truly successful, it was often necessary to have the active *support* of either the church or the crown if not both, and there are numerous examples of philosophers who survived in just that way.

As noted in the last chapter, logic and argument and rhetoric in general doubtless coevolved with (spoken) language itself, but real human language is pretty ambiguous and imprecise and arguments in it tend to be sustained at the alehouse level. One of the greatest discoveries in the history of humankind was that of the “magic” of algebraic manipulation of symbols that permitted the *abstraction* of concepts and relationships observed in and relevant to the “real world”. As key elements of this discovery, philosophers invented two very important tools: *Formal Logic* and its more precise and abstract cousin, *Mathematics*, along with written language.[3]

[1] Wikipedia: http://www.wikipedia.org/wiki/Galileo. We'll have more to say about Galileo's prosecution by the Inquisition for having the temerity to challenge the geocentric view of cosmology that appears repeatedly in the Bible. The current article in Wikipedia (in my opinion) presents a view that makes the Catholic church appear far more progressive than any reading of the primary documents justifies. It is important to view the event in the context of the ongoing and contemporary “revolt” of Martin Luther. Many thought – correctly – that Galileo's work would further inflame this rebellion against the authority of the church, and Galileo's work was indeed a factor in the Enlightenment. *Individuals* within the church may well have been progressive, but the superorganism itself quite rightly sought to defend its collective soul at all cost. See the Appendix on Galileo in this book.

[2] Wikipedia: http://www.wikipedia.org/wiki/Trial of Socrates. We'll have a lot to say – much of it good clean fun – about Socrates. Socrates managed to run afoul of *both* the secular *and* the religious authority, making fun of the former and and challenging the Gods that supposedly protected Athens against its many enemies. Socrates also claimed (metaphorically, of course) that he had a *daemon* in his head that told him what the “good” was and how to avoid mistakes and that generally guided his reason. We will have more to say about this daemon, which has a very Zen feel to it, the watcher that watches the watcher watching the world. For example, one is very tempted to assert that Socrates was groping towards a concept of freely chosen *personal meta-axioms* that form the *substance* of this daemon and are the basis for its “whisperings”, that ought to *preceed* the choice of axioms of religion, political view, ethical view and not follow it.

[3] In addition to providing one with symbols that could be manipulated using (say) clay or sand or papyrus as an extension of the human brain, writing extended the social lifetime of

Mathematics and Logic were immediately useful, of course – bookkeeping, monetary economics, the successful waging of war, the arguments of law, the engineering demands of architecture and winning at a variety of games of chance all relied on understanding and being able to manipulate numbers and shapes and verbal arguments based on historical records to guide future behavior. Some of the very earliest examples of written language are basically bookkeeping records, and large armies (as opposed to "hordes") have always required quantitative logistical planning to transport and support in the field. Verbal argument was doubtless a major component of successful business relationships and conflict resolution, and required a way of determining valid sequences of conditionally true statements as the argument was advanced to be successful.

Thus it was that the card-carrying philosophers of antique and modern times[4] [5] [6] [7] [8] [9] developed *formal logic* as the basis of a *reasoning* process they could bring to bear on questions both deep and abstract and immediately practical. Being (after all) clever, they also invented *schools* where they could develop and pass on their own small changes in the prevailing memetic schema directly to selected young humans, bypassing a lot of potentially dangerous review by religion and king – or better still educating the future priests and kings themselves within their schools – and creating a long "social lifetime" for their ideas. In this way new memes they invented sometimes served as nucleation points that would grow and actually be adopted by entire societies.

Formal logic (as will be discussed later) became a *widely accepted memetic schema* for determining truth value or formulating powerful arguments. It ws very simple and intuitive, but proved very powerful as a basis for symbolic reasoning.

Much of the basis for formal logic can be found in the so-called *Laws of Thought*, which date back at *least* to the aforementioned Parmenides, although

ideas. Abstract discoveries developed before writing became common had a much harder time being "remembered" unless they were adopted as a critical part of an oral tradition within some superorganism, usually a religion. Thus the Vedas and the great Hindu Epics survived until written Sanskrit could capture them, but how many stories, tales, myths, were lost before they were recorded simply by being forgotten? Without the critical support of a written language, even if there was a super-genius of logic and mathematics born in, say, 1200 B.C.E. in India, or in Greece in 800 B.C.E. their work did not survive long enough to be written down.

[4]Wikipedia: http://www.wikipedia.org/wiki/Parmenides.

[5]Wikipedia: http://www.wikipedia.org/wiki/Socrates.

[6]Wikipedia: http://www.wikipedia.org/wiki/Plato.

[7]Wikipedia: http://www.wikipedia.org/wiki/Aristotle.

[8]Wikipedia: http://www.wikipedia.org/wiki/Heraclitus.

[9]Wikipedia: http://www.wikipedia.org/wiki/Pythagoras.

the ones that we will study below are in a form attributed to Aristotle, who wrote prolifically and whose writings (for a variety of reasons) did a better than average job of surviving to today.

Incidentally, Parmenides had some really good stuff in the few of his writings to survive that were left out of Aristotle's Laws of Thought, in particular a concept of the *void* not at all incompatible with Zen's Mu (discussed below). This served as a precursor to concepts (such as that of a *vacuum*) that eventually became Natural Philosophy (in particular, Physics).

However, the language and world view of both Parmenides and Aristotle were unsurprisingly hung up by the idea of *time* (a situation that persisted until the last hundred years or so). Lacking a proper understanding of space-time as a *single* geometry, *verb tense* worked its way into the Laws of Thought where one would expect them to be time-independent and sequence-independent. Even today, one of the hardest things for students of physics to conceptually grasp is that in a relativistic Universe, time ordering and sequence are not what their classically trained perceptions tell them they are.

In fact, they are essentially *classical* laws in other senses as well and are in many ways blind to the possibilities of non-classical theories. As we will see, our notions of existence, causality, temporal sequencing, inference and more rely on *many axioms* which are *not* objects about which one can reason using the laws of thought, and which are, in fact, far from being "obvious" or "self-evident truth" the way they were for Aristotle.

Before we move on and examine the Laws of Thought, set theory, and logic itself, it is worth noting that both India[10] and China[11] were writing down theories of knowledge and rules for inference that were roughly contemporary with those of the Greeks. In both cases the actual rules very likely existed as oral tradition long before they were written down. The Indian rules, in particular, formed the basis for what might be called "Buddhist Logic" which is quite different from Aristotle's formal analysis of syllogism. In particular it focuses less on "proof" and more on fallacies and on ways of grading hypotheses. Its purpose seems to be the practical one of using their "logic" (perhaps better called "reason") to teach, to bring to the auditor of an argument conceptual or causal understanding of the subject at hand[12].

[10]Wikipedia: http://www.wikipedia.org/wiki/Indian Logic.

[11]Wikipedia: http://www.wikipedia.org/wiki/Logic in China.

[12]The Nyaya school, in particular, introduced the notion of four sources of knowledge: Perception, inference, comparison and testimony. These are not at all incompatible with the structure of knowledge as presented in this book. The Aristotelian syllogism (and its formal descendants)

2.2 Thought and the Joy of Sets

Here is at least one way that the Laws of Thought are commonly stated:

- *The law of identity:* Any thing that is, is.
- *The law of contradiction:* No thing can both be and not be.
- *The law of the excluded middle:* Every thing must either be or not be.

Where I deliberately use various versions of the verb "to be" conjoined with "negation", the version of these laws given by modern logicians might use "be true" and "be false", although these are not precisely the same thing. Truth and Non-truth are much subtler concepts than Being and Non-Being, and the latter concept pair is subtle *enough* to cause us no little amount of difficulty.

Note well that I say "modern logicians" in the paragraph above. In some very deep sense mathematicians and philosophers and logicians[13] have advanced *formal logic itself* more in the last hundred or so years than they did in the previous indefinite interval of time preceding the late 1800's or early 1900's. Yet historically, systematic analysis of our *understanding* of things began with these simple Laws of Thought as expressed by the Greeks. That's an excellent reason to postpone until a later chapter the discussion of formal logic per se and concern ourselves with the *existential* analysis of a Real Universe using the Laws of Thought themselves. After all, our ultimate concern is with knowledge of a Universe that actually exists, and the rules of logical inference are perfectly happy establishing *abstract relationships* between *abstract symbols*, often relationships

is a useful tool *after* one chooses axioms but provides no guidance on how to make those choices and little insight on how knowledge arises in the first place. The Indian school of logic was carried into China along with Buddhism itself, where it mixed with e.g. the social rituals and legalisms of Confucianism and the mystical dynamics of Tao to eventually form "Zen logic" – which isn't, at least by the standards of the West.

Zen emphasizes direct perception of the Real, unclothed by the (to it) distractions of language, formal syllogism and inference, very tightly connected to schools and heuristic scriptural tradition. If anything, Zen views syllogism and formal reason as an insidious trap, where your answers are preconditioned by your deepest and most unquestioned beliefs (your personal axioms, as it were) – a point of view with which this work very much agrees. The Koans of Tao and Zen are hence in *some* sense equivalent to syllogism as a foundation for "the rational" in a culture but their purpose is very different. In a sense they attempt to bring one to a transcendant realization of the *right axioms* for Enlightened living, from which point ordinary commonsensical reason in pretty much any language or culture permits one to arrive at right conclusions.

[13]And individuals who can be counted as all three at once.

and symbols that "exist" only in our *imagination*, that shadowy realm of looped experiential reality where we can hallucinate, dream, and think of *six impossible things before breakfast!*[14] We will therefore begin our examination of Thought with the *concrete* instead of the *abstract*.[15]

We will find that the concrete (as abstractly expressed by the Laws above) is a bit mushy and hasn't quite set yet, but that it contains a few hard nuggets that somehow must form a foundation for all knowledge.[16] Let us begin like proper scientists, even though we really don't know what it *means* to be a proper scientist yet, by being very, very skeptical. I mean, like, cynical. Mistrusting. Doubtful. We will try to understand the Laws of Thought in some sense that doesn't require *words* or other symbols by chopping the words themselves apart and attempting to realize the concepts in a way that is more *existential* than *analytical*.

To put us into the proper frame of mind, let us begin by *doubting* all of these Laws. The fact that they are usually presented as *self-evident truths* should not deter us. First of all, they are *not* self-evident truths – we haven't even figured out what they *mean* as they are expressed in English (or for that matter in Greek, or Hindi, or Hopi).[17] Second, a point that will be relentlessly hammered in this text is that historically, a tremendous number of advances in e.g. mathematics, physics, psychology, sociology, and really pretty much all of human intellectual endeavor have come about when people *rejected* "obvious truths" and explored the consequences of *alternative* "truths". Being a physicist and knowing way more than is good for me, I can even express *why* this is so in terms of optimization theory on a rough (non-convex) landscape.[18] "Truth" is often analyzed in some

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[14]From Alice in Wonderland, in case you forgot...

[15]Ho, ho, ho. Like you aren't *reading* this book...

[16]Sorry, but I'm a metaphor fanatic, largely because human language is so marvelously non-linear and compressive. You will just have to live with this, or go buy a book on Logic and Set Theory and work out about umpty zillion empty theorems that, when they are done, tell you *nothing* about the real world you live in beyond what you already knew...

[17]Wikipedia: http://www.wikipedia.org/wiki/Sapir-Whorf hypothesis. An important question in the Philosophy of Mind or Philosophy of Language is to what extent our conceptualization of the Universe is shaped by our language (and other "learned" filters). The famous "example" of this is Whorf's analysis of the Hopi language (although there are many other related analyses that have now been performed for many other languages) where he asserted that an individual raised to *think* in Hopi might have an easier time understanding, say, Relativity Theory because linguistically time is treated in exactly the same way as space, where in English the concept of time is built into verbs and sentences as *tense*.

[18]Wikipedia: http://www.wikipedia.org/wiki/Optimization (mathematics). Yes folks, you heard it here first. Your language, your personal axioms, your beliefs all give you an understanding of the Universe that is a solution to a generalized *optimization problem* in a very high dimensional, very abstract space.

convex region of this "logical landscape" in such a way as to effectively "lock" analytic conclusions in some reasonably self-consistent way to some optimum, where making *small* changes in some logical argument yields immediate change away from optimal *truthiness*[19] , allowing proponents of the accepted optimum to assert its obvious and unquestionable correctness.

However, then along comes an *iconoclast* who makes a "long jump" in the underlying propositional space on the basis of some heretical intuition or another, and the next thing you know all of human understanding is *reorganized* around a *new* optimum – at least until the next brilliant iconoclast comes along. Hence the Copernican/Galilean revolution, hence the Newtonian (classical) revolution, hence the non-Euclidean and non-Aristotelian revolutions, hence the ongoing Gödelian revolution, hence the Relativity revolution, hence the Quantum revolution, hence.... you get the idea.

Interestingly, as a teacher and researcher, I have long observed that it is *dangerous* to *know too much* about any subject if one wishes to *advance* that subject, just as (paradoxically enough) it is dangerous to know too *little*. For example, physics (say, classical Newtonian non-relativistic physics) is generally presented to impressionable young students in an *overwhelmingly logical way*. A logical calculus of being is developed and carefully connected to everyday observations. Objects are assigned coordinates and causality is formalized in terms of differential equations of motion that are so overwhelmingly *perfect* and *internally consistent* that the observation of an incredibly strong correspondance between this system and everyday experience seduces the mind into saying "Aha! This is it! Truth!"

If this isn't enough, we enlist the Brain's own biochemistry and hormonal system, designed to help us *survive in a hostile world* where *fight or flight* can become necessary at any moment by *punishing* and *rewarding* students to a greater or lesser extent in the various versions of Academe around the world according to how well they *master* this system via *conditioned learning* as *if* it really were *Truth*.

But of course it is not, only an approximation that *appears* to work because of the relative scale of a single constant, because of our silly insistence on viewing time as an *independent variable indexing causal time evolution* instead of a *spatial coordinate of essentially static events*, because of our insistence on the *idea*

[19]Wikipedia: http://www.wikipedia.org/wiki/Truthiness. The link in case you've never watched *The Colbert Report* on television. We discuss the notion of truthiness itself below, so you don't really need to go read this before proceeding.

that "objects" exist at all at specific points in space and time with certain *"obvious"* requirements of continuity on the underlying functional description of that "existence". All of which, alas, turns out to not be the case.[20] Small wonder, then, that we have to wait for students to come along who are *a bit lazy*, who are *rebellious*, who are too stubborn or stupid to be properly conditioned, who are unafraid to go all the way back to the beginning and start over making *different* basic assumptions in order to precipitate one of these conceptual revolutions.[21] That which is imagined to be "known" is a trap to our imagination from which we can escape only by dint of immense effort and a certain amount of pain.

When it comes right down to it, Truth is pretty much *Truthiness*. Truthiness is a quality of knowledge assigned on the basis of *intuition* or *instinct* – "from the gut" – instead of on the basis of rigorous logical analysis and connection to things like facts. Very shortly we'll have you hanging out over the existential Pit of Despair, where we will make the true but unprovable assertion that logical analysis and what we consider to be "facts" are inventions of our intuition, possibly supported by our instincts, and hence logical analysis itself is illogical. With that understood[22] we will now proceed to analyze the *truthiness* of the Laws of Thought.

What *kind* of beast, we might start by asking, are these Laws? No matter how self-evidently correct you might imagine them to be, ultimately they are *semantic assertions* in a language, and (like thought itself) exist only in the realm of our imaginations. To "do" anything with them we must imagine a set of definitions and a formal reasoning process in a symbolic language in which the Laws are assumed to be constraints on the symbolic objects about which we wish to reason. Ultimately, such an *imaginary* reasoning process will take a given set of *imagined* (and hence conditionally true) premises and reason "correctly" according to the rules to some given (necessarily conditional) conclusion, where we defer until later just what this process is and how it works.

[20] The Politically Correct way of gently saying wrong, wrong, wrong.

[21] Wikipedia: http://www.wikipedia.org/wiki/Einstein. Which is not really lazy at all, hmmmm. Einstein was, in fact, considered both lazy and rebellious by his teachers who couldn't understand why he didn't give a rodent's furry behind for most of what they "insisted" that he be drilled in in school. Really, one can go down the list of philosophical revolutions and find a lazy heretic iconoclast behind nearly every one. This is the *tragedy* of Aristotle and Euclid and Newton – their contributions, however awesome and majestic, didn't come with a warning label that they were just one small step on a path that we are making up as we go, don't take this too seriously, let the buyer beware!

[22] Or not. Don't worry about it yet. Hopefully you will, eventually.

Since we are making the whole thing up in our heads, we can therefore perfectly reasonably ask whether or not we can *equally* well think up *other* definitions and rules for a a symbolic reasoning process constituting Laws of Thought in which the imagined objects of the reasoning process *are not* required to strictly either "be" exclusively or "not be", with no middle ground possible. Maybe we can, maybe we can't, but there is no harm in trying.

Although we won't discuss the details until later, we already have what we need to develop the primary ideas of this book, neatly captured in the observation that the process is *imaginary* and truths are at best *conditional*. This means that there is a fundamental rational disconnect between abstract rational systems and the real world that can only be bridged by means of a system of axioms that permits us to relate our symbolic conclusions to our instantaneous experience.

Subject to this whole raft of assumptions, if you are reading this at all you are old enough and wise enough to know that the *real* reason we adopt the Laws of Thought is that they seem to *work* to describe our experiences trapped as memories of that which we call the "real world". It seems worthwhile then, to look at some of the *details* of that real world as revealed by our experience in the form of experiments, as well different sorts of experiments with alternative forms of reasoning systems. Our goal will be to see whether the Laws above are really *assumptions* or whether they are instead *necessary truth* – not assumptions at all, but rather things that cannot be *conceived* of as being any different.

Let us begin, then, by looking at a wee bit of physics.

2.2.1 Quantum Theory and the Laws of Thought

The Laws of Thought above are essentially *classical* laws. They describe objects in an essentially unitary way, and embody a *perfectly dualistic* classification of all the objects to which they can be referred. Things that are, are. Things either are or are not, and must be one or the other (whatever a Thing is and whatever all that "means").

For a moment, let us forget the "game" of logic and use our senses instead of our sense[23]. Is *nature* (as an inferred collection of of *real* Things) really like that? In classical physics the answer seems to be yes, things have a definite state and that state can be (in principle) completely known by means of measurements. I can therefore speak of (say) an electron as an object of definite charge, angular

[23] Really, of course, one has to use a great deal of both to figure out the various factoids I pitch around in this chapter, but I couldn't resist the line.

momentum and mass that has a definite existence at a definite position in space at a definite time with a definite velocity. According to the Laws of Thought, a *unitary* object cannot be at more than one place at one time, and most definitely cannot be "created" out of nothingness – in fact this was quite literally one of the first *conclusions* arrived at by Parmenides and embraced by Aristotle.

Nature, on the other hand, says otherwise. In quantum theory (which I occasionally teach) real "things" such as electrons can "be" at once a particle with particle-like properties and a wave with wave-like properties. By coupling macroscopic systems to the peculiar way things like electrons are necessarily described, Schrödinger's famous cat in its infernal box can *in principle* be in a state that must be described as both dead and alive, at least until we open the box[24] .

Even if the idea of building a box containing an apparatus and cat that is sufficiently decoupled from the random state of the rest of the universe to make this *actually* work is a bit dicey (I personally do have a few issues with this, as do/did many physicists including for that matter Schrödinger himself) the basic point is still valid at the microscopic level: if one makes *any* given partitioning into a dualistic set of states that are described by *classical* coordinates of the electron to whatever degree that you like, one *must* place the electron into a state of *mixed* being/not-being in another set of states.[25]

We find that *even though the electron is a point particle* that can be measured (in principle) to be at a single point in space as accurately as we like[26], in general we cannot think of the electron as an object that is *either* at point $x = A$ *or* at point $x = B$ where $A \neq B$, or (perhaps more importantly) reason as if it were. The point-like electron is also wave-like, and can be thought of as "being" at

[24]Wikipedia: http://www.wikipedia.org/wiki/Schrodinger's Cat. I tell you, cats and philosophers have a sorry history together. Schrödinger's "infernal device" is just one example. An ancient Zen Master told his surrounding students that if they couldn't answer one of his silly Zen Koans he would cut in half a perfectly inoffensive (but handy) feline. Naturally, they failed, and so did the cat.

I promise, the only cats injured in the writing of this book were metaphorical ones.

[25]The difference is profound – later we will get a taste for this by considering quantum versus classical computing, where there are very strong connections between computatability and logic, and where being/not-being is replaced by a more prosaic truth/falsity as represented by 1/0.

[26]Well, possibly not. But the failures either aren't germane to the argument or if anything make them still more cogent, as we'll shortly see. In any event, infinite resolution requires an infinite amount of energy. Our current *belief* that the electron is a truly point-like particle stems from the extrapolation of finite measurements to a presumed infinite limit and the problem of needing to figure out what holds an electron (or any "elementary particle") together if it has finite extent.

both points until one performs a special kind of measurement that localizes it, which makes some *other coordinate* uncertain. There are two-slit experiments that have been done with actual electrons that perfectly illustrate this point, as well as the even more mysterious Aharonov-Bohm effect[27] .

In quantum field theory things are even worse, with *empty space* being perfectly capable of turning into an electron and positron pair for a sufficiently brief period of time to "polarize the vacuum". Certain experiments (the same ones that often try to localize an electron by for example bouncing other charged particles off of it) can *knock pairs out of the polarized vacuum*, creating electrons out of one kind of "nothing", as it were. *Existence itself* (of electrons) turns out to be a wee bit ambiguous from the point of view of the laws of thought, yet these things are all readily observable so that we know that in some sense this ambiguous picture is "true".

For many years some of the brightest of physicists rejected the formulation of quantum mechanics *even though it worked and nothing else did* simply *because* it appeared to be a description of a system's state that permitted things to "be and not be" and hence seemed as if it might lead to the possibility of *real* paradoxes in our experimental view of nature. However, it was gradually determined that quantum mechanics has its *own* Laws of Thought that map into the classical Laws in a way that precisely prevents the occurence of real paradoxes, even as it *forces* us to alter the way we view small objects such as nuclei, atoms and molecules. The quantum Laws simply lack the classical "sharp" dualism implicit in the Law of Contradiction and the Law of the Excluded Middle in certain contexts with a "fuzzy" sort of dualism between conjugate variable pairs[28] . Our brains, however, are *evolved* to form a *classical conceptual map*, and have a very hard time understanding how a single particle can pass through two slits at once or have properties that measurably change if we change a potential in a region where the particle *never visits.*

Quantum theory can therefore easily appear to be *illogical* to an untrained observer (and of course it is, from a classical point of view) but the lesson we learn from its success and from mathematical investigations of things such as curved space geometry and alternative logical systems is that the Laws of Thought above, however useful in certain contexts, may *not* in fact be "universal self-evident truths".

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[27]Wikipedia: http://www.wikipedia.org/wiki/Aharonov-Bohm effect.

[28]Wikipedia: http://www.wikipedia.org/wiki/Heisenberg Uncertainty Principle. Conjugate variables are things like x (position) and p (momentum) which cannot both be known (measured) simultaneously to arbitrary precision.

Don't misunderstand me – the Laws of Thought are rules that *work well* as the basis of a system of reasonably consistent and complete reasoning that is *a posteriori* relevant to much of our *experience*. They might, however, not be the *only* such set of rules, and (as we'll discuss at great length later in this work) the phrase "reasonably consistent and complete" (as opposed to *absolutely* consistent and complete) was very, very deliberately chosen. Therefore, even if we accept them as a *provisional basis* for reasoning (as we will throughout most of this work) we need to *carefully consider* the possibility of there existing alternative systems of reason all the way down to the Laws of Thought themselves, and indeed try to determine an even *more* abstract way of encapsulating the foundation of a system of reason.

A final thing to carefully note for later before moving on is that these Laws seem only to function in that peculiar sixth realm of our sensory experience, our memory, imagination, and other Self-generated interior monologue. Reason requires an *object*, where "things" of our experience just "are". Hmmmm.

The process of critically examining the very basis of how we "think" rationally is something to take very seriously. Reason is so *much* a part of our everyday lives that it cannot hurt to turn reason back upon itself (a process that we should *expect* to lead to some "odd" results and paradoxes, as self-referentiality leads to very strange results) and try to understand both how it works and its limitations. Human conflict is all about *disagreements* and somehow we think that if only we used Spock-like logic[29] there could be no disagreement, no contention, no violence, no war. We *expect* reason to be able to provide answers to those SUW-class questions that arise in every human heart, and we expect philosophers to "do the job we've paid them to do" for a few thousand years and come up with those answers and communicate them in a form we can understand and agree on. After all, we have plenty of folks selling various forms of snake oil, be it religious dogma or political tripe, who are all too happy to fill in the missing pieces to our great collective misfortune.

A significant part of this book is devoted to trying to convince you[30] that *pure reason is a subtly flawed tool*, especially when applied uncritically to the "big questions" of the last chapter. Reason is great if you are a physicist or

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[29] Wikipedia: http://www.wikipedia.org/wiki/Spock. If you've never seen any of the original Star Trek series and are clueless about Spock, you have my deepest sympathies, but you can still follow this link to get an idea of what I'm talking about.

[30] I will refrain from asserting that I "prove" anything at all beyond any doubt for "reasons" that are hopefully already self-consistently clear. It's so difficult to be rational about reason, after all.

computer programmer or mathematician and work from the right set of axioms, postulates, premises, definitions, to desired *conditional* conclusions that may or may not empirically *seem* to apply to the real world for reasons that we cannot absolutely prove or fundamentally understand.

Reason, as one can easily see, requires a presumed mapping between "objects of our sensory experience" (including meta-objects as symbols in our imagination) and "meta-objects as symbols in our imagination" that can never be justified by reason itself and is *inevitably* self-referential. However rigorous and powerful a structure reason erects on whatever foundation of assumptions one (literally) dreams up, reason itself can *never* provide or justify that foundation (or do the dreaming!), and self-referentiality leads to its own set of problems as we shall soon see in considerable detail.

With this as a motivation, let's take a closer look at the classical Laws of Thought listed above and think about the *details* of what they say and try to make sense of them *in English*[31] as all too often we have discovered that statements in human language are not sufficiently precise to serve as a basis for the development of either math or science. Note well that I used the phrase *semantic assertions* to describe at least two of these laws. Without wishing to get drawn into the morass of semantic terminology[32,33] – semantics is about *meaning*, and is more often than not associated with "what symbolic objects represent" distinct from the *class relationships* that are asserted to exist between the symbols as representatives of those objects.

With this in mind, the Laws of Thought appear to be used as the basis for establishing relationships across *all* symbolic mappings (symbol into meaning with associated functional relationship) in some Universe. This needs to be clearly understood. They serve as *presumed constraints* on both the (semantic) symbolic mappings and their "classification" by means of rules, and yet appear themselves to be rules applying to the union of all symbols and presumably to the

[31] Yeah, yeah, yeah, Parmenides wrote in Greek, things get translated to Latin, eventually folks write about them in English, who *knows* what was originally meant. Who cares? We happen to be reading a book that was *written* in English, don't we, so let's just smooth down those ruffled feathers and move on.

[32] Wikipedia: http://www.wikipedia.org/wiki/Semantics. This is a decent place to learn exactly what "semantics" really is, if you care. Or you can take my word for it that semantics is all about the true meaning of the symbols used in reason, the *map* that is not, in fact, the *terrain*. Ooo. More on this later.

[33] Wikipedia: http://www.wikipedia.org/wiki/Semiotics. You might also want to read a bit about *semiotics*, although it is more concerned with "human" communication and reason than set theory or information theory, alas. Still, you'll often hear both of these terms bandied about as if they are important to whatever "thought" turns out to be.

"objects" to which they are referenced in the dictionary defining the mapping.

Classification in the abstract can be viewed as grouping into sets. This leads us to ask: is there is a way of viewing the Laws of Thought themselves as statements associated with a symbolic set theory *stripped* of (almost all) their semantic content? This is the topic of the next chapter, but first let us try to deconstruct the English and abstract the meaning as best we can.

As sentences, the assertions are very simple. They contain nouns: "Whatever", "Nothing", and "Everything". These are clearly class or set delimiters, but of the most dangerous kind. "Everything" in particular suggests that the laws of thought apply to objects[34] drawn from a *Universal Set*. "Whatever" then refers to any object drawn from that set, which is straightforward enough.

"Nothing" is even more dangerous a concept than "Everything", however, as it has two possible meanings! One meaning might be "The complement of the Universal Set", which is usually taken to be the *empty set* even though, for a set theory to be truly closed, the empty set is itself an *object* of sorts in the set theory (which is a problem that can lead to certain famous paradoxes unless the set theory is carefully axiomatized to avoid them). The other meaning might be "Not a set at all, including even the empty set", effectively creating a "complement" to the Universal set that is *not* the empty set.

In set theory and mathematics, "Universal Sets" are very, very tricky[35] . They become even trickier when the Universal Set in question can be embedded inside a larger set as a *subset*. For example, the set of all integers can be viewed as a Universal Set for the purposes of discussions in e.g. number theory, but is a particular subset of the set of all rational numbers, which in turn is a subset of all real numbers, which in turn has an interesting relationship to *geometric algebras* and *manifolds* – e.g. complex or quaternionic numbers, two, three, or N dimensional spaces. Oh, dear! It turns out that there are an *infinite* number of ways "the integers" can be viewed as particular subsets of "larger" sets (whatever the latter might mean).

If the Universal Set in question is just the integers, what exactly is the complement? It might be the empty set of integers (a list of integers with no members), all non-integer real numbers, all complex numbers that are not, in fact, a real

[34]Without getting into any sort of debate over what a "thing" or "object" is, mind you. For the purpose of this discussion, it is essentially a *unique label* or *algebraic symbol* that can be assigned any *semantic* meaning we like if we are asserting that the laws of thought are to be truly universal or at least a constraint on the statements concerning relationships between objects in the Universal Set.

[35]Wikipedia: http://www.wikipedia.org/wiki/Universal set.

integer, or it might be *not a number at all*, it might be *"Nothing"* (in the set theory). Which of these is used depends on what one wishes to do with one's reasoning process.

Our difficulties are not over. In addition to these apparent implicit references to a Universal Set, the laws of thought contain various *present tense* forms of a single verb construct: "(to be able) to be". Leaving aside the notion of being "able" to be something per se as irrelevant[36], "being" itself is the core relational concept in both of the non-tautological assertions. This is rather shocking, really, as the English notion of being is a *very subtle concept* with all sorts of baggage brought over from *inferences* made on the basis of *experience*. In mathematics there is no such concept, really, as everything one manipulates is fundamentally "imaginary", not in the sense of complex numbers but rather in the sense that the "objects" being manipulated are symbols in our imagination. There is no such thing as "the number one"; it is only an idea, it has no being *except* as an idea. There is therefore a *significant disconnect* between the term "being" in English (or for that matter, in Greek!) and any sort of concept in e.g. set theory.

In my opinion, the only way this word can make any sort of sense in both worlds is if a set object is considered to "exist" if it is "something" – an object drawn from some presumed Universal Set. The most important kind of existence will be experiential, existential existence – the real existence of real "things" whatever they might turn out to be, and which *include* the symbolic objects of our experiential imaginations. It will be vigorously asserted in the next chapter that this mapping (to produce a consistent logical system at the end of it all) requires that the complement to the Universal Set be *not a set at all* (including the empty set) and that both "Nothing" and "non-being" refer to this sort of complement, not the "mere" empty set within the Universal set.

2.3 Assertions and Experience

The key point, however, is that even in our discussion of the Laws of Thought themselves, we are constantly *making assertions* – statements that are not themselves provable by means of reason – no matter how we proceed, as in order to do so reason would have to turn and act on itself. We might well be able to construct a "rational system" on top of *different* Laws of Thought. Even if we do make the somewhat arbitrary decision to use the Laws of Thought that *do* include both

[36]The original Greek actually was closer to "being is" anyway, not that we care as we analyze the English forms.

the laws of contradiction and excluded middle, the result, expressed in *human* language, is not unambiguous. There are multiple ways they can be mapped into e.g. set theory or number theory with different (equally "valid" and even useful) interpretations of the terms. Some mappings, especially self-referential ones, may well get us into trouble with consistency and completeness, as we'll see later. Ultimately, choosing this particular pair of assertions and defining just what the English words used mean has the effect of *defining a particular kind of "Universe"* and restricting our symbolic reasoning process to that Universe (and possibly to certain classes of super-set-Universes that contain it), for better or worse.

There is one last point we absolutely must make before proceeding to examine set theory per se and explore these ideas in more detail. To each of our human Selves (presuming for a moment that you are not a space alien or very smart canine reading this text) the thing we call "being" in English is strictly an *experiential* state. To each of us things "are" only to the extent to which our Self individually and instantaneously is *experiencing them*.

Our linguistic symbolic reasoning process most often refers, however, to objects that are *assumed* to have an independent external reality that lives *outside of Self*. Yet the reasoning process itself manipulates "things" that in fact *do not exist* in that we are not directly experiencing them by means of our *external* senses. Our assumption of the "reality" of these objects and the validity of the relationships we wish to assert between them is based on *memory and inference*, where memory itself is an experiential state in the now that references sementic objects from a presumed past!

Time therefore comes into the rules of logic in a very, very dangerous way, dragged in by the existence of implicit *tenses* of the verb "to be" that is used[37]. Objects have being in English when they possess properties such as *temporal persistence*. Suddenly we find that our Laws of Thought *beg many questions* by de facto imposing an implied spatiotemporal geometry (where we might as well grab space as well as time to have a place to put "Everything").

It is interesting to note, before we conclude, that the Laws of Thought are the basis for the *fundamentally dualistic* Western philosophies, "to be or not to be" is indeed "the question" when we expect that every proposition we might make

[37] Again I'll treat you to a bit of insight from physics. Time is *not* what you classically and human-experientially think it is, at least not if you accept the extremely rational and well reasoned and in fact mathematically *precise* conclusions of the theory of relativity, for which there is a wealth of empirical evidence and which also is such a *beautiful* theory that it is difficult to imagine it not being at least one part of what is true.

to be definitely *either* true *or* false. Einstein himself wanted that dad-blamed electron to *really* be at one and only one position, regardless of whether or not we could know what that position was. Yet when we pass from the relatively sterile realm of symbolic reasoning, through the semantic intermediary process of mapping out relationships between symbol and object, to the point where the results ultimately apply to the semiotic conceptual relationships in *human affairs* expressed in *real languages* (where we certain wish to be able to use language as a tool for or as the basis of reasoning), we learn that according to the Rules of Real Life contradictory things and paradoxes *exist all the time* as perfect understandable expressions in language.

For example, we almost certainly know some "wise fools" (and might even be one ourselves, or be married to one). It is interesting to note that oxymoronic constructions play a *critical* role in the koans of Zen, and that Zen logic (such as it is) has recognized the *non*-dualistic interpretation of "Nothing" as "Not in the Universal Set" since long, long before the development of formal set theory. These will be quite important in the *poetical* (not logical) development of the themes (not theorems) of this book.

The existence of wise fools is doubtless related to how absurdly easy it is to argue about nearly anything and sound perfectly reasonable on both sides while doing so (a favorite game of philosophers from the time of Socrates through to the present). We'll have a lot of harmless self-referential fun with oxymorons later.

At this point we're far from done with picking on reason, and will eventually take a look at e.g. "General Semantics"[38] and the *fundamental problems* of trying to reference *complex time dependent composite objects* in terms of single collective symbols in a reasoning systems, the problem with perception vs a presumed reality, and of course *axioms*. First, however, let's think about sets. Stripped of annoying features of human language and time-perceptions, it seems like the laws of reasoning are in fact the beginning of, or at least could be formulated within, an abstract *set theory*. Set theory is pretty cool stuff, so maybe we should take a look at it in more detail...

[38]Wikipedia: http://www.wikipedia.org/wiki/General Semantics. Gawds, you are doubtless saying by this point, is there *anything* that cannot be referenced at the introductory level, with lovely links through to more advanced stuff, through the Wikipedia? The answer is asymptotically approaching "no" in the limit as fast as some of the world's brightest and most altruistic people can make it so...

Chapter 3

Formal Set Theory

3.1 Naive Set versus Axiomatic Set Theories

Set theory is often viewed as the "mother of all mathematics". Much mathematics can be cleanly and axiomatically developed beginning with axiomatic set theory and then associating axiomatic rules to suitably defined sets and constructive relations. As suggested in the previous chapter, since the Laws of Thought sound a lot like statements in set theory *and* are the basis for the formal study of logic, it seems as though logic itself may be expressible in terms of suitable set relationships. The motivation for this is subtle. Historically, formal set theory came *last*, but the three form something of a tail-biting dragon. However, the *symbolic language* in which the laws of thought are expressed clearly came *first*, and *already* explicitly encoded an *existential set theory* that is the foundation of all human understanding as it is the basis of generalization and induction and ultimately, deduction.

I would therefore argue that set theory in actuality came *first* as it literally co-evolved with our generalizing human brains and a spoken language. All nouns essentially are symbols associated with sets of "things" that we group together on the basis of our perception or imagination of the *real world*, establishing an *existential* set theory and associated linguistic algebra with set-labelling words like "tree". It simultaneously developed a vast range of associated set selector and set transformation terms, e.g. adjectives, adverbs, and verbs.

Green trees take the set of all trees and extract the subset that are also "green" (where the adjective itself has a different meaning in reference to trees than it might in reference to a piece of paper, or a human face, or a piece of glass, or the wavelength of light). We can *cut down* the green trees, transforming a subset of all uncut green trees to a subset of all cut green trees, and further transform the trees to wood, to fire, to ash, to furniture, to dirt. It is important to remember that as this development of language was going on that permitted us to create a *virtual image* of a perceived external reality and *symbolically manipulate it* within the mental realm, that realm itself was also co-developing. Whole regions of the brain developed that are *devoted* to processing language and (especially) visual imagery, to *automatically transform* sensory input into *neurological* set representations. There is a strong temptation to get lost in the subject of how neuroscience, cognition, and language intertwine with evolution (something that is almost universally ignored by the mathematical philosophers that dominate the discussions of set theory) but we will bravely resist it[1]

To fully understand the laws of thought, then, (which originally applied far more to trees than they did to arithmetic or geometry) we need to analyze their relationship to the existential theory of sets implicit in language itself before being formalized only a bit more than 100 years ago. We need to consider them from a *semantic* point of view as they really form an important part of the way our minds work without getting lost in a forest of contingent truths or assumptions – axioms.

At the same time, we need to keep the analysis *consistent* (more or less) with the formal development of set theory. The reason we are willing to settle for more or less is that even fairly careful set theory formulations are plagued with *paradoxes*[2] and *antimonies*[3] . When given a choice we will always elect a path that allows us to express the laws of thought in terms of sets in a way that most closely resembles their use in language and thought itself without worrying too much about formal symbolic logic or mathematics. As we shall see, this approach leads us to an *existential view* of *naive* set theory that is somewhat at odds with its more formal, axiomatic development but which clearly expresses the use of thought to analyze the real world, if not mathematics.

We adopt the point of view that no matter how you approach it, the development of mathematics requires *axioms*[4]. In order to develop it from set

[1] Here and now, at any rate.

[2] Wikipedia: http://www.wikipedia.org/wiki/Paradox. Yes, you know the word, but the word has a fairly specific meaning in the context of mathematics and set theory.

[3] Wikipedia: http://www.wikipedia.org/wiki/Antimony. Points where two *laws* – things that we cannot easily imagine being different – lead to *contradictions* within a theory that uses those laws in its development.

[4] Where we deliberately defer discussing just what an axiom is for several more chapters, sorry. You can always look ahead and come back...

theory or analyze it in terms of set theory it is not unreasonable for the set theory to acquire axioms which are then *inherited* by the mathematics. However, mathematics already existed and had axioms of its own before the invention of axiomatic set theory and retains some of these axioms even when developed from set theory. This has lead to some famous antimonies and a fair amount of (sometimes passionate, always entertaining) conflict.

However tempting it is for us to dive right in and join *this* fray, doing so would be a major distraction for us (and would consume half the book or more right there, as there is a *lot* of discussion on all sides of the issue, some of it overwhelmingly technical). We will therefore do our best to remain somewhat aloof from this debate by borrowing *ideas* from modern set theory without getting buried in its *axioms* or *paradoxes*.

Still, it will be difficult for is to do this (especially to do this without irritating mathematicians, mathematical philosophers, set theorists, and scientists) without *some* sort of review of the development of modern set theory, if only so that we can properly attribute ideas to their originators. We therefore will begin with a wikinote-dense short course in set theory. Or even a rather long course – Wikipedia's set theory offerings have more than doubled in number and depth since I began this project. We may well omit some critical reference or point of view or another in the process, but we will trust Wikipedia to ultimately balance this out with its rich set of crossreference links for those who really care to pursue it.

In that spirit, let us note that there are two general approaches to set theory[5] . The first is called "naive set theory"[6] and is primarily due to Cantor[7] . The other is known as axiomatic set theory[8] or (in one of its primary axiomatic formulations) Zermelo-Fraenkel (ZFC) set theory[9] . These two approaches differ in a number of ways, but the most important one is that the naive theory doesn't have much by way of axioms.

We need two more results from existing set theory before proceeding. Both

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[5]Wikipedia: http://www.wikipedia.org/wiki/Set Theory.

[6]Wikipedia: http://www.wikipedia.org/wiki/Naive Set Theory. This of a shy, blushing, Set Theory, one that isn't scarred enough by bitter experience to be trusted out on the street. How charming!

[7]Wikipedia: http://www.wikipedia.org/wiki/Cantor. A Very Smart Guy. He pretty much defined infinity as we know and love it today.

[8]Wikipedia: http://www.wikipedia.org/wiki/Axiomatic Set Theory.

[9]Wikipedia: http://www.wikipedia.org/wiki/ZFC. This is *real mathematics* and not for the faint of heart. In fact, this can be made into a *foundation* of real mathematics as a constraint that strongly influenced its choice of axioms, not to mention its axiom of choice.

are associated with work done by Von Neumann[10] Von Neumann managed to create, for at least certain kinds of sets, a transfinite recursion of the generation of set objects that collectively are called a *power set*[11] that formed a *Von Neumann Universe*[12] .

The power set, in particular the set of all subsets of an actual existential Universe of objects, will be a key element of our discussion of the laws of thought. We will keep all subsequent discussion of the laws of thought carefully grounded in reality in this way, and only *later* will we worry about paradoxes and formal developments in axiomatic set theory and number theory and the like. As we'll see, there are tremendous advantages to be obtained from doing so. For one, we can keep the whole discussion "naive", indeed naive at the pre-Cantor non-axiomatic level. For another, we'll see that in an existential set theory of this sort, perhaps unsurprisingly, *paradoxes cannot happen.* At least we hope so. That's the whole *point* of the laws of thought, after all.

3.2 The Power Set

The power set will be a major component of our connection between sets and the laws of thought. While we will carefully avoid getting lost in too much algebra, we'll find it convenient to give them their own symbol and algebra if only to simplify the text itself. We will therefore call the power set Π and refer to the power set of a set S as $\Pi(S)$. We will also need to think about the power set of a power set and so on:

$$\Pi^2(S) = \Pi(\Pi(S))$$

$$\Pi^3(S) = \Pi\left(\Pi\left(\Pi(S)\right)\right)$$

$$\dots$$

As it is our plan to consider thought only in the context of the *real Universe* we need a very concrete set to play with to figure out what Π is and how it works. Consider, therefore, the set consisting of four cards pulled out of an ordinary deck

[10]Wikipedia: http://www.wikipedia.org/wiki/Von Neumann. A man who was a giant in both mathematics and computation.

[11]Wikipedia: http://www.wikipedia.org/wiki/Power Set. This is the set of all permutations of objects drawn from a a given set, the set of all *subsets* of a set.

[12]Wikipedia: http://www.wikipedia.org/wiki/Von Neumann universe. This is a *class* of sets, a *hierarchy* of sets that are generated by transfinite recursion of the power set from the empty set. It is extremely useful in the development of arithmetic from set theory.

of playing cards. To make differentiating easy, we'll pull out the four aces and consider each card to be labelled by its *suit*.

Our toy set is thus:

$$S = \left\{ \boxed{\clubsuit}, \boxed{\spadesuit}, \boxed{\heartsuit}, \boxed{\diamondsuit} \right\} \tag{3.1}$$

and the various subsets of this set make up its *power set* $\Pi(S)$, the existential set Universe for these four set objects.

Here is a listing of $\Pi(S)$ formed from the permutations of the four symbols taken 0 to 4 at a time (where order doesn't matter and each object can only occur once in a set):

$$\begin{aligned}
\Pi(S) \quad = \quad & \{\{\}, \\
& \left\{\boxed{\clubsuit}\right\}, \\
& \left\{\boxed{\heartsuit}\right\}, \\
& \left\{\boxed{\diamondsuit}\right\}, \\
& \left\{\boxed{\spadesuit}\right\}, \\
& \left\{\boxed{\clubsuit}, \boxed{\diamondsuit}\right\}, \\
& \left\{\boxed{\clubsuit}, \boxed{\heartsuit}\right\}, \\
& \left\{\boxed{\clubsuit}, \boxed{\spadesuit}\right\}, \\
& \left\{\boxed{\diamondsuit}, \boxed{\heartsuit}\right\}, \\
& \left\{\boxed{\diamondsuit}, \boxed{\spadesuit}\right\}, \\
& \left\{\boxed{\heartsuit}, \boxed{\spadesuit}\right\}, \\
& \left\{\boxed{\clubsuit}, \boxed{\diamondsuit}, \boxed{\heartsuit}\right\}, \\
& \left\{\boxed{\clubsuit}, \boxed{\diamondsuit}, \boxed{\spadesuit}\right\}, \\
& \left\{\boxed{\clubsuit}, \boxed{\heartsuit}, \boxed{\spadesuit}\right\}, \\
& \left\{\boxed{\diamondsuit}, \boxed{\heartsuit}, \boxed{\spadesuit}\right\}, \\
& \left\{\boxed{\clubsuit}, \boxed{\diamondsuit}, \boxed{\heartsuit}, \boxed{\spadesuit}\right\}\}
\end{aligned} \tag{3.2}$$

where the first entry is the *empty set* about which we will have much to say later. In general there are 2^C such permutative subsets, where C is the number of elements in the original set S, called the *cardinality* of the set.

There are two general kinds of things we can "do" algebraically with $\Pi(S)$ in terms of thought, reason, and language. One is that we can identify particular sets from $\Pi(S)$ by means of a suitable predicate expression. For example, I can "create a set that has one card that is a black suit and is not a spade" to uniquely define the set $\left\{\boxed{\clubsuit}\right\}$.

There will often be many ways to create a predicate that specifies a single subset from the power set, but there is one way that *always* will exist. We can always specify the subset by explicitly specifying the list of its members[13]. We will call this method "identification" as it appears to be somehow related to the law of identity. Note that we use identification of the elements of the original set S, plus the processes of permutation and union to generate $\Pi(S)$. It seems difficult to imagine – literally – working with a set whose members cannot be identified independent of predicates used to describe them.

The second kind of thing we can do is to *identify* (in precisely this sense or via predicates) particular *sets* of subsets drawn from the $\Pi(S)$. If we specify (for example) "the set of all sets in $\Pi(S)$ that contain a heart" we end up with:

$$\begin{aligned} \Big\{ &\left\{\boxed{\heartsuit}\right\}, \left\{\boxed{\clubsuit},\boxed{\heartsuit}\right\}, \left\{\boxed{\diamondsuit},\boxed{\heartsuit}\right\}, \left\{\boxed{\heartsuit},\boxed{\spadesuit}\right\}, \left\{\boxed{\clubsuit},\boxed{\diamondsuit},\boxed{\heartsuit}\right\}, \\ &\left\{\boxed{\clubsuit},\boxed{\heartsuit},\boxed{\spadesuit}\right\}, \left\{\boxed{\diamondsuit},\boxed{\heartsuit},\boxed{\spadesuit}\right\}, \left\{\boxed{\clubsuit},\boxed{\diamondsuit},\boxed{\heartsuit},\boxed{\spadesuit}\right\}\Big\} \end{aligned} \tag{3.3}$$

Note that there is no way to collapse or reduce this to a member of the original power set. Each of these sets is an object in its own right that satisfies the criterion for selection.

This set of subsets (drawn from $\Pi(S)$) is itself a subset from a set of subsets of the subsets of the original set S[14]. Clearly this set is $\Pi^2(S)$. There seems to be no reason we cannot similarly recursively generate $\Pi^n(S)$ for any finite n by iterating the process of making $\Pi^{n+1}(S)$ out of the sets generating by permuting the members of $\Pi^n(S)$ taken from 0 to the cardinality of times[15] .

Of course, this process scales fairly agressively. We cannot actually *draw* even $\Pi^2(S)$ because the number of elements in it is $2^{2^4} = 2^{16} = 65536$, and the number of elements in the $\Pi^3(S)$ is $2^{2^{2^4}} = 2^{65536}$ and so on. However, if the cardinality of the original set S is finite, so is the cardinality of the $\Pi^n(S)$ for any finite n.

[13]We will ignore for the moment the issue of how to deal with "continuous" (non-denumerable) sets. After all, in any interval of the real line there are an *infinite* number of points, and we surely cannot list them all. In fact, we cannot *list* a nonzero fraction of them, and we can think of infinitely many ways to generate infinite lists of points that cannot be listed. Hmmmm.

[14]Sorry about that. I'm pretty sure that this works out to make sense, if you work at it...

[15]Wikipedia: http://www.wikipedia.org/wiki/Natural number. A very similar construction, starting with the empty set {} being equated with 0, is one way of relating natural numbers to sets, where every natural number is recursively linked to a set consisting of all the sets that preceded it.

It's just large.

This may seem like a rather lot of complexity – in only the third level power set we already have considerably more objects than atoms in the physical Universe, for example, and it was *only* four cards! However, nothing less will do, as the answer to *any set theoretic question we can ask* must lie therein. Fortunately for us all, in the physical Universe a great deal of this complexity can be compressed by the human mind into *structure*.

We have already performed such a simplification – imagine if we specified S in terms of the very large set of molecules that make up the cards, of the even larger set of atoms that make up the molecules, of the larger still set (call it, say, S_e) of of elementary particles (electrons and quarks and the various field quanta) that make up the atoms and their nuclei. The first level power set $\Pi(S_e)$ would contain many absurd (non-physical) subsets, but it would also include subsets that contained just three quarks and an electron, which on a good day could take on a new name: a "hydrogen atom". Indeed, follow the process of forming power sets forward, we will discover therein sets of sets of elementary particles that aggregate into other atoms, sets of sets of sets that aggregate into molecules, and so on up to cards.

So each of our cards is *actually* internally organized into structures that can be treated as independently identifiable subsets, themselves aggregated into independently identifiable subsets, all part of a whole hierarchy of $\Pi^n(S_e)$. The card is just one out of a *very large number* of such subsets, with all sorts of internal symmetries. The count of permutations, and permutations of permutations, etc. scales up extremely rapidly, which is why statistical mechanics works as well as it does in physics. There is no infinity there, but there are plenty of finities that (as I like to tell my students) are really *good friends* with infinity, their children play together, every now and then they all get together at infinity's house and drink a few beers.

We are therefore fortunate indeed that the human brain more or less automatically makes this sort of hierarchical decomposition when confronted with permutative power set-theoretic information that even at the first or second levels causes our internal number-registers to beep and return "overflow". And this is still, recall, *just four cards.* Imagine dealing with a *deck* of cards, or a Universe with *many* decks of cards that are one tiny part of one tiny planet in one small solar system in a single galaxy. Yet when I refer to each of these things, your mind *effortlessly* erases all the detail and replaces it with a *hierarchy* drawn from power set upon power set all the way down to whatever the *real, existential* microscopic elementary set of objects are that make up the Universe (where we might have to include all of the points in space and time some way in our set descriptions.

There are a number of consequences of this hierarchical decomposition. One to keep in mind is that when we reason about anything *real* (as opposed to mathematics, which might be real, might not – lots of controversy there and I don't want to get into it) we are forced to do so at the level of one of these $\Pi^n(S)$, and maybe a few recursions on either side of it. We *cannot* extend our reasoning down to the indefinitely microscopic or up to the indefinitely macroscopic. It is absurd to try to understand the rules of poker in terms of the properties and motion of the elementary particles of the Universe *even though every particle in the game* obeys rules defined at that level at *all times*. Nor do we compute the effect of folding a hand in the poker game on the motion of the Milky Way galaxy as it meanders around in the gravitational field of all the other galaxies in the Universe. More *is* different, and so is *less*.

For this and many other excellent reasons that we'll go into, our *actual* reasoning process about the *actual* Universe is almost immediately forced to be *probabilistic*. This suggests that when we get around to axioms and all that, one of the *first* things we should work out is the mathematics of *induction* as the process of building the hierarchies is necessarily inductive as *otherwise there is no reason to favor any particular decomposition over any other*. We must *find* a reason, or give up on "reason" altogether.

For the moment, though, let's *ignore* all this appalling complexity and go *back* to just the some given finite set S and maybe $\Pi(S)$ and $\Pi^2(S)$, just to see what insight we can gain from this formulation into the laws of thought.

3.3 Set Theory and the Laws of Thought

We should now have an interesting, if static, perspective on the set of all things in the real world. All (say) N objects in the "existential Universe" E can be grouped into sets by permutation, forming $\Pi(E)$ with cardinality 2^N. These permutations can in turn be permuted into sets of sets $\Pi^2(E)$ with cardinality 2^{2^N}. However, nature *selects* only a *small subset* of $\Pi^2(E)$ – particular groupings of objects according to certain rules. We simply don't see any of the vast, the good-friends-with-the-infinite, other possible set groupings. We therefore for many purposes define *these* objects to be a basic existential set, e.g. the set of all atoms, and form its power sets instead of including all of the non-observed sets from the cosmic all.

Every possible grouping of objects into sets, though, is contained in the $\Pi^n(E)$ recursion. Predicate logic and set theory can only be judged to be a “theory” or “valid” according to whether or not any given predicate, constructed according to any presumed set of rules, successfully identifies objects in the $\Pi^n(E)$ hierarchy. This construction is so far very nearly axiom free. We have really assumed very little about E except that it exists, that it has a finite cardinality, and that it contains discrete identifiable (in the formal sense) objects, objects that can each be mentally permuted.

We are ignoring for the moment many questions of interest to mathematicians – such as what we need to do if the cardinality of E is truly infinite or if E is a continuous set. Dealing with infinity and continuity is *irrelevant* to our *descriptive* process, because even if E is infinite and continuous we can at least imagine a similar continuous permutive process (which leads instantly to infinitely infinite infinities) to generate the analog of $\Pi^n(E)$, causing us to throw away infinitely more unrealized possibilities as we do not *see* either the infinity or the continuity, only the finity and immediacy of a single slice of the possibly infinite possible. So to speak.

To speak strictly metaphorically, even though the Universe may live in a meta-Universe of possible set groupings analogous to the real line, infinitely divisible and infinitely permutable in every tiny segment no matter how small, the Universe itself is just *one* of those groupings. It may well be like unto an irrational number – infinitely unlikely in a set with uncountably infinite cardinality – but it *is what it is*. Furthermore, we can always renormalize this imagined real line so that the Universe is the integer number *one*. There may be lots of other possibilities out there, but if we can’t see them they really don’t matter. If we *can* see them, they stop being “other possibilities”; our Universe E and the sets $\Pi^n(E)$ just turns out to be larger and more complex than we thought but still is Unitary. This process of conceptually expanding the Universal set E occurs all the time in physics, as we extend into the microcosm.

Accepting $\Pi^n(E)$ as the extremely naive existential set Universe of thought that our brains co-evolved structured wetware and language to cope with, we can at last consider the laws of thought and see what they mean in terms of this fundamental set-theoretic Universe.

The first of the Laws of Thought, the law of identity, states that any thing that is, is (itself). However, English (and doubtless Greek or Sanskrit or other languages in which the law is or has been formulated) is strongly multivalent and thought is an important thing to get right. We had best proceed extremely carefully and not assume that we actually understand what this means. We will begin by *defining* a "thing" as "any object in the $\Pi^2(E)$ hierarchy".

We also have to be careful to define the word "is" (and all various forms of the verb "to be" and – in a moment – the concept of "not to be", or negation of being). Among other things we cannot help but associate different tenses with this verb. We will therefore have to agree to *mentally* ignore all concepts such as "was", "will be", and so on. Our laws of thought are formulated as *static* statements associated with a *static* description of sets, not with a *dynamic* conceptualization of predicates that permits us to convert one set into another. This is actually remarkably consistent with physics and relativity theory, where time is just another dimension like space and one can imagine stepping "outside" the set of all space-time events and considering the whole ball of wax to be E.

With that carefully established, the law of identity becomes a beautiful, tautological existential statement. Any "thing" is an object selected from $\Pi^n(E)$, and as this set hierarchy was itself imagined (not "constructed", as it a priori existed the instant E itself was established) by a process of identification, this law is the *law of identification*. Our set Universe is precisely that which can be identified, drawn from the set of *all permutations* of the existential set E that can be identified. If we can identify, that is, if a statement selects an object from $\Pi^2(E)$, then that statement is valid; otherwise it is not.

Mathematicians and dreamers may object that this definition is cold and heartless – it excludes all sorts of reasoning about *non*-existential Universes, things we might imagine, things we might dream up. Basically all abstract thought. Not so – it merely acknowledges that those subjects contain an *infinity of traps* for the unwary mind that will require *axioms* to deal with, as it is absolutely trivial to conceive of imaginary universes in which six impossible things happen before breakfast[16]. Abstract thought will turn out to be a simply *lovely* game and all sorts of fun, but we need to remember that it is a game where we can easily twist the rules back onto themselves into impossibilities, inconsistencies, paradoxes, and worse. Not so with $\Pi^n(E)$. It is the very definition of mundane.

What now of the *difficult* laws, the ones involving *nothing* and *non-being*, the *negation* of the two ideas that we had to work so hard to clearly and unambiguously define above so that the law of identity could be viewed (literally) as a Universal Truth?

Note well that *negation* is a *very subtle and difficult concept*, so much so

[16] A quote from *Alice in Wonderland*, in case you forgot.

that positive set theory[17] *excludes* it and manages to get along amazingly well without it.

Nevertheless, in the English statement of the laws of thought (and in Aristotle's and Parmenides' Greek statements as well) negation is very much present, and of course negation is a key part of *logic*, which either proceeds from the laws of thought or the laws of thought proceed from logic (depending on who you happen to be speaking to at the time) so we have to at least figure out what we are going to do with it in our set theoretic expression of those Laws. Let us start with the law of contradictions (as I wrote it a couple of sections ago: No thing can both be and not be. This was a somewhat clumsy way of writing it, but now that clumsiness will serve us well as we have at last defined what a "thing" is and what "being" means, which gives us at least a chance at defining what "no thing" and "non being" are.

Even so, we will discover that there are *many distinct linguistic meanings* of negation of "thingness" and "being" with regard to the existential $\Pi^n(S)$ Universe. Let us list a few of them. A "thing" in the existential set S is an object in its associated $\Pi^n(S)$ Universe, so "no thing" might be:

- An object in *another*, disjoint Universe. For example, if S is the set of natural numbers (without worrying in the least about whether or not this set closes at infinity – we will adopt the point of view that infinity is something that we reach by a limiting process and that existential truth is derived from truths associated with finite sets of arbitrary (variable) size), and we introduce an irrational number, that number is "no thing" in $\Pi^n(S)$ – it can be identified with no nonnegative integer or set of sets of sets of nonnegative integers. If we consider the set of all apples, it might be an orange.

- An *imaginary* (or if you prefer, *hypothetical* object. This is really a special class of the first case, because we can define an existential set Universe associated with the imagination and awareness, self and otherwise, itself. It is an *important* special class because for each one of us, it is the *only set Universe that we directly experience*. It is also where e.g. all abstract sets such as those of mathematics live, as it is otherwise remarkably difficult to

[17]Wikipedia: http://www.wikipedia.org/wiki/Positive set theory. Note that parts of the above resemble positive set theory – which is also quite existential – as much as anything. However it has axioms related to the need for axiomatic set theories to be able to resolve concepts such as equality of two *predicate descriptions* in terms of subsets pulled from $\Pi(S)$ (only, as far as I can tell) – it does not explicitly address the $\Pi^n(S)$ hierarchy in general.

find a piece of π in your refrigerator.

- This is the really tough one – no object at all, in any set theory. The negation of all set theories. The utter lack of an existential set Universe of any sort. If this sounds scary, it should. The utter negation of thingness of any sort is *almost inconceivable* to a conscious mind, and this is the source of many religious beliefs that basically assert that this kind of negation cannot exist.

The first two can be associated with predicates in various ways, as can the third one, but they are *very different ways* and can lead to considerable confusion when one attempts to develop "logic" based on one of these forms when somebody else wishes to use another.

This is the easy part. What about "being"? We defined being in the law of identity as "being identifiable", where being identifiable itself basically meant being a set in the $\Pi^n(S)$ hierarchy. Not being is then pretty straightforward. It means not being in the existential set Universe, period. Of course this is now an *existential tautology* and *every thing* is *in* the existential set Universe, unless we somehow embed that Universe in a larger one as one might embed the natural numbers in the complex plane. Which is cheating in *so* many ways, especially if the Universe one is trying to embed is the actual existential physical Universe in which we live[18] *No thing* is not in this Universe.

However, what about the inheritance from the *other* two forms for a "thing"? And more important, what about predicates? People tend to *use* the laws of thought to decide *propositions* or the set equality of *predicate expressions*. Let us consider these separately. Being is now well defined for our existential set Universe and indeed is a tautological extension of the law of identity for that Universe. We don't really need a law of contradiction in this approach, only a criterion for establishing identity, which is doubtless the observation that led to the development of positive set theory.

We are still left with what one might call "strong" nonbeing – not being in any *possible* set Universe, nonbeing in the absolute sense – and "weak" nonbeing where a set *exists*, but just not in the *right* set Universe, where $z = 1.0 + i\pi$ exists but where attempts to reason about it as a natural number involve either some

[18] I can just hear the Mind vs Matter enthusiasts dragging out their siege equipment and donning their metaphysical armor. The actual existential physical Universe is *mind*. No! (clang, bash) It is matter! (thump) Owww, getting whonked with that rock that hurt. But did it hurt in your mind, or in your matter? Was the rock mind, or was it matter? If you don't mind, let me assert that it doesn't matter...

sort of restriction/projection from the complex plane to the natural numbers or extension/embedding of the natural numbers in the complex plane. To do either one requires axioms, many axioms, and many theorems derived from those axioms besides and hence is far beyond our analysis of the laws of thought.

There is one more sense in which nonbeing is used, however – and for better or worse it is one of the most *common* forms of usage and is *completely different* from the ones associated with identity and existence in the set Universe. This ambiguity is one major source of paradox and antimony. In many cases, not being means *not being in the same identity set.* That is, the law of identity can be interpreted as saying "A thing (identifiable in the set Universe $\Pi^n(S)$ for some existential set S) is either *in* set A from somewhere in that hierarchy or it is in $\bar{A}$, the complement of A (from the entire hierarchy)." This is of course a *useful* thing to have around when trying to decide if an object "belongs to" set A or if it doesn't, when trying to define an *axiom of equality*[19] . It is also the source of much dark evil when nonbeing in the strong or weak *tautological* sense are confused with nonbeing in this sense.

The possibility of antimony is apparent when one considers how differently the *empty set* is treated by the two meanings. The empty set is is *always* a set *within* any set theory, existential and permutative or not. Its existence is an axiom in positive set theory, but one can *also* just "observe" it as the outcome of evaluating a false formula. In our permutative approach, it is just the set of all set objects selected zero at a time, one of the possible permutations of objects that exists *even for five year olds* seeking the various ways of grouping a small pile of pennies on a table. It is an explicit but often *invisible* member of the subsets of $\Pi^n(S)$ – I like to think of the empty set at any level of the hierarchy as being the "set brackets" of the hierarchical set itself, so that $\{\boxed{\heartsuit}\} = \{\} \bigcup \boxed{\heartsuit}$ in a manner of speaking, since of course we technically cannot speak of $\boxed{\heartsuit}$ all by itself outside of a set container. If sets are metaphorically objects in a box, the empty set is the box, which can be empty but always is there. Its presence is required to that operations like intersection *close* within the set theory where a full set theory allows set objects to be manipulated with the operations of union and intersection as part of its basic definition.

If not being is used in the sense of *not being equal*, or *not being in the set of true statements* as an essential part of predicate evaluation, it cannot *also* be used in the sense of *not in the set Universe.* Russell worked far too hard to

[19]Wikipedia: http://www.wikipedia.org/wiki/Axiom of equality. Also look at the axiomatic set theories, as they almost invariably have one.

define his paradox (which we will discuss in some detail later). He might just as well have tried to create "a set of all things that are not in any set including the empty set". Say what? Clearly this kind of "paradox" isn't paradoxical at all in an existential set Universe, it's just a meaningless statement.

The final law of thought, the law of the excluded middle, tells us that every thing must either be or not be. Once again, now that we know what a thing is, we can see that this is a tautology of the law of identity for the strong or the weak formulation of nonbeing – all things (objects in the $\Pi^n(S)$ hierarchy) *are*, so sure, they are *or* they are not – not. Once again we see how a wide range of problems can come from extending over the existential set Universe boundary and allowing "things" to exist (sort of) in sets "outside" the existential set Universe S, in which case we can talk about things that are not, like pink hippogriffs dancing the tango or irrational numbers in a natural number Universe. We observe that for the strong version of nonbeing this law sounds rather odd – nothing doesn't exist where anything or everything do, quite literally.

Finally, we observe that as before this statement has a *different meaning altogether* when used *inside* a set Universe as another form of disjunction. In this context we can interpret the law as saying that every object in $\Pi^n(S)$ is either a member of any *particular* set in $\Pi^2(S)$ or it isn't. There isn't anyplace else for it to be, after all, because we exclude imaginary Universes or embeddings of the set S and because no Universe at all cannot exist in the presense of a Universe that does[20].

If we mix up these different interpretations, and use contradiction or excluded middle on the one hand to refer to actual impossibilities and on the other hand to partitionings of actualities into disjoint sets (be those sets sub or super to the set Universe in question) then we are bound to get ourselves into trouble.

Still, this was a generally successful effort. We note that the law of identity is a pure tautology when expressed in terms of an existential set theory, and that the laws of contradiction and excluded middle are *irrelevant* restatements of the *same* tautology – just another way of stating the principle of identification that defines the set Universe as the $\Pi^n(S)$ hierarchy in the first place. We also see that there are at least two or three *other* ways these laws can be interpreted with greater or lesser meaning and utility. The difference is that these interpretations require *axioms* where I would argue that the law of identity itself and its two strong-form statements of negation are tautologies of a naive theory that is nearly axiom free after the assumption "suppose one has a set S of objects that actually

[20]Which again sounds odd, as we blithely talk about nonexistence existing, so to speak.

exist".

It seems worthwhile to see how our new strong definition of nonbeing enters into existential set theory as the absence of any set *including the empty set* as the empty set is very much a part of $\Pi^n(S)$. To make up a formal theory that manages to *sound* like a set theory extended to "include nothing" let us now introduce a new concept (at least in western thought) – the *null set*.

3.4 The Null Set

The null set is a difficult, perhaps even impossible, concept. We can perceive existence – indeed we cannot help but perceive existence as existence and perception are inextricably linked – to each of us, individually. The fact that we perceive means that we exist, as Descartes noted so long ago[21] . How can can we even begin to understand *non*-existence in the deepest sense? Why is it needed when there is already an empty set which can be proved to be singular and unique[22].

I would argue that the empty set is there for a very specific reason – so that the *algebra* of set theory closes under intersection. If we simply consider the empty set $\{\}$ to be an abstract "container" of all sets and hence a "member" of all sets in the Universe, then we *no longer even have to specify* that the intersection of two sets with no members in common is the empty set, we can simply note that *ordinary* intersection of two sets with no members *other than the empty member* in common is of course the empty set. In the Universe of Fruit (which lives in a really big box), the intersection of a *box* of apples and a *box* of pears is an *empty box*. In a positive set theory with at least one pair of disjoint sets within, one doesn't *need* the axiom of the empty set, one just points to it. Similarly, in an existential $\Pi^n(S)$ hierarchy, the grouping of all the objects none at a time just happens in $\Pi(S)$ and is permuted in turn in the various higher order power sets.

[21]Wikipedia: http://www.wikipedia.org/wiki/Descartes. We'll spend a *lot* of time talking about Descartes later, and you've probably already heard of his *I think, therefore I am*.

[22]Except that it *isn't* unique. The empty set of P, the set of all pennies, is no pennies. Since this is a finite, Univeral set, we can insist that the complement of the empty set is in fact P. On the other hand, the Universal set of all quarters Q *also* has an empty set, with complement Q. The empty sets of these two Universal sets are distinguished by insisting on closure within the respective set Universes and permitting me to say things like "I'm out of quarters" when in fact I am *not* out of pennies! This difficulty is usually eliminated in axiomatic set theories by not permitting the action of forming the complement of the empty set (and frowning strongly on Universal sets in general) because you might get something really crazy, like the Mother of All Set Theories, the Universal Universal Set. Or God. Or something like that. Hard to say, really – nobody's ever tried it.

However, the strong idea of non-being that is expressed in the laws of thought above seems to be a *different* concept than the emptiness of a box. Let me see if I can clearly express the way I view the difference, although we shouldn't be too disturbed if the words to do so elude me or if I fail to achieve clarity. An *entire philosophical tradition* holds that the concept cannot be placed into words but is nonetheless one of the most *important* concepts in the theory of knowledge.

Set theory is all about boxes, about Venn diagram containers, about categories. The empty set in an existential set theory is an empty box, but is not *nothing* because the *box still exists within the theory*[23]. We can, in fact, perform *all* the algebraic operations of the set theory on the empty set as an "object" in the Universe as long as we insist that its complement (as one of those actions) is precisely the Universe itself so that the set theory *closes*. If we relax this condition we open the door to many paradoxes, a situation which the null set is introduced to avoid.

This concept of non-null emptiness extends into mathematics and physics. It is fairly straightforward to imagine an empty Universe[24] – an infinite set of points represented by some set of abstract coordinates with no "objects" located at any of the points. Hmmmm, isn't that what mathematics is all about for the first umpty years one studies it?

Note well that (empty or not) we can *imagine* putting things at those coordinates, using those coordinates to label the things and help to sort them into sets (including disjoint "identity sets"), just as we can *imagine* putting things "into" the empty set (via the Union operation) and creating a non-empty set[25].

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[23]Null sets in measure theory are even more concrete – they can contain objects from the universal set in question, e.g. points on the real line – as long as those points have zero *measure*. There can be infinite numbers of these objects and the entire set can *still* have zero measure. For example, the set of all rational numbers has measure zero on the real number line and hence belongs to the null set of measure theory, which is *not* the one I propose here.

[24]Wikipedia: http://www.wikipedia.org/wiki/Milne Model. I remember with a certain wry joy learning about something called "Milne's Empty Universe" when studying astrophysics and general relativity. Kind of a boring place to live, of course...

[25]There are all sorts of interesting things in this paragraph – enough that it is worth pointing them out. For one thing, a truly empty Universe – coordinates with nothing anywhere *at* any of the coordinates – is a moderately creepy concept, a *mathematical* concept. To a Logical Positivist (a philosophical school made mock of somewhat later in this work), the entire idea of an empty Universe (or mathematics in general) is probably meaningless, although a good mathematician or theoretical physicist has no problem whatsoever with it and it is thus to *normal* human beings *not* meaningless.

For another, I use terms like "putting things into" to describe set-theoretic statements such as $S = S \bigcup \emptyset$. The *language* is that of *operators* that act on one thing to produce another, which is a valid construct in mathematics and in fact we could (I promise) build an *algebra* of *creation*

There is, however, a deeper notion of "emptiness", that of "non-being". The notion of *no box at all.* In physics, this might be the notion of *no Universe at all*, not even an empty one consisting of a perfect vacuum at a single mathematical point. Of course this is an odd statement and it makes us vaguely uncomfortable even to read it. This is a concept that can be expressed in English (and *within* a system of logic) only as an oxymoron or a kind of example of what has come to be called a *Russell Paradox*[26]. We will consider it in a somewhat different context than that which is usually presented, because in the case of our naive existential set theory, we cannot actually make any sets at all that do not contain themselves by virtue of Existential Identity, where we do not "make" sets at all, only identify them or choose them from the set of all sets that *exist* within the set Universe (including the empty set) and of course *all* sets in such a universe *precisely* contain themselves.

So, consider the set of all things that are not in *any set in the set Universe including the empty set.* Let's see, all "things" from our set Universe are minimally contained in their own identity sets, so no things can be members of this set. However, the empty set is *also* explicitly excluded, so the result of trying to create this set cannot be just a set with no members. It is not a set at all, it is *nothing*, the absence of *even emptiness* as a capacity to be algebraically manipulated or "filled". Yet you can perfectly well understand what I say when you read the English. This is an "empty set" *without a box* – it isn't, by definition, a set; it is rather an intrinsic contradiction of the *concept* of set. It is the absence

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and anihillation operators that act on a suitably defined "empty set" to create non-empty sets. This is, in fact, the algebra of quantum field theory (which has more bells and whistles, of course).

The equals sign in mathematics, however, is a symmetric entity that has no implicit "time" or notion of "action". It describes a static true relationship. You can write an equation forwards or backwards and it says the same thing. It is a pure abstraction of the notion of identity itself. Two algebraic representations that *are* equal *are* the same thing. Even in algebra, however, algebraic derivation retains a sense of order and operation in the steps performed on one equation to transform it into another, and certain operations are only conditionally permitted.

In computer science, the equals sign really stands for *logical assignment*, for *operational* equality. `A = B + C;` in the *C* programming language stands for "take the contents of the memory locations labelled B and C and add them, and place the result into the memory location labelled A". Any of these *work* to describe the way the empty set is *algebraically* manipulated, but they *mean* very different things and just by using language cleverly I can predispose a discussion about them to proceed along very different lines. But you probably knew that.

[26]As you should have learned by following my previous Wikipedia link, this "set" was discovered/invented by Bertrand Russell in 1901 while working on his *Principia Mathematica.* Russell observed that the set of all sets that do not contain themselves is a bit "odd". In particular, does this set contain itself? Hmmm, the answer appears to be a bit cloudy. Try again later.

of any set Universe at all.

Note that this is a *self-referential definition* of a "set" and is *precisely the kind of set* that ties one into Gödelian knots[27] or produces Barber paradoxes in logic/set theory[28]. Yet we can perfectly well understand what this refers to and *use it all the time in common language*. Obviously there are *no* things that are not in some set (minimally the identity set), and since the empty set has no members at all these nonexistent things aren't there either. Our minds can create a "class" of "things that are not" while juggling the word "things" and the concept of "non-being" (not-things) back and forth like a hot potato and somehow end up with a meaningful idea out of a contradiction that isn't just "the absence of trees" but is the "absence of even a Universe in which things that aren't necessarily trees that I cannot imagine do not exist." Our minds can empty a hypothetical Universe, shrink it to a point, and then *throw out the point*, as long as we don't think too carefully about just what the junk heap we throw it out upon really "is", since one might well argue that "nothing" is literally inconceivable – certainly not *directly* conceivable – to a conscious mind.

In our semantic conceptualization of all things that *are*, that are minimally in their own identity set, we can "fill" the empty set by taking the union of the empty set with a nonempty set. We can consider the intersection of the empty set with any nonempty set and of course get the empty set. However, we *cannot* take the intersection of all things that belong to no set at all including the empty set with any set. If the result were the empty set, then the set we intersected was *not* in fact the set of all things not in any set including the empty set. The null set is therefore the absence of any box – it lies *outside the algebra of the set* where the empty set is within the algebra. Similarly the union of any real set (including the empty set) with the null set is undefined, is itself null.

We can imagine joining a box of apples and a box of pears and ending up with a box of mixed fruit, or filling an empty box with the box of mixed fruit (forming unions of sets of fruits). We can imagine looking for apples in a box of mixed fruit (forming the intersection of the "subset of all apples in the Universe" with the "subset of mixed fruit") to put into an empty fruit box – the result can be some apples, a non-empty intersection added to the empty box to make it a *box of apples* – or no apples at all, empty intersection added to the empty box, leaving one *with an empty box*.

Can we even *imagine* combining a box of apples and a null set?

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[27] We'll get there, don't worry.

[28] If you aren't familiar with the Barber paradox now, soon you will be. You will be.

We can! At least sort of, metaphorically, kinda. Physics to the rescue. If we dump a box of apples into a *black hole*, then Poof[29]! It is gone! No more apples, *no more box*. So we can *conceptually* think of the null set as a "black hole" of set theory[30].

This concept of set theoretic (and other) contradictions are actually explored and developed more in *Eastern* philosophy and logic than in the West, and Zen logic[31] is perhaps more suited to the sorts of oxymoronic construction that one associates with nonbeing as opposed to emptiness. For example, "the sound of one hand clapping" in a rather famous Zen koan is not the sound of clapping in the limit that the noise being produced by a clap goes to zero, it is not even *no clapping at all* – two hands sitting at rest. It is "impossible", or "undefined", or "self-contradictory". Not clapping. Not the absense of clapping. It is null.

This concept pervades Buddhism and Eastern philosophy and culture. It is referred to in e.g. Musashi's *Book of Five Rings*, for example, as the *Void*. One essential component of Zen and meditation (often meditation on paradoxical Zen Questions) leading to Enlightenment is the realization of the null, the no-thing, Mu[32] . It is a concept that is inconceivable and hence openly contradictory in language. It *cannot be spoken of* because words are *symbols* and live in an information-theoretic set Universe where things *exist*. Zen masters therefore refuse to speak of it but rather force you to perform exercises that provide you with at least the opportunity to wrap your mind all the way around the blind spot to the point where you can see it by considering what isn't there, to *resolve* the paradox of existence and our imperfectly imagined versions of death, of impermanance and permanence and change, of *non*-existence. This resolution, whenever and however it is managed, brings about a state of remarkable mental clarity[33].

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[29]Poof is somehow too modest a term for "it vanishes in a blaze of hard radiation releasing immense amounts of energy into the Universe on the way down" but it will have to do for now.

[30]Only more so, since real black holes preserve a few of the coordinates of the stuff you dump into them – charge, mass, and at least some *bounds* on location. These set theoretic black holes preserve *nothing* – they suck any set *in* the Universe into a (non) state of total nonexistence, not just the "emptiness" of vacuum, of the empty box.

[31]A concept that would openly offend any Zen master, especially ones who are good at it.

[32]Wikipedia: http://www.wikipedia.org/wiki/Mu (negative). Ain't Wikipedia wonderful!

[33]Or, in the case of Musashi, the ability to take a crude "sword" fashioned out of a spare oar from a boat and with a single blow slaughter a top-gun wannabe named Sasaki Kojiro armed with a razor-sharp katana and a highly developed "strategic" technique but still in a state of mental confusion regarding the Void. Individuals who have truly mastered the conceptualization of the null set are often portrayed as having considerable power over the *non*-null Universe, perhaps because they know how to take its complement in different ways and hence select their reality...

The null set is conceptually similar to the role of the number "zero" as it is used in quantum field theory. In quantum field theory, one can take the *empty* set, the *vacuum*, and generate all possible physical configurations of the Universe being modelled by acting on it with creation operators, and one can similarly change from one thing to another by applying mixtures of creation and anihillation operators to suitably filled or empty states. The anihillation operator applied to the *vacuum*, however, yields *zero*.

Zero in this case is the null set – it stands, quite literally, for no physical state in the Universe. The important point is that it is not possible to act on zero with a creation operator to create something; creation operators only act on the vacuum which is empty but *not* zero. Physicists are consequently fairly comfortable with the existence of operations that result in "nothing" and don't even require that those operations be contradictions, only operationally non-invertible.

It is also far from unknown in mathematics. When considering the set of all real numbers as *quantities* and the operations of ordinary arithmetic, the "empty set" is algebraically the number zero (absence of any quantity, positive or negative). However, when one performs a division operation algebraically, one has to be careful to *exclude* division by zero from the set of permitted operations! The result of division by zero isn't zero, it is "not a number" or "undefined" and is *not in the Universe* of real numbers.

Just as one can easily "prove" that $1 = 2$ if one does algebra on this set of numbers as *if* one can divide by zero legitimately[34], so in logic one gets into trouble if one assumes that the set of all things that are in no set *including the empty set* is a set within the algebra, if one tries to form the set of all sets that do not include themselves, if one asserts a Universal Set of Men exists containing a set of men wherein a male barber shaves all men that do not shave themselves[35].

It is not – it is the *null set*, not the empty set, as *there can be* no male barbers in a non-empty set of men (containing at least one barber) that shave all men in that set that do not shave themselves at a *deeper level* than a mere empty list. It is not an empty set that *could* be filled by some algebraic operation performed

[34] To be *formally* precise here, "legitimately" is not easy to come by. It is worth noting that it took Russell and Whitehead close to a full page – more if you embed the referenced theorems – of some of the nastiest algebra on the planet to "prove" that $1+1 = 2$ in a formalism that *excluded* this kind of contradiction. Real Mathematics Is Not Easy. Fortunately this *is not a work on real mathematics*. I keep saying that, so it must be true, right?

[35] Note well that I am very careful to specify that our barber is a *man* where this is frequently omitted in statements of the paradox in both books and online. Obviously if we refer only to a *barber*, that barber that might in fact be a *woman* or a blob-shaped hermaphroditic *space alien* and there is no essential paradox.

on Real Male Barbers Presumed to Need Shaving in trial Universes of Unshaven Males as you can very easily see by considering any particular barber, perhaps one named "Socrates", in any particular Universe of Men to see if any of the sets of that Universe fit this predicate criterion with Socrates as the barber. Take the empty set (no men at all). Well then there are no barbers, including Socrates, so this cannot be the set we are trying to specify as it clearly must contain at least one barber and we've agreed to call its relevant barber Socrates. (and if it contains more than one, the rest of them are out of work at the moment).

Suppose a trial set contains Socrates alone. In the classical rendition we ask, does he shave himself? If we answer "no", then he is a member of this class of men who do not shave themselves and therefore must shave himself. Oops. Well, fine, he must shave himself. However, if he *does* shave himself, according to the rules he can only shave men who *don't* shave themselves and so he *doesn't* shave himself. Oops again. Paradox. When we try to apply the rule to a potential Socrates to *generate* the set, we get into trouble, as we cannot decide whether or not Socrates should shave himself.

Note that there is no problem at all in the existential *set theory* being proposed. In that set theory either Socrates must shave himself as All Men Must Be Shaven and he's the only man around. Or perhaps he has a beard, and all men do *not* in fact need shaving. Either way the set with just Socrates does not contain a barber that shaves all men because Socrates either shaves himself or he doesn't, so we shrug and continue searching for a set that satisfies our description pulled from an *actual* Universe of males including barbers. We immediately discover that adding more men doesn't matter. As long as those men, barbers or not, either shave themselves or Socrates shaves them they are consistent with our set description (although in many possible sets we find that hey, other barbers exist and shave other men who do not shave themselves), but in *no* case can Socrates (as our proposed *single* barber that shaves *all* men that do not shave themselves) be such a barber because he either shaves himself (violating the rule) or he doesn't (violating the rule). Instead of concluding that there is a paradox, we observe that the criterion simply doesn't describe any subset of any possible Universal Set of Men with *no* barbers, including the empty set with no men at all, or any subset that contains at least Socrates for any possible permutation of shaving patterns including ones that leave at least some men unshaven altogether.

That is we don't end up concluding that the set described by our predicate criterion is the *empty set* (a set with no men) or any other possible subset of the Universe of Men. We conclude that the predicate leads to a *null* result. There is *no Universal Set of Men* (including one with no members at all) for which the predicate describes a set or subset or empty set as the answer.

We therefore dump the proposed statement, Socrates and all, into the null, or undefined, "set" (which is *not* a set). It is an algebraic placeholder for all algebraic set theoretic results that do not consistently lie within the algebra even as an empty set and which (among other things, such as overt contradictions and English words such as "nothing" or "nonbeing" or mathematically "undefined" results) lead to paradoxes, incorrect propositions, undefined results. Set theory (and language and logic and mathematics) have *always* had this "black hole" around, it just needs to be formalized.

To make this understandable at a very simple level, there is a very real difference between the sentences: "Honey, could you take this *empty* list and stop by the store on the way home and pick up nothing today?" and "Honey, could you fail to take this nonexistent list and not stop by the store on the way home and not pick up nothing today?". The first describes something that could really happen. We can easily imagine tearing off the wrong piece of paper (the blank one) and taking it to the store, only to be frustrated and end up buying nothing. Mathematically, one can perform all of the operations permitted with the algebra (stopping by the store to pick up items on a list to create a new list called "items I got at the store") where an *empty list* in leads to an *empty cart* out.

In the second case, there *is no list* – not even a blank one or piece of paper that *might* hold a list – and this sentence really *makes no sense.* You cannot pick up a list that doesn't exist. Without a list (even a mental list or a *possible* mental list that you could perhaps *fill in* at the store itself) you would never *go* to the store motivated to buy items from a list (even if the list turned out to be empty). Basically, if there is no list at all you *cannot perform algebraic operations on what is not there.* List oriented computer languages do not just spontaneously start up and run themselves not just on empty list pointers but on *no pointer at all.* I don't even know what such a thing would *mean.*

We thus see that this is *not* a silly issue; that even a naive existential set theory requires *both* an empty set, defined to be "a set" and required so that the intersection operation in particular closes within the "Universe" of objects being listed/grouped/placed in sets, *and* a null set which is *not* a set[36] – it is

[36] And you, dear reader, are going to *have* to try to keep this in mind as you read, as I'm not going to keep pointing it out and if you forget you'll start asking yourself if null isn't really the same as empty. It isn't, as it isn't a set. Calling it a set is merely a convenience of (and trap of) the language – referring constantly to the null *no*-set would be tedious. There is something

algebraically the undefined result of operations that *might* be defined within the set theory that result in no set within the theory including the empty set, and semantically it is nullity of the *concept* of "thing" or "existence" (set object) so great that not even the absence of a thing is permitted within the language. "Inconceivable" is perhaps the right term for it, as opposed to "imaginary"[37].

Of course, the word "inconceivable" itself is a walking, talking oxymoron waiting to happen. When I say that it is inconceivable that space aliens[38] control the President of the United States, what I really mean is that I've already conceived of the notion but consider it to be pretty unlikely[39]. Only when one uses it in a sentence containing a null construct does it really make literal sense. It is *inconceivable* that there exists a male barber who shaves all men who do not shave themselves.

We cannot (by definition) even *imagine* that which is inconceivable and will get a nasty headache from even trying – it is the "set of all sets that are not sets", which leads the imagination into unresolvable knots if one tries to conceive of it, at least as a set. It is *nonbeing*. It is No-Thing. Let's call it Mu, and write it symbolically as μ.

This symbol is selected quite deliberately to make an entirely relevant trilingual Zen Pun. By strange chance the word for No-Thing in Japanese is Mu. Note that this isn't an exact translation – it can equally well be thought of as meaning "That does not compute!" or "Say what?" or "That is bullshit". We will use it quite happily in all of these senses when we make *it* the idea of non-existence in our existential set theoretic Laws of Thought.

As you should know by now from having followed the previous Wikipedia link for Mu[40], one of the most famous Zen koans is: "Does the dog have Buddha-nature?" This is a damned-if-you-do, damned-if-you-don't sort of question – if

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delightfully self-inconsistent by referring to it as a set anyway, sort of a two-word embodiment of the Russell paradox.

[37]Two terms that are often confused in ordinary language or rhetoric. I recall with great fondness the scene in *The Princess Bride* where Vizzini announces that thing after thing done by Westley (in the person of the Dread Pirate Roberts) is "inconceivable", finally leading Inigo Montoya to observe "You keep using that word. I do not think it means what you think it means."

[38]Armed with razors and threatening to shave all men that do not shave themselves, perhaps?

[39]At least I *think* that I do. Noting well that this *is* the George W. Bush era as I write this...

[40]You are following those links, aren't you? Of course you don't have to, but if you don't you're pretty likely to miss some of what I'm trying to say as the Wikipedia articles are *rich* with connections. Of course it might take you a year to read the book if you really follow all this. Tell you what, go ahead and read the book one time just straight through, then try it *again* following the links. That way you'll get the point much better anyway.

you say yes it indicates that you are just parroting scripture (which also says yes), and if you say no then you are disagreeing with scripture which is if anything even worse as we'll see when we study the axioms of religion.

When asked this 'are you still beating your wife' sort of question by a wandering monk in a Zen Shootout (see above) Jōshū replied "Mu". The generally accepted interpretation of this reply is that Jōshū was indicating that this wasn't a question, it was a transparent ploy to make him look bad. The alternative way to demonstrate this might have been to beat his opponent about the head with a banana, but Jōshū doubtless didn't have a banana handy at the time. He was acclaimed instant winner of the shootout and his opponent's very name is long since lost in the mists of the past while his is still remembered and revered.

Zen students *now* aren't permitted to answer any of "yes", "no", or "Mu" any more. My own favorite reply to this question is to fire back at the questioner "Does Buddha have Dog nature?". This neatly traps the trapper. If they reply "That's not an answer!" or really say pretty much anything at all, you can slam a book down or otherwise make a loud noise and whack them with a banana. They are *almost certain* to be Enlightened, and you are very likely to have the questioner follow you around fawning at your feet and calling you 'master' (something, hmmm, that you should think about before trying this in public). You should feel free to try this at home instead, by the way – it isn't necessary that you strike *someone else* with the banana for it to work, and you are less likely to be annoyed by your Self fawning at your own metaphorical feet.

At any rate, this and many other Koans make it very clear that the discovery of the null "set" (where it is not a set but rather the lack of any set, even empty) quite probably occurred no later than the very beginning of Zen, if not thousands of years *still* earlier as captured by the writers of the Vedas and Upanishads so that it was merely *refined* in Zen. Many of the odd customs and stories and Koans of Zen – for example the recurring statement that Zen Enlightenment cannot be stated and that to reduce it to words is to lose it – are reflections of the fact that μ (Mu) is the ultimate *null* semantic construct and hence *cannot be stated in words* or other symbols[41].

μ in Zen therefore cannot be defined, only demonstrated, and that only by semantic contradiction of direct experience – from the *metaphor* of "holes" No-Thing leaves in (experiential) Things of all sorts. Symbolic representations or visualizations to help you come to terms with μ all consist of strange exercises such as writing a perfectly lovely complete and consistent set theory (or a pithy

[41] As these words should make perfectly clear, of course.

little koan) down on a piece of paper and then *burning the paper*. Or by the bottom unexpectedly falling out of a bucket of water being carried on a moonlit night so the *reflection of the moon* vanishes along with the water, leaving one carrying – No-Thing, a *hole* where the *illusion* of the moon once danced on the *illusion* of the water.

Hmmm, pretty heady stuff, but can it be worked into an actual set theory? I think so. Let's try.

3.5 A Bit of Formalism

It is perhaps worthwhile to formalize this, to define and extend traditional naive set theory algebraically just a bit to encompass the null set, the "set of all things that cannot be put into sets", where we insist that all subsets in any set theory *already* de facto include the empty set, so that this "set" isn't one and is necessarily distinct from the empty set.

First, like good algebracians let us give the null set the symbol suggested above: μ. This will help us differentiate it from the empty set $\emptyset = \{\}$. To simplify the algebra and show cleanly that the empty set is inside of it, we will introduce at the beginning an "empty object" which is in our existential set Universe. Rather than introduce an extra "empty object placeholder" in a list of objects (which would work just fine) we will treat the *brackets themselves*, the set boundary, as the empty object.

Then given a Universal set S of objects $\{a, b, c...\}$ with their identity subsets $I_a = \{a\}, I_b = \{b\}, I_c = \{c\}...$ (recognizable as permutations of all the group's objects one at a time and the *implicit* empty identity subset $I_\emptyset = \{\}$ (the permutation of all the group objects zero objects at a time), they can be grouped into subsets $A, B, C...$ in many ways via the union process e.g. : $A = I_a \bigcup I_b = \{a, b\}$ where in particular $S = I_a \bigcup I_b \bigcup I_c....$ Each of these subgroups represents a unique (unordered) permutation of the set objects. Note well that *all sets* include the brackets and hence the empty set.

In spite of the apparently discrete index on the set objects, do not be fooled – this index is discrete only in the sense of indicating uniqueness and should not be taken to mean that we can actually algebraically *specify* all the identity subsets for any given space in the sense of creating a mapping between some set of symbols and the set objects. In this I am being no sloppier, really, than any set theorist is when discussing a set S that might have infinite cardinality (uncountably infinitely many members) such as any interval of the real number line.

In English, these existential set theoretic statements say that all things that exist (set objects) can be placed in identity subsets, the union of all things that exist is all things that exist and that all non-empty subsets of all things that exist can be built out of unions of identity subsets (all of which seems pretty obviously true, given a Universal set of "things that exist" and a union and permutation process capable of handling continuum manifolds if that is what the Universal set happens to be).

Given this, the following three statements (plus the notion that any given subgroup can be formed by – or better yet selected out of the permutations of – the unions of identity groups) fully specify the notion of the Law of Identity:

$$\forall a \in S : I_a \bigcup I_a = I_a \tag{3.4}$$

$$\forall a \in S : I_a \bigcap I_a = I_a \tag{3.5}$$

$$\text{if } a \in S \neq b \in S, \text{ then } I_a \bigcap I_b = I_\emptyset \tag{3.6}$$

In this approach we *do not require any special treatment of the empty set* in the algebra. It is just the "zero" of the algebra and lies within it just as $x+0=x$ in arithmetic so all numbers "contain zero", and $a \in S$ can be $a = \emptyset$ (the empty object) as easily as a nonempty member.

Now, however, we *add* the following 'black hole" relations:

$$\forall a \in S : I_a \bigcap \mu = \mu \tag{3.7}$$

$$\forall a \in S : I_a \bigcup \mu = \mu \tag{3.8}$$

where a can be any object *including the empty object.*

These are *very different from the properties of the empty set!* Set operations involving μ (the undefined or null set) are without exception themselves *undefined or null.* One *cannot* in any sensible way take the union of "undefined" (which is neither an object nor the absence of an object) with a list of objects and end up with a list of objects, not even an empty one. Nor can one take the intersection. μ isn't, really, a set and doesn't live "in" the Universe S.

3.6 Set Theory of Thought

[THIS SECTION NEEDS WORKING but I'm just putting things where they belong in a very quick pass so that I can get this book ORGANIZED.]

For any given object, the intersection *and* the union of its identity set with itself is the identity set of the object, and the intersection of the identity groups of two *different* objects is the empty set. This last line defines, in fact, the very essence of what we mean by "different" just as the first two lines encapsulate what we mean by "the same".

Let us relate these two statements back to the Laws of Thought. In an existential μ-set theory, μ is not a set. Our human minds try to *interpret* it as "the set of things that do not exist" within the existential set Universe in question, but of course no such set *exists* within that set Universe (including the empty set) – it is a μ statement even in English. Nevertheless, we recognize the first of these two relations as the *Law of Contradiction* where as usual, a can be any object or the "empty object" corresponding to the empty set drawn from *within* the set Universe. Rendered in English, it says that "the intersection of any object drawn from our Universal set and not-an-set is not-a-set" (within the existential Universal set of the theory). Nor can we form the union of any set object to a "μ-thing" that is not, in fact a set.

In this formulation, the two μ-statements become requirements of *consistency* of a set theory. Once one defines a set Universe with its implicit existential subsets, then any sort of algebraic operation or set specification that yields a result that isn't one of these subsets must be μ, an *inconsistent* result. That isn't a disaster, but it does mean that this and any subsequent operations involving that result are also μ – meaningless – within the specified theory.

3.7 Summary

In this introduction so far you've already seen at least glimpses of many of the basic punch lines of this book, but they're probably a bit amorphous yet (at least I hope that they are or you won't keep reading). Either way, we covered a lot of ground so let's summarize what we learned before moving on.

At this point we should be able to see that set theory is all really lovely and seems somehow to be more fundamental than the rules of logic and mathematics or the Laws of Thought. We've also seen how it appears possible to make a naive, existential set theory that eliminates the possibility of paradox while embodying the Laws of Thought in a way that at least seems *less* ambiguous than they did in English.

In the process we deduced some important truths about the necessity for matching the *domains* of proposed set relationships intended to pick out particular sets from the set of all sets within our existential set Universe (which are all there whether or not we pick them out). Since we can easily come up with *silly* relationships, or broken relationships, or paradoxical relationships, or self-referential set relationships that do *not* describe a set in the set Universe (including even the empty set) we invented a "set" μ that is *not* a set, the NaS set. A metaphor for this set (which is *only a metaphor* since it isn't a set and doesn't exist in the closed set Universe where set operations are defined) is that it can be thought of as the *non*-invertible complement of the Universal set we wish to reason in.

At this point, formal logic is one possible thing that can be built on top of or in parallel with existential set theory – we just add a very few axioms and definitions and stir gently, since the Laws of Thought (viewed as axioms or not) are built right into its basic operational structure. We do need to discuss and define the notions of "true" and "false" and how they differ from "exist" and "don't exist" (are null) in the set theory, discuss the notion of "provability" as a possible proxy for "is true", and so on (and will do so in the next chapter), as those things appear to be *algebraic* constructs that gain existential validity only to the extent that they permit us to make *well-formed propositions* concerning their associated Universal set. In general we'll find that they are really useful only in *artificial* set Universes, not existential ones, and only useful to existential ones to the extent that we construct axiomatically defined mappings between the two. The real Universe isn't "true" – it just is. Abstract propositions in logic about the real Universe can never be *proven* to be true using logic without this *presumed* (unprovable) mapping.

Formal mathematics is what we call the human activity of creating the artificial set Universes we wish to either use as a proxy for the real existential Universe or just for the sheer fun of doing so. It is usually developed from *axiomatic* set theory from the beginning because we can see almost immediately upon attempting to develop set theoretic mathematics that any such development cannot be unique or complete. Axioms are needed almost immediately for non-existential mathematical sets to deal with notions of conditionally undefined set operations, paradoxes, domain restrictions and infinity, and oddnesses that result from viewing any given Universal set – say, the integers – as being embedded in a larger Universal set – say, a quaternionic field expressed as a function of curvilinear space-time coordinates with specific conditions on smoothness and a metric. Cantor's paradox (really, Cantor's theorem) suggests that pretty much any set Universe can not only be embedded in a larger set Universe, it can be embedded in a *much much larger* set Universe, recursively, so we can never talk about a *truly* Universal Set that contains all possible Sets any more than we can talk about a largest real number, only various ways that real number sequences can scale to infinity.

Computational mathematics is a particularly lovely blend of logic and arithmetical mathematics on a highly constrained, discretized domain. The "set Universe" of objects acted on by the operations of a computer is finite and discrete, intended to *approximate* real number arithmetic via integer arithmetic and symbolic mappings on a finite mesh. As a result it is nearly ideal for our purpose of understanding the μ (NaS) set, especially since there is of course no way to *actually* produce a truly undefined result in the limited set of logical transformations available to a computer.

Physics and natural science in general are still another and are *truly* based on an existential set Universe, even though without axioms even there we find ourselves unable to reason about the set Universe, only to experience a single instantaneous realization drawn from it. We *imagine* that there is something we have *named* "set theory" (and all related imagined results such as "logic" and "mathematics") but to be able to *use* this to *reason* about the actual existential set requires axioms galore.

Just as is the case with computing, where NaN results have to be encoded "by hand" based on higher order definitions and axioms "inherited" from a presumed mapping to a particular space expressed in terms of discrete binary transformations so μ (NaS) results can only be encoded for our human brain "computers" as metaphors, higher order axiomatic construction within the confines of the existential set available to our sensory perceptions. In neither case do our computers or our brains actually generate a "set" (result) that is not in the theory – rather they agree to *waste* one or more of the sets in the set Universe by assigning them the *meta-meaning* that results mapped there are not "results" and do not belong in the set Universe in question.

μ is as inconceivable to human reason as "infinity" is to a discrete binary computer, yet we can build a computer program that identifies arithmetical operations that would produce infinity or undefineable results and cause those operations to be consistently treated according to a table of operational results that determine what one gets when one e.g. adds "infinity" to a finite number (get infinity), divide a finite number by infinity (perhaps we wish to make this zero), subtract infinity from infinity (usually considered to be an undefined result). Truthfully, the only way the human brain itself understands infinity is in terms of tabular constructs just like this – we understand infinity in terms of how it behaves as the result of an *imagined* limiting process. In ordinary arithmetic $0/0$ is undefined, yet in physics $\lim_{x \to 0} \sin(x)/x = 1$ is used all the time because *for all nonzero x no matter how close to zero one gets* the result is well-defined[42].

In all thes cases, in order to *reason* about the probably infinite number of subsets of the presumed Universal or non-Universal set, the very general framework of an abstract set theory is clothed in *imaginary clothes* – unprovable *assumptions* called (in various contexts) definitions, axioms, rules of inference, laws of nature, microcode of the computer, a language (with a dictionary of symbols, a semantic mapping of those symbols, a syntax one can use to assemble valid "statements" with the language, and more). These are all rules that exist in our *minds* as we *reason* (or that appear to exist by *inference* in nature as it operates or that are engineered into the computer under the same assumed inference rules as those of nature or mathematics but applied). These abstract, arbitrary rules both select particular subsets of the existential Universal set via *metaphorical* relations established between that set and particular abstract mathematical sets and identifies them (encodes them within a language) via *information compression*, with inherited axiomatic functional relations between them. This is how we reason.

Since assumptions – specifically the *axioms* of a theory – seem to play a pivotal part in where we go from here (and is, after all, the title of this book) we'll next *explore* axioms in the context of logic and try to better understand just what they are and how they occur throughout *every realm of human endeavor* as a prior step to being able to do anything "rational" within those realms at all. In the process of looking at axioms and their critical role in formulating any sort of system of reason, we will inevitably be drawn to look at what can only be called a kind of breakdown in the scope of reason itself – Gödel's Theorem.

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[42]Whether or not you care about what happens *at* the point $x = 0$ depends upon what you are going to *do* with the expression, which could easily lead us to a discussion of measure theory and the *other* definition of null set, to which the single point $x = 0$ belongs in cases where one is using the expression under an integral sign. Who cares if one leaves a single mathematical point out of an otherwise well-behaved integral? But this particular digression is once again way too close to real mathematics and hence is only offered parenthetically for those that already understand it.

This is basically an extension of work done by Russell himself, in particular, the Russell Paradox. Although its importance *can* be overemphasized – it certainly doesn't mean that reasoning itself "no longer works", it doesn't mean that mathematics and physics and all that are in any fundamental sense unsound – its importance should not be *minimized*, either. It definitely warrants its own dedicated discussion, as it *both* maps certain paradoxical logical constructs out of set theory and into the null set *and* separates the notion of "truth" from that of "provability".

This is quite disturbing. It turns out that we cannot even completely analyze *mathematical* or *logical* propositions for truth within any sufficiently complex axiomatic system. As noted in the somewhat irreverent beginning of this part of the book, we want answers to the Big Questions – the questions on Life, the Universe, and Everything. We've assigned the task to Philosophers and want them to be able to explain their answers to us "beyond any doubt" using this reason thing we've been paying them to work out for so long. And it isn't just everyday people that expect pure reason to pay its own way and explain it all – even relatively contemporary and quite competent philosophers-mathematicians like Bertrand Russell would like "startling" conclusions to come out of the simple rules of logic applied to the world[43].

Alas, as we will see in great detail, we will be forced to conclude that Russell's fond hope is doomed from the beginning. We cannot prove *one single damn thing* about the Universe using *pure* reason. To use reason at all we must begin with unprovable axioms (unprovable premises leading to unprovable conclusions according to logic itself) and when we do, we will *almost certainly* still be left with some things that may be true or false or both or neither but unprovable in any event.

Now let's get started. It is pretty clear that our examination of "reason" must continue with a look at the *details* of how logical systems work. We've laid a good foundation with our discussion of set theory above, and I've laid out some of the things we hope to learn already so they won't come as a complete surprise or shock, but the *details matter*. Part of the "stomping the corpse" thing.

[43]This is nearly a quote, in fact, from one of his earliest works referenced elsewhere in this book.

Chapter 4

Logic

In the previous chapters we have seen how the Laws of Thought, as one of the basic tenets of Logic, are in fact quite troublesome and not at all "obvious truths". Since they are generally used to *determine* truth in an extensible manner, this is a problem. We also saw that to make the way they are usually framed in English (at least) *precise* and to *not admit existential paradoxes*, we had to try to formulate them in terms of *existential set theory* (where set theory in general is "the mother of all reasoning systems"). Only in existential set theory (with a well-defined set Universe) could the abstractions of "being" or "non-being" be found, only by *extending* this set theory with the null Not a Set μ (while leaving the empty set as an element of set theory *within* the set-theoretic Universe in question) could we deal with certain paradoxical statements that appear to be perfectly understandable, well-formed English sentences that parse out *logically* to be nonsense, contradiction, to things that violate our intuitive ideas of true and false, existence or non-existence, or that simply fail to actually specify any set in our set Universe *including the empty set.*

In this chapter we'll home in on Logic per se, especially in the context of *symbolic reasoning systems* that are do not *strictly* reference an external existential reality that is what it is, but instead can be used (sometimes in enormously subtle ways!) to make self-referential assertions. The purpose of this book is in no sense to denigrate the power, the beauty, the simplicity of Logic (or its cousin Mathematics); it is to point out that it is a sterile kind of beauty that cannot *in and of itself* give rise to *a single absolute truth* relevant to the physical world we live in, and that can all too easily implode, making *all* theorems in the system essentially unprovable. There is a fundamental disconnect between experience and reason that cannot be filled in by reason, and reason applied to itself proves to be *unreason* if one is not reasonably careful!

The easiest way to accomplish our goals will be by presenting a very few examples of logical arguments (famous logical arguments at that) to illustrate the different *parts* of a system of logic. We will see that systems of logical inference, without exception, can be described in terms of actions taken on sets (no surprise), that rules of inference are in some sense set-theoretical definitions or operations, and that to go *beyond* the elementary list-making and categorization operations of a raw set theory we have to *dress the sets up* with a mix of *definitions* and *axioms*.

A language is often viewed as a system of definitions, a dictionary. All dictionaries[1] share a fundamental self-referentiality that makes them far from trivial logical objects. Tarzan aside, it isn't at all obvious that real human beings are capable of taking a *dictionary for a strange language alone* and learning the language thus represented[2]. Indeed, there is considerable evidence to the contrary – without a Rosetta stone, without a context or pre-existing relationship in terms of which a decryption algorithm can seek information compressing patterns, the dictionary is *arbitrary* and can even *continuously change*. Modern cryptography is based on this premise – it constructs a highly nontrivial "dictionary" so that statements are (ideally) indistinguishable from random noise, at which point there is no informational compression at all. A further problem is that even within a single language with a fixed dictionary, all dictionary definitions in that language are *circular* – they are written in words in the dictionary, whose definitions are written in terms of other words, which are written in terms of *other* words, until eventually you find that the dictionary is nothing but a set of equivalence connections with a certain pattern. Yessir, Tarzan's accomplishment puts John von Neumann, Shannon, and the rest of them[3] right into the shade.

If we know something about the Universal set to which the dictionary applies, we can sometimes guess a consistent mapping between the "real" patterns of the subsets of that set and "virtual" patterns of the dictionary terms, possibly aided by visual cues such as a "picture of a tree" next to its definition that help us establish at least some provisional mappings. In essence, the dictionary represents a *code*, and to break the code we have to determine a homologous set

[1]By assumption here a dictionary written in the language it defines.

[2]Remember, Burroughs fans, Tarzan managed the miracle of learning written language from just having a pile of books and a children's primer dictionary handy in the jungle hut where his parents died. In my opinion this makes Tarzan a *transcendental genius* that makes Newton, Einstein, Goethe, Ramanujan look like dullards...

[3]Sure, WIYF, no doubt.

of linkages between the dictionary and the system to which it refers. Ultimately this task is made extraordinarily difficult because there is no guarantee that any homology will be unique. Given the high degree of degeneracy (redundancy) of human language it will almost certainly *not* be unique[4].

Dictionaries do *not* intrinsically specify a system of logic, however, and a language is *not* simply the set of homologies represented within the dictionary and some reference system. Dictionaries (real ones, not idealized ones) are only rarely complete – perhaps when they reference some "simple" closed system that is capable of being *well-defined* (literally) such as the "dictionary" of a computer or mathematical language.

Because of their intrinsic incompleteness – a complete dictionary for something like a real world would require the moral equivalent of a word for every event in space-time that *completely specifies the homology* between that event and all other events, plus the ability to represent *all higher order homologies* built on top of the raw physical homology – the "language" of human experience, of poetry, of illogic and paradox and contradiction – a dictionary is most generally an *approximate*, or *coarse grained* set of homologies, and requires something *more* to aid in the abstraction of *relationships* before anything like a system of logic ensues.

We've encountered just the tip of this particular iceberg in our discussions of sets, where ultimately the *dictionary* is what is required to identify *each object and sort it into its own identity set* when confronted with the Universal set. It is not enough to identify an object as a "tree", it has to be able to identify an object as *this particular tree*, with its own unitary and unique existence, as of this particular moment in its existence. Where in *fact* the tree is made up of a dynamically changing set of molecules, the molecules are made up of atoms, the atoms are made up of electrons and nuclei, the nuclei are made up of protons and neutrons, and the protons and neutrons are made up of quarks – ultimately a complete definition of *this* tree extends to the subatomic level, to the *fundamental* level, and extends through space and through time as a set of intertwining relationships.

This in turn doesn't necessarily recognize or encode the *relationships* and *structures* that emerge at the higher degrees of complexity. It is not at all easy to understand *this* tree's particular role as a home for nesting birds and eventual source of firewood based on an understanding, however complete, of its sub-

[4]A fact that, recall, really bothers General Semanticians.

atomic structure[5]. Specifying relational operations is like specifying the syntax of the language. We can define an apple quite precisely (if we try hard enough) as a concatenation of specific molecules that underwent a particular process of development in natural history without ever mentioning that apples are good to eat, that an apple a day keeps the doctor away, that a thrown apple can be used to bean someone on the head, that deer are attracted to apple trees in the back yard at certain times of year *because* they are good to eat except those yards of healthy people who bean deer on the noggins with apples any time they dare to show their furry little faces!

When we come to reason, we find that in addition to a set of definitions (that are fundamentally arbitrary and certainly not "obvious truths" or "provable") we need to specify relationships in order to be able to *operate* on the objects that are appropriately defined within the theory. I leave this term deliberately vague – operating on an object might (for example) be an action that "transforms" (in a sequential reasoning sense, not a temporal sense) a defined object from one state to another. Or it might be viewed as a sorting or categorization operation, one that takes an object or subset from one set and places it in another. Or it might assert a more abstract relationship between objects or collective subsets that we discover we need as we proceed. Ultimately such relationships function as *rules* of our system of reason. There are two primary kinds of rules involved in formal logic. One is the so-called *rules of inference* which are (as their name suggests) a set of rules that permit one to "infer" provisional truth relationships. The other is the set of *axioms* of the theory.

These two things are differentiated primarily by rules of inference being presumably *self-evident* statements – in fact, the Laws of Thought in disguise. They presumably "come with the territory" of set theory, universes and mutually exclusive partitionings of identity relationships, although I'm hoping that the previous chapters were enough to make you a bit skeptical that this is in fact the case. Axioms per se are simply unprovable assumptions, the hypotheses that lead one to *this* system of reason (or *this* set theory, *this* branch of mathematics, *this* hypothesized universe, *this* computer's microarchitecture) and not *that*.

It is a fairly recent discovery that it is possible to choose *different* hypotheses and reason validly to *different* conclusions even in that most precise and self-evidently obvious of mathematical systems – ordinary geometry. It is worth repeating like a mantra that while the sum of the angles in a triangle in *plane*

[5]The author is deeply indebted to Richard Palmer for teaching him this general idea as part of an introduction to the general topic of Complex Systems in the sense studied at the Santa Fe Institute – GIYF and WIYF, naturally.

geometry is π radians, in an *infinity* of other two-dimensional geometries it is *not.* If we change the assumption that the two-dimensional surface is "flat", the result goes away and is replaced by new, different results.

Eventually, I'm going to compress rules of inference into a *very limited* set based on the set theory above, which does *not* require things like the Law of Contradiction and the Law of Excluded Middle to universally operate *within* the Universal set of the theory but rather to differentiate that which is (in an *external* Universal set, including the empty set) and that which is not (is μ). "True" and "False" will be particular sets that may or may not be exclusive and exhaustive within set Universes that contain the system of reason being used (making it self-referential) distinct from "Being" and "Non-Being". The particular extension that permits it to be applied to True and False categories will then become an *axiom* of a *particular* system of reason applied to something *else* that is moderately concrete

This is a very good thing. It uses these two rules only to state the truly obvious – "Contradictions cannot occur" – without specifying precisely what a contradiction *is* (which requires both definitions and other axioms and a set of objects that might or might not be contradictory). In fact, perhaps it is better to think of it as being "Contradictions *do* not occur" as an assertion or constraint on possible sets of symbolic reason that we wish to consider in case they prove *useful* in *particular contexts.* The null set (the impossible) is not in the Universal set (the context in question), regardless of how objects are parsed into nonempty and empty or true and false sets *within* the context, the set Universe of the problem.

We *have to do this.* One apparently ignored consequence of Gödel's theorem (which we will cover, sooner or later) is that the existence of a single undecideable statement in a theory, together with the usual rules for inference, makes all statements within the theory undecidable just as surely (and using the exact same mechanism) as the existence of a self-contradiction in the theory makes all statements in the theory self-contradictory. In fact, the Law of Contradiction and Law of Excluded Middle can easily be shown to be *false* in any system of symbolic reasoning that admits Gödellian knots, which is pretty much any system of symbolic reasoning that matters, in particular, English (or other human languages).

This doesn't (ultimately) mean that they have to be abandoned. What it means is that *they are not self-evident truths* but are rather *axioms*, assumptions that can be used, in a constrained or limited way, to build a system of contingent relationships. *If* one can introduce an axiom or axioms that are capable of specifying *truth relationships* in the theory – a very big if indeed, since this is categorically impossible in nearly all interesting cases – one can build pretty little systems of classical Boolean logic with its Venn-diagrammatic disjunctive truth relationships. Whether or not these systems are *useful* is a different matter entirely and will depend strongly on what our goals are!

Let's see what the problem is, though, as people have grown remarkably attached to classical Boolean logic because it is a limiting case of the way our brains are more or less hardwired to think, and is "built in" to normal language and validated by all sorts of quotidian experience. It is a box that it is very, very difficult to think outside of, because most of what we think is implicitly derived using classical Boolean logic and one has to work hard to either clearly demonstrate its self-destructive nature in human language or other nontrivial symbolic systems or to bootstrap from it to a more general system of reason.

4.0.1 The *Formal* Problem with the Laws of Thought

Consider the following cute little set of carefully numbered (but self-referential) statements. We will skip the axioms and definitions required to specify "English" as the language of discourse and presume that we all recognize a "statement" to be a well-formed English sentence and so on. Here is a bit of fun we can have with the Laws of Thought and Gödel:

1. Statement number one is false. (Self-Referential Statement)
2. No statement can be true *and* false. (Law of Contradiction)
3. All statements must be true exclusive-*or* false. (Law of Excluded Middle)
4. Statement number one is neither true nor false. (If statement number one is true, it is false, but if it is false, it is true. It is not a member of the set of "true statements in English" *or its complement*, the set of "false statements in English".)
5. The Law of the Excluded Middle is therefore *false* in the domain of "statements in English". It is *definitely not true* that all statements must be true *exclusive-or* false, as we have constructed one that is not.
6. Statement number one is arguably both true *and* false by *implication* – *if* it is true *then* it is false, *if* it is false *then* it is true, suggesting that it is somehow *both* in a symmetric way – and therefore *the Law of Contradiction*

> *is false as well!* Or at least it *would* be false if it weren't for the fact that we just threw out the Law of Excluded Middle – it is no longer sufficient to show that it is not *true* in order to be able to conclude that it is *false*.

This is a set of statements that frames an argument that is *obviously* understandable both in human language and in logic. They are *reasonable*, whatever that means. Every term in the sentences used has a well understood meaning, the sentences are well-formed grammatical constructs, and the logic used is impeccable. We have used the basic rules of formal logic, in the context of a well-defined system of symbolic logic, to contradict themselves *with a clear demonstration of the contradiction!*

However, it is extremely important to make it very, very clear just what we have discovered and illuminated with this example, because even if classical logic based on the Laws of Thought is *inconsistent* in any nontrivial language (one capable of formulating statements such as statement number one) – which includes, as Gödel noted, all formal systems of reason capable of formulating arithmetic, which incidentally includes axiomatic set theory via a mapping between the power set construction and the natural numbers – those laws are often *empirically useful*, seem *intuitively* true, and we'd like to understand *why* and *how* they end up being useless and untrue some of the time if only to be able to put a well-defined fence around the hole yawning in the fabric of reason, threatening to flush *all of mathematics, all of logic, all of reason itself!* Has reason proven unreasonable, has the weight of symbolic argument created a black hole into which all reasoned discourse must slide?

The answer, perhaps *unsurprisingly* is "yes and no"! This argument shows that symbolic reasoning *does* have such a black hole at its center, waiting to trap the unwary. The name we have carefully given that hole is *Mu*. We see that in order to build a *consistent* system of symbolic reason, we *must* extend the Laws of Thought to acknowledge μ, that it is not enough to have a simple boolean dichotomy of true *exclusive or* false for all objects and constructs in any nontrivial system. We have also shown that the rule of material implication cannot be permitted to work the way we have blithely used it *without further restrictions* because once one demonstrates a statement where A implies not A and not A implies A (so that the statement is μ, undecidable), one can follow the usual method used to show that admitting a contradiction into a theory allows one to prove the truth of any statement to show that admitting an *undecidable* statement into a theory similarly makes all statements *undecidable*. This is a point that seems to have been missed – uncertainty is just as contagious as contradiction in any logical symbolic theory that contains modus ponens and modus tallens as valid algebraic rules for determining contingent "truth".

Take any statement, no matter how outrageous, that we wish to prove: The moon is made of green cheese. Invert it: The moon is *not* made of green cheese. Now we add statement one above: "This statement is false". Now it is obviously true that if "This statement is false" is true, then it is *also* true that if the moon is *not* made of green cheese then "This statement is false" is true. The fact that it would still be true of the moon *were* made of green cheese is irrelevant to the *process* of formal logic. However, we can transform this logical statement into if "This statement is false" is *false*, then the moon *is* made of green cheese.

In ordinary arguments this is no problem. As I type this, today is Thursday. It is certainly true that if I were the supreme ruler of the Universe, it would be Thursday because it *is*, most definitely, Thursday. We don't care in the slightest that this means that if it were, say, really Monday that I logically could *not* be the supreme ruler of the Universe because it isn't Monday, it is Thursday. We only get into trouble and arrive at a (note well) *true conclusion* – that I am not supreme ruler of the Universe – if I *lied* and the premises of my original argument were false, or if they were contradictory – today is Thursday *and* it is not Thursday, it is Monday, in which case I *am* supreme ruler of the Universe too and equally well its contradiction, a mere flyspeck on a backwater of a planet in a tiny corner of the cosmos. We hate it when the latter happens so we require logical systems to admit only statements that are never both true and false they have to be one or the other.

In our *perfectly sensible argument*, however, we are in a *different* kind of trouble. Which is it? Is the moon made of green cheese or isn't it? If we look at statement one, we find that if we assume that it is true, we conclude that it is false. We therefore conclude that the moon is made of green cheese. If we assume that it is false, we conclude that it is true. The moon is *not* made of green cheese. If we assume that it is false, prove that it must then be true, and conclude that it must therefore be false (iterating one more level in the process of decision) then the moon is made of green cheese again. Unless we try the opposite, or iterate one *more* level, in which case we conclude that the moon is *not* made of green cheese! *Ad nauseam*, if not ad infinitum.

Neither. Both. The existence of *one undecideable statement* in *any system of formal logic* makes all statements in that system undecideable. We can use the very power of formal logic like a poison, working *backwards* using nothing but permitted algebraic steps to contaminate every single axiom upon which any theorem is based, making them as undecideable as that undecideable statement. If, when confronted with *any question in a system of logic* we *ever* answer "I don't know" or "Mu", or whack the asker on the head with a banana and run away, giggling – all the rest of the answers to all of the other connect*able* questions becomes suspect. The basis of formal reason is *formally unreasonable.*

Let's see if we can rescue it, if only because it does seem to work so well, most of the time. To fix things up, we are going to have to clear our head of cobwebs, shake off the seductive allure of logic, and fall back on a *higher level view* of what we're trying to accomplish. The easiest way to see where we are going is to look carefully at the difference between the argument that used "Today is Thursday" and the argument that used "This statement is false". The former refers to something that is *objectively true* in an *external set Universe.* For that matter, so is the statement "The moon is (not) made of green cheese", in English! Who the hell cares about logical games like the ones above – they are *bullshit.* There is only one correct answer to the question "What is the moon made of?" That answer is *I do not know!*

At least not "know" as in "can prove to be undubitable truth using nothing but pure reason in any system of logic". We can (as we will see) find ways of providing *highly plausible answers* to what the moon is made of, and those ways will *in no way* depend on whether today is Thursday, or whether "This statement is false" is formally undecideable. The answer to the question of what the moon is made of is *formally* undecidable, and so are all other well-formed questions any human has ever formed, because formal logic, even if used extremely carefully and avoiding the truth-sucking pit of undecidability, leads to contingent, not absolute truth as the argument above *formally demonstrates.*

No process of logic – and pay careful attention here, because this is *very important* – *no* process of pure logic will answer this or any other question. Not even if I go to a "higher order" logic and fix up the silly problems with self-referential undecidable statements, restrict my domains suitably, introduce the μ-pit and dump all Gödellian knots into it so they can't sully the landscape and purity of our reasoning process. This was argued convincingly by David Hume two hundred and fifty years ago and philosophers, logicians, and mathematicians have been in a state of acute denial ever since. The question of what the moon is made cannot be *definitely*, or *certainly* answered in our imaginations, and all symbolic reasoning occurs in the imagination.

The moon *is what it is!* Which may be nothing at all like what we *imagine* it to be, nothing like what it *appears* to be. The moon may not have the objective reality we presume for it *at all*, let alone have specific properties such as "being made of green cheese". Or not. It may be the *illusion* of a moon, a moon that exists only in our sensory perceptions. Or it may have perfect existential external reality and be made of what it is made of, quite independent of what we *ever* think it is made of.

What matters, then, is not so much the validity of the system of reasoning we use to "prove" things about the moon, as the *correspondance* between the *results* of that reasoning and our *experience* of the moon. If we take the system of reason used too seriously, it contains a black hole and will swallow itself. If we admit that the black hole is there and simply *keep away from it*, we'll find that it is quite useful and results in a remarkably good and consistent correspondance, a *compelling* correspondance, but not a *logically necessary* correspondance, between our imaginations and our sensory experience of what may well be an objectively real external Universe.

The deepest foundation of any system of symbolic reasoning, then, must be basically "black hole repellent". μ is there, waiting, and we have to wrap our minds quite literally *around* it and accept the contingent and uncertain nature of all knowledge, *including knowledge based on formal reason and mathematics* but especially inductive or deductive knowledge of a presumed existential reality. We must *begin* with assumptions, with axioms, and if we are not careful to avoid overstressing the *lack of certainty* of the axioms, those axioms will cause our system of knowledge to "self destruct" as we come up with predicates that do not close within the system, that must map into μ (carrying everything else along with it).

What we should conclude from all of this is that formal logic is rather insubstantial, existing in our imaginations, and yet there is *something* that is non-null, an existential set Universe that *at least* contains our sensory experiencing *including* our imaginations. The latter can be likened to a big (really really big) messy (really really messy) room, in which our "selves" wander around, trying to pack it all away in neat little boxes we fold out of the trash paper we find on the floor, finding unsurprisingly that some of our boxes have holes through which the contents fall, and that no matter where we wander, the room itself seems to just go on and on so that we have a very hard time building a box large enough to contain the room itself: no matter how large a box we make up, we can easily find an object that won't fit into it. Remember, our imaginations themselves are *at least* a subset of the contents of the room, we can in one breath imagine a box large enough to hold everything, and then imagine an object just a bit too big to fit that box, or write a sentence that claims that it is false that is true, therefore false, therefore true, therefore neither, therefore both.

So let's be sensible, and focus on the process of making boxes, of organizing whatever we can see, without *worrying* so much about whether the boxes we build are *perfect* boxes, without holes, always large enough to hold all possible contents. Indeed, let's fall back on *existential set theory* – the set theory appropriate to a *real objective existential Universal set* (whether that set is open, infinite, finite, closed or most likely of all – unprovably any of the above) and stick with only *the Law of Identity* and the *power set construction* applied to the Universal set. The latter specifies the set of all possible sets, all possible sets of sets, etc. *of this actual set Universe.* These "sets" *are*, whether or not we imagine them – the partitionings we might try to predicate or otherwise construct are imaginary, but the set objects are *real.* The only processes that are necessary for building the various orders of power sets are *iteration and permutation* of set objects, and we should never confuse our fanciful attempts to pack subsets in the power set away into neat imaginary categories, boxes constructed out of spiderwebs and fairy dust with the underlying reality where the boxes themselves are just high level manifestations of structure that are at best a *part* of the reality.

Or, as a General Semantician might say, the map is not the territory. But even this is misleading in an attempt to metaphorically represent knowledge, cognition, semantics, epistemology versus the world. The map may or may not be the territory it represents (reality can be thought of as a perfect map of itself), but maps of *disjoint* territory are, in fact territory in their own right within the *global* territory that contains the maps and the territory they are mapping. The essential existential condition of a Universal set is that it is the *only* map of itself, it has no legend, and that all lesser maps must *begin* with a legend to establish symbolic correspondances between information-compressing constructs in the territory of the map with a (usually much larger and information rich) territory that is *outside* of and disjoint from the map. Any such map (if it is honest) will always contain Terra Incognita – unknown territory – along with an intrinsic inability to be a perfect map of the global territory *including* itself, no matter how carefully the legend is constructed.

What is this "legend", the code that specifies what the lines on the map are *supposed* to mean, and how to we establish and test that meaning, decide if the map we have built is a *good* map or a *bad* one? We need just two things: Axioms to specify an *imperfect and mutable* system of reason and enough *common sense* to come in out of the rain, or more relevantly, to not take our imperfect system too seriously, to accept its limitations, and to keep away from the black holes that inevitably appear when we try to make a self-portrait, a map that is at least partly a map of itself. Reason works pretty well when it refers to *something else*, but the minute you apply reason to reason or expect it to produce something besides contingent truth (on a good day, with a tail wind), you discover that it is *unreasonable* and that its conclusions can *always* be doubted.

Common sense is, we must hope, common. If you don't have it, I'm unlikely to be able to help you discover it (although later I'll certainly try to *quantify* it). Axioms, however, are not common. Or are they? Axioms could be as common as dirt (and the basis of common sense itself) and most people would never know. Hmmm, at long last it appears to be time to look into this "axiom" thing. Time, in fact, to ask...

What's an Axiom?

Chapter 5

What's an Axiom?

So, just what *is* an axiom? Even if you know (or think that you know) it doesn't hurt to do an authoritative check. Let's start with a dictionary definition:

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From Webster's Revised Unabridged Dictionary (1913) [web1913]:

  Axiom, n.-- L. axioma, Gr.; that which is thought
     worthy, that which is assumed, a basis of demonstration, a
     principle, fr.; to think worthy, fr.; worthy, weighing as
     much as; cf.; to lead, drive, also to weigh so much: cf F.
     axiome. See Agent.
     1. (Logic and Math.) A self-evident and necessary truth, or a
        proposition whose truth is so evident as first sight that
        no reasoning or demonstration can make it plainer; a
        proposition which it is necessary to take for granted; as,
        ``The whole is greater than a part;'' ``A thing can not,
        at the same time, be and not be.''

     2. An established principle in some art or science, which,
        though not a necessary truth, is universally received; as,
        the axioms of political economy.
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These definitions are the root of much Evil in the worlds of philosophy, religion, and political discourse. These first of these two definitions is almost universally taught (generally in Euclidean Geometry, which is the only serious whole-brain math course that nearly all citizens in at least the United States are *required* to take to graduate from high school and which is therefore not infrequently the *only* math outside of a few courses in symbolic or predicate logic and *maybe* a course in algebra that a humanities-loving philosophy major is typically exposed to). A relatively few students may move on and hear the term used in the second, "wishful" sense (wishful in that by calling an established principle an "axiom" one is generally trying to convince the listener that it is indeed a "self-evident and necessary truth").

Alas, they are both *fundamentally incorrect* (although the second is closer than the first). When I say incorrect, I mean that they are *completely, formally, and technically incorrect*, not just a little bit wrong in detail. Neither of these is what an axiom is, *in mathematics* (from which *technical* usage the term's definition is derived)[1].

This can best be illustrated by means of a simple example, well known to anyone who studies mathematics beyond the elementary level[2]. Everybody (as noted above) learns the geometry of Euclid, as the archetypical Axiomatic System. One begins with the Axioms of plane geometry and proceeds to derive Theorems (not Laws, which are something else entirely, if one actually bothers to call things by their correct names). Euclid for the most part (and his many overawed successors to a greater part) did indeed hold the axioms to be self-evident truths, although one should carefully note that the Latin root means *"that which is assumed"* and *not* "that which is self-evidently known"!

Well then, what about *non*-Euclidean geometry?

As was only finally discovered in the mid to late 1800's (by Gauss, Riemmann, and a few others), geometry on (say) a curved surface such as that of a sphere is *not the same* as geometry on a plane. On a sphere, unique parallel lines *always meet exactly twice*. Triangles have *more* than 180°, with 180° being a strict lower bound for "small" triangles that lie approximately in a plane. That isn't to say that there *is no* geometry on the two-dimensional surfaces of spheres, or hyperboloids, or ellipsiods, or arbitrary amoeba-like-bloboids, only that it is

[1]Note also that one example they give of an axiom is the Law of Contradiction from the previous chapter! The *same* dictionary gives a mathematical or physical definition of "law" that is very definitely not that of an axiom. Clearly there is a great deal of semantic confusion that underlies the epistemological confusion being addressed by this work. That this mistake absolutely pervades even the *language* is evident from the fact that this commonly accepted dictionary definition is technically incorrect *in its supposed logic and mathematics definition.*

[2]Where, for the sake of argument, University level introductory Calculus will still be considered "elementary" for the most part. Hey, nobody said this would be easy – otherwise somebody would have already done it!

different from geometry on the plane, and that the difference is *fundamentally connected* to the differences in the *axioms* from which one reasons.

Different axioms, different theorems, different results, with all the axiomatic systems considered and their theorems *equally empty* in terms of "meaning", if by meaning you mean "in some necessary relation to the real world".

For a long time – that would be *thousands of years* – after the invention of axiomatic reasoning, this was the way the world worked. Philosophers (and a whole lot of mathematicians) continued to think of axioms as self-evident truths, laws of logic and mathematics, as it were, and a hundred-odd generations of students derived Euclid's theorems about triangle congruence without ever thinking too deeply about them. Even the belated discovery that there could be *different* axioms that led to different theorems left the sanctity of axiomatic and logical reasoning itself untouched, seducing many a philosopher to continue using the essentially *classical* reasoning processes that follow, in fact, from using a number of *self-evident* axioms that were rarely to never openly acknowledged and which were all *unprovable assumptions*, every one.

In the late 1800's and early 1900's, though, some *fundamental* cracks began appearing, this time in the *theory of logic itself* as increasingly brilliant mathematicians and physicists began examining it very critically indeed. This was motivated in part by the development of much that was startlingly new and different in mathematics. Suddenly it was not only not forbidden to challenge the masters such as Euclid, it became the very fashion!

This was almost entirely due to developments connected to the field of physics (one of Philosophy's great success stories and the father of quite a bit of mathematics). Iconoclasts showed that the Universe itself turns out, in plain fact, to be neither simple nor classical nor flat, and in fact to violate all sorts of "self-evident" principles to the point where human beings (with a few extremely well-educated and fairly brilliant exceptions, maybe) can no longer really understand it. Let's do a quickie review.

Einstein, Lorentz, and Minkowski discovered and wrapped up in a beautiful piece of new mathematics that space isn't flat after all, that time isn't a sacrosanct independent variable but is rather "just another dimension" not only on a par with spatial dimensions but one that mixes with them every time anything moves, and that Euclid's (and Galileo's) axioms where not, as it turned out, even the *right* axioms to describe the spatiotemporal structure of the Universe. I *teach* special relativity to both undergrads and graduate students, and it is quite literally a mind-expanding exercise to attempt to visualize and think in terms of four-dimensional, curved, space-time when your *entire psychological perception* of the Universe is very definitely of three apparently flat dimensions and an independent time[3].

Consequently, every philosphical argument ever made that relies on an implicit temporal ordering of events or that is implicitly independent of the relative viewpoint of the observer (and there are arguments aplenty in this category, given the implicit ordering in *modus ponens*, if A then B) at least has to be reexamined and probably is just plain "wrong", if one has a criterion for correctness that includes using logic intended to apply to reality that is not egregiously inconsistent with the logic revealed in empirical observations *of* reality[4]. The broader lesson, though, is that such arguments, to have even *provisional* validity as the basis for some kind of rationalism, need to have a kind of "invariance" with respect to the space of possible fundamental axioms because tomorrow someone might well discover that four-dimensional spacetime is itself just a projective view of a structure that is much larger and more complex – or simpler – with *different axioms* and definitions that formulate the theory. If we aren't careful, we'll have to do the winnowing process all over again[5].

Curved space is *simple* compared to quantum theory. By the end of the first or second year of physics grad school, most students[6] have made a peace with special relativity theory as it is so mathematically *elegant*. Quantum theory takes years, decades even, to *approximately* understand. Feynman once said that "Nobody understands quantum mechanics" and Feynman was a card-carrying supergenius. Quantum theory is just a little bit too difficult for the human mind to fully comprehend, even when that mind can actually do computations with it and get correct answers.

Quantum mechanics *can* be developed axiomatically, and is usually taught at the introductory level by (at some stage) differentiating its axioms from and contrasting them with the axioms of classical mechanics. Perhaps the best ex-

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[3]There are some lovely books for the lay reader that manage the same thing in prose fiction, such as *Flatland*.

[4]You think that I joke here, but for the world the philosopher Hegel served as a sort of "Antichrist" or "straight man" of rational philosophy. No conclusion was too absurd for this master logician, including a "proof" that there could be no planet of any kind in the orbital interval between Mars and Jupiter, published months *after* the discovery of the Asteroid belt. Ba-da-*bum*.

[5]Or if we *are* careful. This process precisely defines what happens at the leading edge of physics, where each newer, bigger theory has to completely swallow its predecessors and not explain any *less* but which precedes from *different* axioms.

[6]Mathematically competent students, that is.

ample of a self-contained axiomatic development (one that avoids introducing the classical/quantum choice point until the geometry of the states of a generic "system" and the algebra of the measurement process are defined, making mathematically precise an issue that philosophers address in words) is Schwinger's *Quantum Kinematics and Dynamics*[7].

As we'll discuss in future chapters, quantum theory pretty much destroys the implicitly *classical* conclusions of rationalist and idealist alike whereever those arguments *implicitly* rely on "self-evident" axioms that are classical in nature. It makes a hash of some of the supposedly inviolable *fundamental premises* upon which they argue, where a thing can either "be or not be" but *not both*. In quantum mechanics things are nearly *always* in a state that can only be called both, unless you *look* at them in which case they resolve into one or the other – it is impossible to speak in the abstract of the electron being in box A or box B, or of having passed through slit A or slit B unless you *measure* it and entangle its abstract state with your own unknown and unknowable state as an observer[8]. Even measurement doesn't get you out of the woods, as a measurement of property X often creates a state where property Y is no longer classically defined in accord with the naive "Laws of logic".

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[7]Which is alas out of print and no you can't borrow my copy. Amazon sometimes can locate a used copy; there are also some in physics libraries. And somewhere one of my ex-students is walking around with *my* original copy and if/when they read these words I'm *certain* they'll put it into a mailer and send it back...

[8]And *this* turns out to be a time-ordered, non-relativistically-covariant kind of statement that is just plain wrong. From the *inside* of the Universe you were *always* entangled with the system and no actual change occurred in your combined state. There is no such thing as the "collapse of a wavefunction" in a properly relativistic reversible quantum system, only "ignorance of the initial state of all of the entangled Universe outside that small part you call "the system". If you are a physicist or mathematician, you can see the truth of this by reviewing the derivation of the generalized Master equation in the quantum theory of open systems, but it is *not* for the mathematically faint of heart. I may have to write a wikipedia article for the GME just to put *something* out there for lay people to understand, as google reveals nothing immediately useful to anyone but theoretical physicists.

The GME is generally not taught to physics graduate students, alas, unless they are in one or two subspeciality fields. This means that most physicists are not terrible aware of its existence or how it works in quantum statistics. Consequently, damn few *non*-physicists have ever heard of it, including the ones that teach or write in philosophy departments. This in turn leads to silliness that often goes under the name of "quantum philosophy" where it is asserted e.g. "wavefunction collapse" as a truly random process opens the door for free will (as if randomness is any more free than determinism) or the even sillier "new age quantum" stuff that appears in the movie "What the (bleep) is it All About".

Sigh.

Note well that the point isn't that philosophical arguments should now all be consistent with quantum theory and we should all be logical positivists (more on that later). After all, quantum theory is likely enough not precisely correct and has yet to be properly unified so it can describe all the fields (especially gravity) within a relativistic framework where interactions are due to the curvature of spacetime and not the exchange of quanta of some underlying field. Even if physicists solve *that* problem (and they might, eventually) there is always, or so it seems, another box to be opened within the latest box we manage to find a key for. It is that philosophical arguments should *begin* by stating the axioms from which their conclusions are derived and should either be viewed as *conditional truth* that can be doubted and judged in accordance with those stated axioms or shown to be conclusions that are *invariant* with respect to classes of motion in "axiom space".

Whenever a physicist or mathematician starts talking like this[9] you know you are in deep trouble. We actually were all in precisely this sort of trouble early in the last century, when a mathematician named Cantor was working out certain classes of infinity in set theory. Cantor was the guy who realized that while (for example) the count of the set of all rational numbers is a pretty big number – a countable infinity, in fact – the count of the set of all *irrational numbers* is a *bigger* number, an *un*countable infinity. This little (very simple) observation had vast consequences in number theory and even in physics and calculus, where it is related to *measure* theory[10].

It also had implications in the fields of computer science, where it could be related to the "computability" of various formal patterns and, as it turned out, to formal logic, the study of axiomatic systems! Our friend Bertrand Russell[11] made an important contribution right about here involving just how a large set can be split up into smaller sets. This isn't a mathematics treatise, so we won't recapitulate these arguments in any detail but rather will get to the important point. The outcome of this line of reasoning is that by mapping "axioms" and

[9] What is a "space" of axioms, anyway? We clearly need some axioms to describe it...

[10] For example, the theory of classical chaos arises in part because for any sufficiently complex interacting system, the set of closed orbits is of *measure zero*; there are usually a countable infinity of them while in between there are an infinitely bigger uncountable infinity of open orbits that never quite repeat. This, in turn, is one of several reasons why the Universe cannot be classical and also structured and persistent (given our classical empirical understanding of the forces of nature).

[11] A Really Smart Guy(tm) in the annals of modern philosophy, who thoughtfully *refrained* from contributing lots of Hegelian Bullshit while still writing with great insight upon the basic problems of philosophy. He was helped by being, actually, a decent logician/mathematician who was working on the formal *limits* on what can be known from logic.

"propositions" (things that can be considered true or false according to the axioms and logical deriviations therefrom) into a *space of integers* and applying the well-known logic of integer systems to them, the sanctity of *axiomatic systems themselves* was metaphorically whomped upside the head by Kurt Gödel[12]. What Gödel showed is important enough to warrant a chapter of its own (where we'll avoid the Evil of mathematical detail but demonstrate in fairly simple terms how verbalizable reasoning systems *of nearly all sorts* are either inconsistent (and mathematicians hate that) or incomplete (ooo, mathematicians hate that too).

Here is a summary of what you should take from this chapter and into the next. They are, I hope, a fair summary of the structure of modern mathematical logic as a system capable of examining *itself* and embracing modern physics and mathematics:

- *Propositions* are objects that we wish to rationally analyze and assign a value of true or false to. Note that these are *algebraic* or *symbolic* objects. A "penny" is not the right kind of object as it cannot be true or false or "future cloudy, try again later[13]; a statement such as "All men are mortal" is a proposition.

- *Axioms* are *not* self-evident truths in any sort of rational system, they are *unprovable assumptions* whose truth or falsehood should always be mentally prefaced with an implicit "If we assume that...". Remembering that ultimately "assume" can make an *ass* out of *u* and *me*, as my wife (a physician, which is a very empirical and untrusting profession) is wont to say. They are really just assertions or propositions to which we give a special primal status and exempt from the necessity of independent proof.

- *Definitions* basically specify the objects upon which the axioms act or the nature of that action. They are purely descriptive and hence also unprovable, but they are also not assumptions. You cannot *prove* that "penny" stands for slivers that might be copper, zinc, or whatever, produced by

[12]An archetypical mathematical genius who was so brilliant that he couldn't manage his own personal life and accidentally starved himself to death when his wife became too sick to cook for him. History is full of examples of super-brilliant people who are somehow, incredibly, simultaneously too stupid to come in out of the rain. Or (for example) to put down a stylus and address an invading soldier armed with a very sharp piece of metal and dressed in bloody armor respectfully by (for example) grovelling a bit while declaiming "Slay me not, oh master, I am the Great Archimedes and a spoil of war and your king will Have Your Head if you take mine..."

[13]Yes, as a kid I had an Eight Ball, and still think that as a tool for prophecy and logical analysis it is unparalleled. It beats the hell out of Tarot cards, and is cheaper too!

an authorized governmental institution, with one of several possible classes of history and morphology, you can only assign the word to refer to that class of *actual* objects each of which is a unique individual with its own specific *differences*) by means of a sufficiently precise definition. This definition itself is expressed in words that require definition. Ultimately any given dictionary is *circular* – it defines words in terms of other words in the dictionary and cannot be understood unless you *already understand* those words.

How then can we group objects into a class and name the class "penny"? It is one of the miracles of human consciousness, this ability to generalize and construct symbolic algebras and languages, and is clearly built in human functionality as most other animals lack it altogether and even in humans it is remarkably fragile and dependent on developmental stimulation at just the right time.

- *Rules of Logic* that we've already discussed above. For thousands of years it was thought that the rules of logic were universal and beyond question – axioms in the sense of being *manifest truth*. It was discovered less than a hundred years old, however, that the Law of the Excluded Middle is not, in fact, a universal "law" but rather an assumption. It can be *left out* of certain classes of logical systems and the resulting system still works to support "reason". Certain interpretations of quantum theory similarly suggest that the Law of Contradiction is essentially classical in nature and cannot be naively applied to classical statements in a quantum theory.

  A particle cannot be "be at position $\boldsymbol{x}$" and "not be at position $\boldsymbol{x}$ in classical theory – to assert this would be a contradiction. However, in quantum theory there is a third alternative – that its wavefunction has nonzero support at $\boldsymbol{x}$ and the particle can *neither* be said to be *or* not to be "at position $\boldsymbol{x}$". The English words make perfect classical sense but are not valid forms for quantum reasoning, and making naive classically formulated statements about the particle and its position will lead one to all sorts of classical paradoxes.

  Even the law of identity (which is by far the strongest of the three) gets a bit shaky in a world where a positron/electron pair can be anihillated to produce photons, or created from photons in the inverse process, especially when the electrons themselves are *always* being described by relativistic wave functions that are microreversible and the electron, the positron, and the photons are quantum mechanically entangled and smeared out over space and time.

The moral of the story isn't that logic is somehow invalid, it is that we need to be very cautious about our belief in absolute truth, especially when those beliefs concern the system by which we decide on truths. History is full of cases where the human mind was trapped by its own preconceptions. In this case we are linquistically trapped by the *classical language* learned at a young age by our *classically evolved brains* where things can be "seen" only in three or fewer dimensions and it gives one a headache to try to draw or imagine objects in four or more, where propositions cannot be true and false and must be one or the other. It is interesting to note that even a child's toy like the Eight Ball is smart enough to answer "maybe" or "try again later" but logicians for *thousands of years* insisted on "yes" or "no" with no middle ground!

- Axiomatic systems can be *consistent* (where none of the axioms directly or indirectly contradict themselves). They can also be *inconsistent*. Easily, as it turns out. Almost inevitably, really, especially if you are careless and start throwing in too many propositions as axioms. There may be only one way to solve any given mathematics problem correctly but there *always* an infinity of ways to get it wrong, and getting it wrong usually arises from a student using some axiom or theorem incorrectly, de facto introducing a *new and inconsistent* axiom into the problem.

- Axiomatic systems can be *complete* (where all propositions that can be sensibly framed can be determined to be either true or false by developing the axioms with logic) or they can be *incomplete*. There can actually be propositions that are sensibly framed and whose semantic content is understandable in human language whose dualistic truth or falsehood *cannot be determined* within an otherwise sensible and well defined set of axiomatic reasoning.

The last two elements – completeness and consistency – are fairly recent additions to logical and mathematical theory. In fact, there is a *conflict* of sorts between consistency and completeness, where a consistent system of more than a certain degree of complexity *must* be incomplete and contain statements that (for example) are true but cannot be *proven*, statements that are neither true nor false. Note that such a system can always be *made* to be complete by adding more axioms to specifically assign truth or falsity to these "ambiguous" or "self-contradictory" propositions but this, of course, generally can be done only at the expense of no longer being consistent.

This leads us in the most natural of ways to Gödel, who was the primary logician responsible for proving that logic is a tragically flawed tool *even for the purpose of guiding abstract reasoning*, let alone for fulfilling the rationalists' dream of *deducing* the True Nature of Being from Reason Alone.

Chapter 6

Gödel

Pursuing the mathematical study of axiomatic system themselves leads one to some dangerous, convoluted conclusions, conclusions that would have more than sufficed to get you burned at a metaphorical (or quite possibly a real) stake if they'd even been proposed during Euclid's time, or during the 1300 or so years in which the Church dominated philosophical discourse with its iron hand, its inquisition, and its very "special" axiomatic system described in later chapters[1].

To make a long story short (and relatively simple!), propositions (mathematical statements) can be mapped into *numbers*, usually called *Gödel numbers*. For example, they can be encoded by the ASCII[2] string that represents the statement. Some propositions are used to determine certain arithmetical mappings, for example the truth value of other propositions; these presumed true propositions are then the axioms of the "theory" consisting of the set of all enumerated propositions.

We can then write down propositions about themselves – propositions that refer to their own Gödel number, and a strange thing happens. *Either* the axiomatic system is *inconsistent* (not all the axioms can be true, although Gödel's theorem of course cannot tell you which ones are true and which ones are false) *or* there are propositions the truth or falsehood of which cannot be determined by applying the consistent set of axioms – the axiomatic system is thus *incom-*

[1]Not just "the Church" of course, but rather *all* religions in *all* primitive cultures, especially the really successful and scary religions with a harsh memetic defense system. Recall from the introduction that religions preferred to have a monopoly on logical and philosophical discourse so that they could make people believe seven impossible things before breakfast.

[2]A mapping between characters and binary numbers used in pretty much all computers for handling character data.

plete. Axiomatic systems with an enumerable set of propositions that can be made self-referential are thus either incomplete or inconsistent.

It is tempting indeed on the philosophical side to make too much of this, just as it is *equally* tempting to the mathematicians and computer scientists (for whom the theorem makes some very practical statements about computability) to make too *little* of it. We'll try to come in "just right".

First of all, it *does* impose some fairly stringent limitations on what we can know from science, but most of those limitations are *irrelevant* to the use of science as a tool for human understanding. The primary lesson I will emphasize below is that it should force us to think carefully about the axioms underlying Natural Philosophy whether or not those axioms are openly or even covertly acknowledged in most philosophical or scientific discourse. This is a primary failure of Russell, who *did* know some mathematics and should have known better in his philosophical discussions of e.g. inductive reasoning than to do anything but identify the validity of inductive reasoning as an axiom and hence beyond analysis for anything but consistency or completeness. Second, it *is* an immensely important theorem in reference to languages of all sorts and hence to the most common form of expressive human thought.

In fact, all sentences can be framed as propositions. They can all be mapped into unique *Gödel* numbers by means of humble ASCII. All human written or spoken language can be encoded/transcribed into sentences, and sentences (like this one) can easily refer to themselves. It therefore seems perfectly reasonable that one can easily get into Gödelian knots when analyzing the truth or falsehood of any statement that can be written or spoken, including all philosophical reasoning, all computer programming, and all statements of physical or natural law, although in the latter case the language of mathematics is perhaps not so simply trapped in the ASCII web.

To put it another way, mathematical and logical and semantic systems that can be written in such a way that they can refer to themselves can easily become *fundamentally conflicted*, with true but unprovable propositions and propositions that "sound" like meaningful hypotheses which in fact cannot be proven true or false and somehow appear to be neither.

Why should all questions (including this one) have answers?

Here is where we *can* draw some very useful conclusions from Gödel. For any of a wide class of questions, especially including questions that might in any way direct or indirect refer to themselves (like this one) *they don't*. That is, it is perfectly possible to formulate statements in English (or any other language) that *look* like questions, *sound* like questions, *fool the mind* into thinking that they are questions to the extent that all sorts of time and energy are expended attempting to answer them, but that *are not questions* (or more generally, hypotheses, propositions, other entities whose truth or falseness or relationships we might wish to explore).

Here's fun mental game that has been around for a rather long while one way or another:

- The Law of Contradiction tells us that any given statement cannot be true *and* false at the same time.
- The Law of Excluded Middle tells us that any given statement must be true *or* false.
- The following question is false.
- The preceding statement is true.

So, if we assume as premises the first two statements (which, we must carefully note, are two of the Laws of Thought and it would be very bad indeed for "reason" should they prove incorrect), are either of the last two statements true or false?

All attempts to parse out a consistent answer instantly kick one into a loop. Somehow the two statements contradict each other, yet the sentences clearly exist and are *independently* sensible. In fact, the sensation that parsing the language leaves us with is that neither of these statements is true *or* false and somehow they are both true *and* false at the same time. Both the Law of Contradiction and the Law of Excluded Middle crash to the ground, and with it nearly everything we thought we "knew" on the basis of logic applied to statements that can be written in English.

So much the worse for reason. In addition to things that can be True or False, there can be things that are Neither. Or Both. Or "Answer Cloudy, Try Again Later". This is in the context of *trivial syllogisms*: simple sets of two or three statements that are supposed to be *easy* to take to an unambiguous conclusion. If reason fails us here, what can we expect when we ask a question like "Should abortion be legal" or "does God send humans who commit murder-suicide to nominally defend their faith to heaven or hell"?

Fundamentally, asking if these statements are true or false isn't a question, it is a "pseudoquestion"[3]. It looks like a question (or proposition) semantically and grammatically, but because it has no answer it isn't, really, a question.

Note that it doesn't have an answer in the sense that we don't *know* the answer or that we might hypothesize an answer and have it turn out to be correct or incorrect. The answer isn't "yes/true", or "no/false", or "maybe" or "I don't know" or an oscillating sequence of true/false values or even the much beloved "because" – it is the great, rushing *silence* that results in response to a set of mutually self-referential sentence fragments that *seem* to mean something individually but that, when logically integrated, have no meaning at all. They are the "undefined" operations of the algebra, so to speak, the one divided by zero of common discourse.

There are lots of self-referential pseudoquestions or pseudostatements that have logical values that are "odd" and lead one to conclude that *even in systems of mathematics and logic* our ability to create *complete* axiomatic systems is very much limited. For example, meditate on the statement:

This sentence is unprovable.

Suppose it is false. Then it is, in fact, provable. However, provable things are necessarily true, which is a contradiction. By the good old law of contradiction, it exists and is not false so it must be true. From this Gödel was able to conclude that in (sufficiently complex) axiomatic systems, there exist statements that are *true but unprovable*, which means that the axiomatic systems cannot be *complete* (if we accept the Laws of Contradiction and the Excluded Middle, at any rate).

Of course as we just demonstrated with a fundamental anti-syllogism, and have suggegsted in several contexts before, neither of these are unquestionable truth in any logical system that *also* contains the statement:

This sentence is false.

which exists, seems to make "sense" semantically, but is neither true nor false.

[3]Just in case it isn't obvious, I'm making a *formal definition* of the term *pseudoquestion* (or its cousin, the *pseudostatement*) here. We need to *be* formal, because this is related to logic and mathematics and there is no room for sloppiness. This usage is common enough, if you look for it, although it is usually used in polemic discourse to discredit some question or statement – "That's not a real question, it's a *pseudo*question." Here it is not used in anything like the polemic sense – a *pseudo*statement will be defined to be one whose unambiguous truth value cannot *fundamentally* be demonstrated within an axiomatic system of reasoning. Axioms are therefore all pseudostatements. So are the Laws of Thought.

It is (to borrow an idea from a previous chapter) μ – no-thing. Not-true *and* not-false. It is a pseudostatement.

All axioms (with a narrow definition of axiom that precludes them in fact being provable from other axioms as theorems), as it turns out, are pseudostatements. This is a tough statement, and those of you who are alertly following the discourse should be saying to yourselves "Wait a minute, pseudostatements aren't things which *could* be true or false and we just don't know it, they are things for which it are not in some fundamental sense either true or false. Surely there are statements that we could make as axioms (and hence are assumed to be true) that in fact *could* be correct, aren't there?"

Well, let's think about that. Let's leave out the Laws of Thought for the moment – we've already seen that two of them appear to be pseudostatements and the Law of Identity I'm perfectly willing to accept as intrinsic truth since it damn near defines the notions of truth and being themselves – a thing is what it is, whatever that might be, if it isn't no-thing.

How about the axioms of mathematics? Clearly these are all pseudostatements. It is neither true nor false that parallel lines never intersect. Rather, it is a statement that we all agree upon as a prior basis for further reasoning, and if we assume that they *always* intersect all we get is *different* conclusions, not "true" conclusions or "false" ones. Looked at this way, it seems closer to being a definition in a mutually (we hope) consistent language than an actual assumption.

How about the axioms of science? As we will see in great detail below, the axioms of science are (among other things) the axioms of mathematics plus such window-dressing as an Axiom of Causality through Natural Law, an Axiom of Spatiotemporal Conservation of Natural Laws, and more and even less rarely stated axioms. Couldn't the Universe in fact *be* causal? Might it not be the case that Natural Laws exist as a truth independent of whether or not we can "prove" it?

Here our knowledge of set theory and number theory comes in extremely handy. Suppose that the Universe is "like" one of three kinds of real number. It could be like a rational number, all perfectly ordered internally to the extent that the algorthm that generates its digit string eventually repeats. It could be like an irrational number such as $\sqrt{2}$ or π – a digit string that never repeats but that is nevertheless just as tightly bound to an algorithm that generates its digits as any rational number. It could be like an irrational number with *truly random* digits – a digit sequence that *cannot* be generated by *any* algorithm or iterated map.

The latter class *includes* the two former classes. Any given rational digit string, however long, has exactly the same chance of being randomly generated as any particular irrational one. How can one resolve the difference between these latter two? It is literally impossible to distinguish a Universe that is completely causal and ordered in its internal structure (like a rational number is causal and ordered) from a universe that is intrinsically completely random but that happens to be completely ordered[4]. In a very real sense, the question of which sort of Universe it is makes no sense, because no matter what the pattern of organization "within" the Universe itself, we cannot extrapolate the pattern into the mechanism that produced the Universe. If we try, we merely extend the boundaries of what constitutes "in the Universe" according to whatever answer we decide upon or observe (or don't). An utterly causal Universe can itself be the result of causality in a larger meta-Universe or can have *no* cause (whatever that means) in the larger meta-Universe, and so on ad infinitum.

Ultimately, we are left pretty much with the Law of Identity. The Universe is what it is, at any or all meta-levels. Beyond that, we can assume that it is causal. We can assume that it is acausal. (Or better yet, we can define the patterns that we observe with our senses to be causal or acausal). Either answer can only be "proven" with additional axioms or possesses *even in existential reality* the same general arbitrariness as mathematics, where the notion of "truth value" of an axiom does not hold.

How about the axioms of sensate being, of psychology, of perception? Again, identity is fine. Each instant of individual perception (both self-perception and the input from the sensory stream we identify as connecting to the "real world") is what it is. That unnamed thing that perceives exists every instant that perception exists. This is not an *axiom*, it is the essence of empirical observation, it is *identity*. We *are* our instantaneous perceptions of the sensate and self.

From this it begins to be clear that *all propositions concerning the state of*

[4]This is the famous dartboard problem in measure theory. If you throw and infinitely sharp dart at a 2-dimensional dartboard surface, it will strike some point. *Which* point? Well, it could be a *random* point, in which case *every point* has equal probability of being struck, including the point in the exact center of the board. That probability is (paradoxically) zero because a point has measure zero with respect to the finite area of the dartboard, but *some* point is nevertheless struck. Alternatively the point struck could be completely non-random – the dart might be designed and directed to hit precisely in the center. One cannot infer anything about the mechanism (or lack of mechanism) that produced the hit by examining the point itself – it lives in a different space altogether. This metaphor can be iterated indefinitely, just like truth/false loops in the syllogistic example above.

existence except this one (which is really the essential statement of identity, the identity of your being and your perception as an empirical *truth– whatever they "are" beyond that according to your beliefs) can be formulated as pseudostatements.*

Not necessarily self-referential ones – psuedostatements can also easily appear to reference external ideas like "God" or "reality", or can throw into conflict inconsistent ideas such as "omnipotence" and "omnibenevolence". As we will show below (recapitulating the work of the masters, but with a bit more attention paid to mathematical/logical rigor): with *one* exception questions concerning reality are pseudoquestions in the sense that they have *no self-evident, rigorously provable answer.* They fall into an even *more general* class of pseudostatements – those that have truth values that *vary* as one varies the fundamental axioms that underlie the logical system one uses to assign truth values. They are questions like "How many times do parallel straight lines meet" – the answers depend on your *assumptions*, on your *axioms*. The answers to such a question range from none to an infinity of possible answers or to an *axiomatic* answer, and an axiomatic answer may or may not (according to Gödel) lead to an non-conflicted, consistent, complete deductive system when combined with other axioms!

One is tempted to meditate upon an axiomatic system containing the axiomatic proposition "Statements that refer to themselves directly or indirectly *except this one* are not a part of this axiomatic system". "This statement is false" is therefore not true or false because it is not a statement, it is a pseudostatement and explicitly excluded from the class of permissible propositions. The laws of Contradiction and the Excluded Middle are then recovered, but only for a relatively tame subset of the set of all propositions.

It is amusing before moving on to recall a couple of the many times Gödelian pseudoquestions like this have been used to destroy Evil Computers in books and movies. The Prisoner, for example, asking "The General" the one word question "Why?" The very example question above causing an Evil Robot to melt down trying to resolve the sequential cycle in the old television version of Lost in Space. Harlie (in Gerrold's *When Harlie was One*) concluding that all one needs to answer this sort of question is an infinite amount of time and awareness, as it sets out to perpetuate its own, greatly augmented, existence for that purpose. One can only imagine Harlie in the infinitely distant future being asked if there is a God and replying "There is now…"

Hah. Good Luck Harlie.

All of this digression is really only intended to show that axioms, far from being "self-evident truths" or even the gentler "established principles" are, in both mathematics and derived usage in physics, science, philosophy and other disciplines neither more nor less than *unprovable assumptions* – indeed in many cases pseudostatements where we don't really know what it means to assert that the statement is *true*. Furthermore, *even* with one's axioms in hand, axiomatic reasoning is far less powerful than was imagined until the 1900's, and there is a very serious risk, nay, a near certainty, that any nontrivial axiomatic system proposed as a basis for understanding "everything" will be neither complete *nor* consistent and that in any event it cannot be both.

There is nothing more dangerous or powerful in the philosophical process than selecting one's axioms, especially given that they are nearly invariably expressed in sloppy old human language. There is nothing more useless than engaging in philosophical, religious, or social debate with another person whose axioms differ significantly from one's own.

To reiterate, an axiom is at heart something that *cannot be proven.* It is itself a *pseudostatement* whose truth or falsehood *cannot even be addressed* except, of course, with any of a variety of *other* pseudostatement axioms and their associated axiomatically proven or disproven propositions that will soon have all the participants in any debate melting down in a puff of smoke if the resulting system of "reason" is inconsistent or, like Harlie, writing grants for the purpose of perpetuating existence for the rest of eternity while working out the complete "answer" if it is incomplete. An axiom is a *free choice*, a denumerable selection out of a *non*denumerably infinite space of possibilities, upon the back of which we *choose* to derive our system of so-called reasoning, dealing with contradictions and inconsistencies as best we can – or just ignoring them.

How can I convince you of the *importance* of coming to a full, conscious realization of the truth of this observation in real human affairs? For philosophies, expressed as social and religious memes, have an enormous impact on our daily lives and indeed are the very forces of history that have led the world to have the shape it has. Problems within our world very often have their origin in the fundamental problems – inconsistencies and incompletenesses – in our underlying axioms, along with our *memetic* tendency to treat our social and religious axioms as being "true" beyond all examination or consideration.

To understand this, we have to take a journey of two parts. The first is through a (partly historical) exploration of the development of the fundamental axioms of The Cosmic All, with David Hume[5] as our highly skeptical bus driver,

[5]See, for example, his *Enquiry concerning Human Understanding.* Or not, it isn't too im-

Bertrand Russell[6] as our tour guide, and accompanied by the Three Stooges: Descartes[7], Berkeley[8], and Kant[9]. We might talk a wee bit about Plato (respectfully) and a few others (not so respectfully at all) but I wouldn't inflict a reading of even the Republic on anyone else who wasn't totally into it, in which case you've probably already read it five times and annotated all the margins and highlighted the significant passages.

The second is through a very much *current* exploration of genetic optimization[10], complex systems[11], and social geneto-memetics[12]. This is some more of the new math stuff that hasn't really been understood by modern philosophers and metaphysicians. Naturally, I won't omit using a wee bit of modern *physics* as well, being as how I *am* a physicist, and physics in the twentieth century did such a *lovely* job of utterly destroying so *much* supposedly rational nineteenth century philosophical reasoning about our Cosmic All.

Yes, sorry, pretty technical, but I *will* do everything I can to make it all very simple, just as Russell did in his little book.

portant and the basic idea is presented in spades below.

[6]There is a lovely book called *Problems of Philosophy* by Russell you might want to look over. Now I personally have a hardback copy of the original Home University Library text from 1912 sitting on my chest as I write this, but fortunately it is also available on the web for *free* at http://www.ditext.com/russell/russell.html. Russell was a Very Smart Man, and this book – which I read only when the first draft for *Axioms* was long since completed and had been on the web for a year or more – is a lovely sort of pre-Gödelian and not sufficiently mathematical version of what I'm attempting here. Its *mistakes* are sufficiently illuminating that I'll have occasion to refer to it very specifically from time to time, so be prepared.

[7]*Meditations.*

[8]*A Dialogue Between Hylus and Philonous.*

[9]*Metaphysics.* Of course.

[10]No good reference, sorry. This is just one of the things I *do* on computers though, so I'll tell you what you need to know in a self-contained way.

[11]This is a fairly broad branch of fairly new mathematics. Y'know, phase transitions, earthquakes, economics, statistical mechanics, and all that. Simple stuff. Check out http://www.santafe.edu/

[12]You might try reading *The Lucifer Principle* by Bloom at some point if this appeals to you.

Chapter 7

Paradoxes

7.1 Fun with Logic: Contradictions and Null Results

The need for a null set μ isn't something I'm just making up. No matter what you *call* it, it has been around for a very long time in mathematics and logic. It has been around for a somewhat shorter time in computer languages, because computers themselves are relatively new, but (as pointed out by Jaynes) a "robot" (or computer) is an excellent model for logic because of the entirely *practical* constraints associated with *engineering* it to actually work.

Computers are nearly ideal embodiments of the raw *mechanics* of logic and arithmetic. Computers more or less directly implement a system of boolean logic as the underlying basis for their operation – all successful operations have an associated "truth table" and can be described by a set of permissble binary transformations with the representation. However, the representation itself is *finite and discrete* and can be *self-referential* – one can program a computer to program a computer and work other dark magic (some of which is covered from time to time by such luminaries as Martin Gardner in *Scientific American*).

Computer programmers typically learn in their very first class – the hard way – about the null set μ as the result of certain operations. Computers can easily be asked to take perfectly ordinary and reasonable results as input to operations that produce *no* meaningful output. That is, they have to deal with "Not a Number" (NaN) return conditions in addition to *other* (possibly domain specific) undefined or oscillatory conditions *all the time.*

For example, there is nothing to prevent *algebraically* well formed computer programs from attempting to divide by zero or take the inverse sine of 2.0, things that are *algebraically* sensible but that happen to be undefined for particular values or ranges of inputs. Indeed, it happens all the time, as people write a program without checking and the program manages to generate a forbidden value as input. Similarly it is easy to write a program that enters a loop such that the value that is tested to determine when to terminate the loop oscillates and hence never reaches the end condition with a well defined answer. One might even write such a program deliberately, if the program has some desired output that is incidentally generated along the way, and terminate the program only by killing it from "outside the Universe" of the program, with a Ctrl-C from the keyboard.

Once a NaN or indeterminate state is introduced into any computation by any means, all operations that include it in any way become equally undefined and result in NaN as well. In fact, I was very tempted to use NaE (Not an Element – of a set) instead of μ in the formulation above to draw careful attention to the correspondance.

Nor is the abstraction of the null set unknown in formal logic. (A & !A) is the essential statement of contradiction[1][2]

If you ring a contradiction into a theory (however subtly) you can prove anything you like *symbolically*[3]. The argument goes something like this:

- Let us state as an absolute truth some A &!A: "Robert Brown is a wise fool" (where we define "wise" to be the same as "not a fool"). This is a fairly familiar oxymoron in English, and is probably even true...

- Suppose that God is Not A Penguin (GiNAP). Seems like a perfectly plausible assertion, at least in the minds of some, although it does somewhat beg the question of whether or not God exists to *be* a penguin. Fortunately, it is only an assertion.

- Well, if Robert Brown is wise (and he is, see the first line), then it is certainly true that "if GiNAP, then Robert Brown is wise" (and, for that

[1]My computer science roots ring through here, as I'm using '!' as the symbol for negation instead of logic's $\sim$. Another good reason for this choice is that I'm using LaTeX, and typing ! requires a single keystroke while I have to enter $\sim$ to get a $\sim$. Always nice when personal inclination meets efficiency...

[2]As we introduce the Aristotelian concepts of A and its dual, !A, I supposed that it is time to give a web redirect – visit *The Institute of General Semantics*, http://www.general-semantics.org This institute (founded by Alfred Korzybski) pushes a somewhat touchy-feely version of some of the ideas advanced in this work, and is addressed later on in a section all its own.

[3]See e.g. http://en.wikipedia.org/wiki/Contradiction

matter true that "if God *is* a Penguin, then Robert Brown is wise" – you begin to see the trap).

- This is *logically equivalent* to the statement "if Robert Brown is a fool, then God *is* a Penguin".
- But Robert Brown *is* a fool – see the first statement! Therefore...
- God is a Penguin!

And you thought logic wasn't good for anything!

We've just proven that God exists *and* is a Penguin[4] all in one simple derivation[5]! Bertrand Russell would be so proud...[6]

Or rather, we've proven no such thing. The point is that the statement "Robert Brown is a wise fool" isn't true, and it isn't false. It is a *premise*, an *axiom* from which the argument proceeds. It happens to be an *inconsistent* axiom, but so what? Who would doubt that Robert Brown is wise is at least *sometimes* true, or *somewhat* true all of the time. Similarly, who could doubt that Robert Brown is a fool is at least *sometimes* true, or *somewhat* true all of the time[7]. Socrates used to do this kind of thing to poor Thrasymachus in Plato's *Republic* about the same place that he offered to go shave lions that don't shave themselves[8].

In any event, if you use a contradiction implicitly, explicitly, accidentally or on purpose, or somehow insert any *other* undecideable Gödelian proposition in in place of the contradiction in a way that performs an equivalent purpose, your final result isn't "true", it is a contradiction or it is itself undecideable. In particular, both "and" and "or" operations involving a contradiction are a contradiction. A contradiction contaminates anything it touches, because asserting it is "true" *or* "false" gets you into *equal* amounts of trouble, because

[4]Given that this is true, I expect all religious computer users to immediately stop using Microsoft products and convert over to Linux...

[5]If nothing else, this may keep religious individuals who are *not* computer users from accusing me of being a "wise fool", as has been so often done in sermons attacking people who are convinced by silly little things such as *physical evidence* that, e.g. – much of the Bible, the Koran, and other religious scripture with creation myths incorporated therein are wrong. Their argument would be something like: God is *not* a penguin! If God is *not* a penguin, then Robert Brown is *not* a wise fool.

Hmmm, I like this argument too!

[6]Probably not, actually...

[7]Not my wife, my kids, or anybody who actually knows me, that's for sure...

[8]Hmmm, I think that would be *all lions*. I foresee real trouble ahead if we are ever to assert that Socrates was a "lion" among philosophers...

there are always clever ways of inserting it into logical statements that corrupt the downstream processing of the truth tables. It isn't just that the intersection of your final answer and the set of all true answers is either your final answer (shown true) or the empty set (from the law of exclusion, shown false). The law of exclusion is *directly violated* by the presumed condition, and the *entire result* is null.

Finally, just for fun (in case you, dear reader, have never seen it), consider the following algebra. Suppose I suppose that I have two variables, x and y that are equal. Then:

$$x = y \tag{7.1}$$
$$xy = y^2 \tag{7.2}$$
$$-xy = -y^2 \tag{7.3}$$
$$x^2 - xy = x^2 - y^2 \tag{7.4}$$
$$x(x-y) = (x+y)(x-y) \tag{7.5}$$
$$x = (x+y) \tag{7.6}$$
$$x = 2x \tag{7.7}$$
$$1 = 2 \tag{7.8}$$

Nothing up my sleeve, right? Or *is* there? Every algebraic operation is perfectly lovely and valid without question but one, which has an *undefined exception* that has been delicately inserted into the proof. The trick line is the one where I cancel $(x-y)$ from both sides of the fifth equation. $x = y$, right? So this is *zero*. I'm dividing by zero, which is an operation with an undefined answer and it should come as no surprise that I can prove *one* undefined, contradictory, null result (that $1 = 2$) using another implicitly in the algebra.

As is the case with computer programs, algebraic or logical or set operations that lead to NaE or μ are usually indicative not of a failure in the "computational logic" as embodied in the computer *hardware*, they are not necessarily due to a failure in static *syntactical* validity of the program, they are due to a failure or mismatch between the program and its *data* – a *domain* failure. One way to view A & $!A$ (and other μ) is that they are *bad data*, ta that cannot exist in the "Universe" of set (or logical, or algebraic, or computational) operations we are considering.

This is an intriguing viewpoint, but (of course) is not original here – Jaynes points out that many of the difficulties with Aristotelian reasoning involving the Law of Contradiction and Law of the Excluded Middle, a.k.a. Western dualism, like the ones that I'm ranting about in this book come about because one attempts to reason in the incorrect domain. To be more precise, he asserts that multivalued logical systems (systems with more than e.g. True *exclusive or* False, A *exclusive or* $!A$, and so on) can always be reduced to two valued logic on a larger domain.

I'm not completely certain if I agree. If what he fundamentally means is that the truth values in e.g. a logical system based on true, false, unproveable, and contradictory (four possible values all of which appear like they'd be very useful in analyzing a Gödelian proposition) can be mapped into a *two* bit binary system (or equivalently that the base does not matter when you do arithmetic) then sure, I'd never argue with that. On the other hand, this alone does not make it a "dualistic" system as not true does not automatically imply false – it just means what it says, not (proven to be) true. Also, although there *is* still a dualistic "partitioning" possible – true and not true where not true includes false, unprovable and contradictory – the *truth tables* for any given partitioning seem like they'd be very different[9].

Jaynes also points out (doubtless correctly, as he was a careful sort of guy) that most of the candidate non-Aristotelian (multiple-valued) systems of reasoning are internally inconsistent, embody logical "fallacies" (logicspeak for "bad logic"), and even argues that predicate logic (the logic of human language involving categorical propositions) is rewritable using the ordinary expressions of algebra and mathematics and is nothing really different from a set theory analyzed with good old boolean/Aristotelian principles in disguise.

However, there are two fairly clear examples where it is not at all obvious that this is true, and both are well worth mentioning here. The first is known as *Intuitionism.* Intuitionism basically rejects the notion that "A is true" means anything other than "A can be proven". For some A, the fact that it cannot be proven does *not mean* that $!A$ is proven. In this logical/mathematical system, then, the Law of Excluded Middle is *rejected* as an axiom. Nevertheless, Intuitionism (as a form of mathematical constructionism) appears to be a *consistent* form of non-Aristotelian logic where one cannot use *reductio ad absurdem* – assuming a proposition p is *proven* and showing that it leads to a contradiction,

[9]Nor have we exhausted the possibilities. Really we have something like True (existentially correct, whatever that means) and Provable (deducible from axioms and appropriate laws of thought), True and Unprovable, False (existentially incorrect) and Provable (to be incorrect), False and Unprovable, True and Inconsistent, False and Consistent, Unknowable (period) and more...

then concluding that $!p$ must be *proven.* It is very Gödelian in this respect – a proposition might well be true (or false) but unprovable.

In real human affairs this is not an empty point – it is, in fact, part of the basis of the United States Constitution and common law. Just because I (or "society" or "the district attorney") cannot prove that John did not rob the bank does *not* mean that I have proven that John *did* rob the bank.

Even if it *cannot* be proven by *anybody* – possibly because there were no witnesses, John left no clues, and John himself is dead, it doesn't seem to follow that John is guilty because his innocence cannot be proven. Consequently we require a *direct* proof that John is guilty, and feel more than a bit uncomfortable with "circumstantial" evidence of his guilt or statements like "John must have done it because nobody else could have done it". Does this *really* mean that this particular District Attorney cannot *imagine* how anyone else might have done it, or cannot prove that anybody else did it and wants to pick on John? Both are logical fallacies again, even in Aristotelian logic. Intuitionism carries the avoidance of such fallacies to the level of the rules of the logic itself so there can be no mistake – one has to *separately prove or disprove* A independent from $!A$ respectively, and certain rules of inference are thereby formally altered.

There is a bit of an empirical cast to this example drawn from human affairs (instead of mathematics per se), which is fine with me as the primary theme of this book is *Hume's* (not Aristotle's) empirical statement of knowledge, that our *sensory stream* is all that we are knowing of the Universe and consequently Aristotle's actually rather *absurd pronouncement* as a basis for all knowledge that for a thing to be known it must be *provable by reason* is – wait for it – absurd[10]! It cannot even be used as a logical basis for concluding that we know *nothing.* As we shall see and beat half to death in the following chapters, although we cannot prove a single conclusion about the nature of that which we observe in our sensory stream using reason *alone*, we cannot deny that the sensory stream itself is *known.*

Jaynes acknowledges this in an indirect way as his entire first chapter is devoted to the notion of "plausibility" – basically an axiomatic development of the theory of probability to give us *plausible* grounds for concluding that John *did* rob the bank without the strict requirement of absolute logical rational proof. This too seems quite *plausible* to me – it describes the way real humans reason. However, it doesn't properly seem to appreciate the non-Aristotelian

[10]In fact, in a beautiful Gödelilan twist, this statement cannot be proven by reason. It is also *incorrect*, but that's beside the point.

nature of Hume's empirical statement, and how it is a statement that describes an *observation* (not an argument) that any of us can make at any time, the fundamental truth of which cannot be doubted although it can never be rationally proven. To move beyond this requires axioms, and axioms cannot be proven rationally either.

Jayne's discussion of plausibility is a very good thing, because this entire work is devoted to showing that axioms are the basis of all that we *think* that we know in such a way that it cannot *plausibly* be doubted (although it cannot be proven as the proposition itself states). "Plausibility" seems to be a better description of human knowledge. We know *nothing* for *certain* about *anything* but our instantaneous existential sensory stream. This is true enough, but useless and (as Hume himself observed) nobody lives that way – we live instead as if the Universe that we imagine and infer is a *plausible* truth based on some set of axioms that are then more or less logically developed.

As *The Matrix* movie series so aptly and convincingly demonstrated, the price we pay for the *logical certainty* of mathematical and logical reasoning is that it cannot permit any certain conclusion to be mathematically or logically drawn about Reality. Our sensory stream could *in principle* not reflect an actual external Reality at all, or it could reflect an actual external Reality but be mistaken in *every respect* as to its true nature. Indeed a great deal of our creative energy as a culture is devoted to *making up* or experiencing Realities that are superimposed "weakly" on our minds through our sensory streams – dreams, interior monologues, fantasies, hallucinations, movies, music, books, theater, role playing games – all *mental* experiences that nevertheless communicate to us a *sensory simulation* of a Reality via various means that generate (externally or internally) sensory impressions "like" those that our presumed Reality itself generates.

The Matrix (or its literary predecessor *The Joy Makers* by James Gunn, or various other works by William Gibson and others) are science fiction stories that speculate that eventually (due to advances in technology) it will become possible to make the simulation sufficiently precise via direct neural stimulation directed by extremely powerful computers that humans will be unable to tell the difference between the "fiction" being presented to them electronically and "reality". At this point the layers of *unknowable abstraction* between reality as a sensory stream and sets of symbols that *might* be used as an objective basis for that stream become obvious – the experience of a thing does not imply its existence. This is not a purely theoretical argument, as the same thing happens all the time in our presumably real world. The use of certain psychoactive drugs, neurophysiological or neurochemical trauma, or plain old psychoses all can create significant deviations between what one experiences and an objective reality, sometimes transiently and sometimes permanently.

The second (and probably best known) example of a non-Aristotelian theory of reason (such as it is) is Alfred Korzybski's *Science and Sanity* and the umpty derived works by the collective of philosophers and thinkers who are members of the *Institute of General Semantics* (http://www.general-semantics.org). This Institute, founded by Korzybski, promulgates a *semantic* overview of reason that in certain important respects resembles the viewpoint being advanced in this work. It is touted as being a *non-Aristotelian* (and non-Newtonian and non-Euclidean) system of reasoning[11].

There is a simple mantra for its primary axiom. "The map is not the territory". This means that the word for something is not the thing itself. Words are multivalent and categorical, things are unique; therefore "whatever you say that a thing is, it is not". Ouch! Seems like this approach has something to say about our efforts to chop up uncountably infinite sets like the real numbers into subsets (where the chopping can be done an infinite number of ways that cannot be specified by any compressed representation – one with less information in it than the points in the set).

However, General Semantics doesn't seem to go this way as information theory and random numbers aren't their thing. Also, this is pretty difficult to work through and this isn't a math text. To make this concrete *and understandable*, let us return to The Universe of Fruit (as a set theory).

If I wish to sort Fruit into boxes, apples in this one, oranges there, pineapples over there, I have to pick up a piece of fruit and make a decision about it. Unfortunately, *every piece of fruit I pick up is unique! This* piece that I pick up is a complex assortment of objects – sugar, starch, cellulose molecules, pigments in the skin, antioxidants, toxins, water, alcohol, and more – that are *themselves* complex assortments of objects – protons and neutrons and electrons, gluons and photons, quarks – in a complex and *dynamic* relationship that in the not distant past was definitely *not* a fruit and in the not distant future will definitely *not* be a

[11]It is also castigated for being mostly unoriginal, egocentrically presented, and both bigoted and sexist, with examples of "reason" or the lack thereof that are highly demeaning to women. In spite of this there are some decent ideas mixed into the bullshit (and we have to expect there to be bullshit to the extent that it *is* a philosophical work). I will therefore personally throw no stones from my glass house as *this* work is mostly unoriginal, and it is likely that at least some readers will find it egocentrically presented although I really do try to make it clear that its theme is far from original but all too often forgotten. It very definitely is not sexist and can think of no reason it should be demeaning to women, however hard it is on lions and penguins. Perhaps I'm a closet speciesist.

fruit but for a brief interval in time has come together into what we call "a fruit". It has other coordinates and properties that contribute to this categorization – its origin, its size, its genetic encoding – many of which are examples of "higher order" structure yet. *This* piece of fruit is not only unique, every *instant* of its existence is *independently* unique.

So where do I get off calling it "an apple" and tossing it carelessly into the set-theoretic box at my feet? Even if it was an apple as it left my hands, quantum mechanics and thermodynamics conspire to more or less guarantee that it *might not be* an apple by the time that it lands, that it damn well won't be an apple by any standard at all after I eat it and excrete it, and that a year earlier my "apple" consisted of a myriad of elementary particle world lines that were gradually being carried from an initially random state into the *highly organized* and *extremely transient* state that is different from that of every other object on the planet that has ever been named apple.

Repeat *ad nauseam* (for every unique object ever given a name, since by your argument you aren't permitted to make general arguments because the things they apply to are dynamic and unique) and you too are now a Master of General Semantics!

Without disagreeing with a word of this (and in fact, duplicating some of the underlying reasoning here and there throughout this work for an entirely different purpose) it isn't, really, terribly relevant to logical systems and systems of knowledge. That is because my knowledge of the apple, unextended by the axioms of science and inference and inductive reasoning, unenlightened by language and categorization and analysis of structure, is appallingly shallow – it is limited to my *instantaneous* sensory stream in which sensory impressions that may or may not represent "the apple" occur. We are left with a profound paradox, not of the logical sort but the experiential and rational.

If I see the Universe free of all categories, with every single sensory impression in my sensory stream being unique and disconnected from any sort of memory of previous impressions, with no inferred logical relations between any two parts of the instantaneous stream or the memory of the stream at different times, then *there is no reason at all*. The term doesn't apply. Experiencing "life" in this manner is *entirely passive*, and reason leads one to no conclusions whatsoever. There is no language, as language has no point, no mathematics because mathematics is not a sensory impression, there is arguably no *consciousness*, because consciousness itself seems (in my own mind at least) to involve a complicated feedback process involving the immediate memory of the past. *Really* treating each moment as a unique and disconnected experience of sensory data is like trying to comprehend a movie as a huge pile of its individual frames, each cut out and flashed up on a screen in a random, disconnected order, while taking drugs that interfere with the formation of long term memory. Chaos is the only word for it.

If I on the other hand use language and symbology, if I create *imperfect maps*, if I invent *sets* and methodologies for *sorting out objects into sets and deducing empirical relationships between the sets*, if I admit time, and memory, and causality, and physics, and all the other forms of science, then I'm bound to make mistakes because I casually reason with *imperfectly formed rules* for specifying sets – I throw an orange in with the apples, literally or metaphorically, or what I thought were parseley greens turns out to be aconite[12]. It means that I'm bound to get all tied up in Gödelian knots when I try to reason about notions such as "all men that don't shave themselves" as this becomes a sort of a *category error* – the error of putting *anything* into a category and trying to reason about it, especially a self-referential one.

Now, I personally am not absolutely certain that General Semantics qualifies as an actual system of non-Aristotelian reasoning, but it claims to be one and there *are* well-reasoned analyses of the idea that in order to sort any sort of real objects (whatever those might be) *properly* into sets requires an ever growing set of axioms, with a whole set associated with *each object* that one adds to a given set. For example, I need an axiom that says something like "This particular sensory impression that I'm having, that my presumed memory and understanding inform me is made up of a myriad of tiny whirling particles interacting with invisable potentials to create a wave-like ensemble that represents its collective 'state', interacting with a still more unknown outside Universe that constantly makes small interactive changes with the ensemble, will at the moment be presumed to be 'an apple' because it has the following inferred properties..."

Only nobody ever says that. They implicitly use broader axioms and live (or die) with the inconsistencies, if any, that result. So sure, it is all nicely pointed out. So what. It seems to miss the two main points – that it *isn't* all about identity of apples, it is about axioms, because without them we don't even have the ability to talk about not being able to call an apple an apple just because it is a *unique* apple and not exactly like any other apple. That ultimately all the *non*-Aristotelian systems of reason are just as linked to their axioms every bit as

[12]Oops. Aconite, or wolfsbane, or monkshood, is a pretty garden flower that contains one of the more deadly and dangerous plant poisons, one that regularly kills people or pets or livestock that eat it or even get it onto their skin).

much as Aristotelian ones.

The issue isn't "dualistic reasoning systems are always bad and multivalued ones are always good" as dualistic logical reasoning systems *work incredibly well* once you've made the right axiomatic assumptions about the systems you're applying the logic to. It is "you have to make a set of axiomatic assumptions as a necessary prior step to doing any sort of reasoning at all." Some of these axiomatic assumptions will lead to systems that work pretty well as a "symbolic representation" of the time-ordered, memory looped sensory impression that we call our "awareness of external Reality". Others will not. Some may be Aristotelian and work. Some may be Aristotelian and not work. Some may be non-Aristotelian and work or not work.

We are attempting the impossible, or asserting the impossible, or including in our language or symbology the inconceivable, and need to either restrict the range or domain of certain operations to exclude metaphorical division by zero or undefined inverse sines or the possibility of infinite non-convergent loops or reconsider the *meaning* of that which we are trying to compute, or prove, or discuss altogether. Perhaps the null set is just a symbolic referent that our Universe isn't well matched with our logical system and "program".

However, *algebraically* introducing these very simple operational *definitions* (not axioms) for a NaE or null set into a naive existential set theory very naturally eliminates all of the Cantor, Barber or Russell paradoxes, as the result of the operations proposed or requested is undefined, or NaE, or restricted away through closure – the paradoxes do *not exist within the Universal set being considered.* Precisely as happens in computer science, where the computer gives you and *error message* that says basically "This is a null result, you idiot; fix your code and try again..." OK, maybe it leaves off the "you idiot" part, but I always imagine it anyway when debugging my code.

Hopefully by now we have clarified a longstanding puzzle, or word-trap in the Laws of Thought. The "state" of non-being is not a state. The set of all a that are not a set, where a is permitted to be any object in the Universe S *including the empty set* is not a set (even the empty set) in S, it is μ. When the Laws of Thought refer to "things" not being, this is "the set of all things that are not in the set algebra" which is just as self-contradictory as (A & !A). With this in mind, let us reexamine the Laws of Thought first as they are written above, then as they are usually *applied* as the basis for Logic.

The Law of Identity is perfectly understandable as the first grouping of set definitions above. All objects in the set theory live in their own private "identity set" which is disjoint from the rest of the objects in the set Universe. The entire set theory is made up of the union of all of these objects. These are the objects that "have being", where the empty set is considered to be a set object that "has being" within the set Universe.

The Law of Contradiction, which ordinary logic treats as if it involves the *empty set* (where it would be a vacuous result, as the empty set cannot contain "things"), is now seen to refer to the *null set*. In fact, it is the statement:

$$\forall a \in S : I_a \bigcap \mu = \mu \tag{7.9}$$

where as usual, a can be the empty object or any non-empty object and μ is now interpreted as the "set of things that do not exist in the set theory". The empty set is *in* the set theory, where it performs the mundane task of defining the intersection of disjoint sets within the theory; μ is *not* in the theory.

The Law of Contradiction *as stated* is *not* a statement about applying the "not" operation to sets within the theory as if it is implicitly followed by a set descriptor. It is not (for the set of all fruit) that something must "be an apple" or "not be an apple"[13]. It is (for the set of all fruit) something must be a fruit or not *be* (in the set). If our entire Universe is fruit, non-fruit is null, not empty, because *we defined the empty set to be in the set*. We cannot then talk about cars as if they are "non-fruit" so that it is possible for some "thing" to be not a fruit – not even the candy-apple red T-bird that I'll purchase with the vast profits from writing this book if they turn out to be vast enough – without *implicitly* creating a larger Universe for our set theory!

In mathematics this sort of thing is pretty obvious. In number theory, for example, Fermat's Last Theorem (one of my favorite propositions) states that $a^n + b^n = c^n$ has no solutions for integers $a > 0, b > 0, c > 0$ for $n > 2$. Of course it is *trivial* to find solutions for *any* $a > 0, b > 0, n > 2$ if one relaxes the requirement that a, b, c be *integers*. A whole different ballgame results if we let the numbers be negative (integer or not) and let n be a real number – we are forced to conclude that solutions exist, but they might be complex. Yet another class of results follows if n can be complex.

So when Fermat asserted that this equation has no solutions, that solutions *do not exist*, he meant that they do not exist *within the Universe of positive integers*. The existence (or non-existence) of solutions within a *different* set of numbers – the rational numbers, the real numbers, the complex numbers – is *irrelevant*. They are μ.

[13]However true that might be for apples, it doesn't work as well in physics where an object might not either "be at $\vec{x} = (1, 1, 1)$" or "not be at $\vec{x} = (1, 1, 1)$".

This is a much cleaner formulation. Rather than stating that nothing can be and not be (leaving the exact meaning of "something", "be" and "not be" ambiguous and embedded in the *dynamics* of being, with its implicit past and future tenses), we instead create a *static* observation in set theory that the "set of things that do not exist within the Universe S" (the null set) has no intersection with the "set of things within the Universe S" including the empty set – the intersection is not just *empty*, it does not exist within the Universe S. The intersection of sets of imaginary unicorns with my box of apples isn't "no apples", it is "you are out of your mind considering the imaginary unicorns to be a kind of fruit". This is a *stronger statement* (and more accurate statement) of "non-being" than the usual Law of Contradiction.

Note that we *ignore* all lesser statements as being *trivial tautologies* that would never have even been written down in the first placea if one conjoined $\{\}$ to all sets or subsets algebraically at the beginning, so that the empty set is considered a "subset" of all sets of zero or more members. In that case $S = I_\emptyset \bigcup I_a \bigcup I_b ...$ leads to *both* that Law of Contradiction *and* the Law of Excluded Middle as an absolutely trivial application of the usual definitions of intersection and union, but one is left with no way to deal with the inconceivable, with the self-contradictory, with μ.

The Law of Excluded Middle is more troublesome to write as even an approximately algebraic result. The difficulty is that μ has *no members* (in the set Universe) and *isn't even an empty set there.* So talking about "everything" being either within the Universe S or not within the Universe S only makes sense if there is a *bigger* Universe U in which S is embedded, $S \subset U$, where an object that (such as a candy-apple red T-Bird) *exists* but isn't in S, the Universe of Fruit might be. This is, in fact, the way the Law of Excluded Middle is usually applied – something must either be a fruit or not a fruit (in which case it must be something else). However, Russell paradox sets *cannot* be in such a bigger Universe. The set of all sets that do not contain themselves in S doesn't exist in some larger U, it isn't the empty set (which contains itself utterly trivially), it is self-contradictory and doesn't exist. It is *not a set*, in *any* Universe.

Instead let me define the Law of Excluded Middle backwards. Things that exist (that is to say, everything) are *not* in μ. Since they exist, they must be in S (by hypothesis, our entire Universe):

$$\text{if } a\ ! \in \mu, \text{ then } a \in S \tag{7.10}$$

We see that Excluded Middle is basically the *existential constraint on the set Universe.* This is the statement that effectively eliminates all possibility of paradox, explicitly, by construction!

Thus we eliminate imaginary unicorns and red T-birds from the World of Fruit, integer numbers from the Universe of Pocket Change, complex numbers from the real line. We also eliminate the Universal Contradiction from set relationships – the metaphorical or real division by zero, the (A & $!A$), the inverse sine of 2, the set of all sets that do not include themselves, the set of all Universes where a male barber shaves all males that do not shave themselves – the *inconceivable* – these exist within *no* Universes[14].

Now, how does one get from set theory as the Mother of all Math to *real* mathematics, to physics, to the *good stuff?* At this point we (as a species, as represented by its brightest scientists and mathematicians) have a pretty good idea how to proceed at least for mathematics and physics and the other sciences. I'll devote considerable space to discussing this in detail in later chapters and you'll have to just keep reading and trust that I'll get to it eventually.

[14]Hopefully it has occurred to you, dear reader, that I have just spent a great deal of time trying to communicate to you the *concept* of the *inconceivable*. Furthermore, unless you are a complete dodo-brain, you probably *understood* the concept, even though the "understanding" of it is much like trying not to think of the word "rhinoceros" for the next thirty seconds. It would have been really easy if I just hadn't told you what not to think of.

Now you can begin to appreciate the difficulty of teaching (and learning) Zen. In fact you *could have* been Enlightened, if only someone had smacked you in the head with a banana while you were reading this footnote, but now it is too late because you're still thinking about rhinoceroses, aren't you. The banana thing only works if you aren't thinking about large grey endangered species with nasty tempers, hunted for their horns. The bulk of Zen is about how to stop thinking about animals with heavy plate-like skin that live in dry parts of Africa mixed in with Wildebeests and such, usually by means of meditating using the word "rhinoceros" as a mantra for a decade or so until it loses all possible association in your mind with animals whose horns are often ground into potency-enhancing elixirs in Oriental medicine.

I'll stop now.

Chapter 8

The Pit of Existential Despair

Now, if you've been paying attention and haven't already figured out where I'm going with everything to the point where you are now horribly bored, you *should* now be intellectually poised above a Pit of Existential Despair (PED). This is deliberate.

However, there is a distinct possibility that you are instead going "huh" and scratching your head, when you are *supposed* to be dangling out there screaming at the glimpse of Philosophical Nothingness that underlies All Things. This won't do. So permit me to get out the block and tackle and tie this rope around your feet – there, comfy now? Now – mmmph – we'll just crank you up and swing you out over the PED, hold on to your loose change and try not to lose your eyeglasses, if any. There. Now look up – errr – down.

In the previous sections *all the questions that you hold most dear* (no matter what they are) have just had their legs kicked out from under them – if *all* the fundamental questions are really *pseudoquestions*, is it not the case that we can build little chains of sensible-sounding questions leading from any question at all to one of the biggies? It is[1].

Ah, you begin to see the pit? Stop that whimpering! I'm not going to drop

[1]No joking now. This PED is *real* and lies far too near, beneath the facade of the "reality" in which we live. It is to combat this despair that humans create religions and elaborate systems of belief in an *answer* to the SUW-level questions, for only an answer here can provide a foundation for all the more mundane answers that follow. Even with such an artificial foundation (or perhaps because of its manifest artificiality) the PED looms in every human life, to yawn agape when one is depressed, sad, or chemically imbalanced. In a *fundamental sense* it is the PED that is a prime factor in most suicides. We require *faith* to live, and we require a faith that isn't obviously inconsistent with the reality in which we live to not lose it when things get tough.

you in. In fact, the purpose of this whole work is to *fill in this pit* so that it is no longer lurking as a trap beneath your every step in life. But first we have to *face* the pit and even *embrace* the pit. Consider:

How can we ask whether we should have a reuben or a grilled cheese sandwich for lunch when we can't answer the pseudoquestion at the base of the whole question chain of why eat lunch in the first place (to stay alive), why stay alive (because God wants me to, because the Bible says I must, because I'm evolved to want to so that I can reproduce and pass on my genes), why did I evolve, why are there laws of physics, why is there a God? Psuedoquestions. There is basically *no reason* to choose between reuben, grilled cheese, or a hot shit on marble sandwich for lunch until we find a *pragmatic* way of dealing with this issue.

Note that a variety of smart-ass solipsictic answers work, but only if you are *already living* on the *bottom* of the PED. After all, the solipsists get to choose whether or not to continue *imagining* that they're reading all of these words that they were clever enough to think up in third person. They regularly manage to *imagine* that they are masochistic enough to cause themselves to endure the pain and suffering an uncaring (and in my humble opinion *real* and *external*) Universe inflicts upon them on the movie-screen of their senses, unless they are so incredibly fortunate that their lives are totally free from toil, moil, and angst. Surely they can *imagine* some way to make hot shit tasty.

The rest of us have no Good Reason for Doing Anything without *first* having a good reason for being, and right about there we run into trouble as *reason* and *being* in a single proposition is totally pseudo. Yet we generally *do* choose a sandwich, and that choice sometimes even works out well for us. We only get in trouble if we think too deeply about it and the waiter starts to fidget and look around longingly at his other tables. And of course there are days that you (metaphorically) try to choose grilled cheese but the "cook", so to speak, prepares grilled shit...

This is more than a bit of a shame; so much so that sensitive souls literally go mad over it. What is the suicide's standard apology? I have no reason for living. Surrounded by choice, a mentally ill person often has little to no free will[2]. Confronted by an endless parade of choices big and small we make them, badly and well, for better or worse, yet *most* humans never work out *why* they do what they do from the beginning, the *nature* of the answers they necessarily

[2]And the mentally *healthy* don't have much more. We just do a better job of ignoring that fact and revelling in the joy of a Universe in which, for the most part, it *feels* like we do.

embrace to the most fundamental of questions that underlie all decisions, to the end – the choice of what to have for lunch today. At best their choices work if not examined too closely or deeply, lest they fall into the Pit.

We as a *thinking species* should be able to do better.

This is why it is *important* for you to clearly recognize the True Nature of the most *fundamental* factors that you *do* use as the deepest basis of all of the casual decisions you make throughout the course of the day. Ultimately, these factors are your *axioms*, both philosophical and socio-memetic. They cannot be proven, but that is *not* as we shall see, a problem, it is a blessing! Indeed, *this choice is the fundamental exercise of free will!*

If your philosophical axioms include a belief in God, and your cultural (memetic) axioms include the particular interpretation of Leviticus that prohibits pastrami and provolone or bread made with milk in the same bite, well, the reuben is out. If your personal axioms *also* include the laws of temporal continuity and causality (and hence, physics, biology, and all the rest), you might well conclude that hot shit on marble isn't likely to be either tasty or nutritious, leaving you with grilled cheese. This decision would be even more soundly based (given these same axioms) if you both have memories of enjoying toasted cheese sandwiches past *and* are silly enough to believe, without any *possibility* of rational proof, that something as ephemeral as a memory has any bearing whatsoever on the Now or an expectation of future satisfaction.

We leave it as an exercise for the reader to work out how to resolve a set of axioms that includes God, Leviticus, temporal continuity and causality into a system of reasoning and decision making that doesn't have *too* many internal contradictions[3].

You may not agree, of course, but according to *my* axioms, the Truth Shall Make You Free. Somewhat paradoxically, this axiom is *also* in the published axiom set of many religions – in the Catholic Catechism, for example[4]. In particular, simply having the epiphinaic insight that axioms are ultimately both a matter of totally free choice (as in they are *neither* true *nor* self-evident in any sense of the word, and cannot even be judged for consistency or esthetics without *more* axioms to tell you how to do so) *and* that most of the axioms you *do* have are very probably geneto-memetic social imprinting and not something you

[3]An exercise, of course, that is doomed to failure in *so* many ways.

[4]On the other hand religions, for the most part, have yet to actually *act* on this axiom and attempt to reconcile e.g. science with scripture because the reconciliation would *absolutely require* the *rejection* of much scripture, which would violate the Prime Axioms of religions in general, see below.

"chose" at all (providing that we agree on enough axioms for us to be able to continue a discussion at that point, which will not happen if you are slamming this book shut and crying out "Get thee behind me Satan") might just empower you to, perhaps for the first time in your axiomatically surpressed and conditioned existence, to *choose your axioms* as a matter of absolute, conscious *free will.*

It will then be time for you to go axiom-shopping. I will, of course, offer up a set that I find particularly lovely and useful, and even moderately consistent and adequately complete (although Gödel teaches us not to take that particular combination horribly seriously as we can't get both and well may end up with neither). These axioms come with a free shave and haircut from a very sharp razor, metaphorically speaking, as we sloppily adopt as an *esthetic standard* (not really an axiom) a wee bit of the William of Ockham's single contribution to Western Thought. *Once accepted* these axioms can form the irrational basis for a reasonably rational view of the Universe, and can even provide at least some poetic meta-answers to some of the unanswerable pseudoquestions, which is the best one can ever hope for.

In the meantime, I'll have the reuben on rye, chips on the side, with a frosty cold beer. Mmmmm. Don't worry, my axioms permit it. As long as I get enough exercise, so does my wife...

Part II

Philosophy

Chapter 9

Philosophy is Bullshit

We will now pause for a short romp through historical philosophy. We will focus to some small extent on the Enlightenment – the tremendous philosophical advances made in Europe in between roughly the end of the fifteenth century and the present (as it is a process that continues to this very day and this very book). No attempt at all will be made to do this in a strict historical order; rather we'll focus on certain key contributions that are relevant to the central thesis of this book.

Note well that this book is very definitely intended as a polemic. It is perhaps intentionally a bit disrespectful of the mistakes of our elders. This is because those mistakes get *repeated* over and over again – I teach physics at a University and advise students who are taking physics and philosophy and mathematics courses and hear over and over again how the same old shell game is perpetuated. I refer specifically to the fact that philosophy and logic courses time and again present rhetoric as if it is the *logical content* of the argument that matters, not the axiomatic basis from which the logic proceeds. They present *all arguments* as *loaded questions*[1].

What, you might ask, is a loaded question, or its close cousin a loaded argument? It is a proposition that can be proven (or disproven) only on the basis of premises that are at least as dubious as the proposition itself. When I was a teen-ager I once wrote an entire fantasy story whose fundamental basis was the saying "if you put your elbows on the table you squish a fairy"[2]. No kidding.

[1]Google up "loaded questions" in the wikipedia, of course, if you don't recognize the term, or just wait a second.

[2]What, your mother never told you that to teach you to mind your manners at the table? Good.

Yes, even then my notion of "rational discourse" was perhaps a bit skewed.

Now, if I were to attempt to prove the proposition "if I put my elbows down *gently* I can just *trap* a fairy without harming it" and used nothing but the finest of facts and purest of logic to observe that any possible presumed physical form of a fairy would require some presumed force greater than zero, expressed in Newtons of force to be "squished", that there was no physical reason I couldn't apply my elbow to a table with less than this critical force, that by doing this inside of a fair trap would more or less guarantee a non-fatally injured fairy within the trap at the critical moment of contact, Q.E.D., *would you accept this conclusion as proven*?

Only if another proposition, the proposition that "you are a complete idiot" is true. To accept the argument you have to accept the *premises* upon which it is based – that fairies exist (first of all) and that they magically appear underneath all elbows that approach "a table" whatever one defines that to be. So fine, these are axioms, or conditional premises of the argument that cannot be proven and might be false and which you are (in fact) likely to disagree with. At least I hope so.

As the Pit of Despair made clear, however, *all axioms are equally unprovable.* They are *assumptions.* Unprovable is unprovable, right? Nice dualistic split, a bit simpler than the existence thing (a fact that has caused an entire system of logic wherein "true" stands for "is proveable", sort of moving the notions of logic closer to those of logical positivism). "If it is an axiom it must be unprovable" isn't an axiom itself (or even a real proposition), it is a part of the *definition* of the word "axiom". We cannot rank unprovability. It is equally unprovable to assert that invisible fairies do *not* exist. Maybe they are there, only invisible. Maybe they are Neutrino Life and don't much interact with ordinary matter enough to be detected. Yet.

All philosophical arguments *but one* are built on top of a set of axioms as unprovable assumptions, not on top of self-evident truths. All philosophical arguments are hence loaded. A common term for the "proven" answer to a loaded question, one that openly expresses the *contempt* one should rightfully feel for the attempt to convince you that the unprovable is proven, is *bullshit.*

Now, much of the prose so colorfully presented above is not terribly idea-original. The perceptive reader[3] will observe that I've read and been influenced

[3]And I'm sure that at least some of you who are gnashing your teeth as I disrespect one or more of *your* favorite philosophers past and telling all your philosopher friends what a silly fellow I am.

by many philosophers and thinkers of years past. Yes, I've digested my Plato, barfed up my Aristotle, danced with Descartes, listened to falling trees in the forest with Berkeley and God together, been smacked by Johnson, laughed hysterically at the grave and oh-so-wrong "rational" pronouncements of the Germans[4] nodded thoughtfully at the Major Upanishads and some aspects of Bhuddism, Taoism, and Zen, and *wept quietly* as Philosophy attempted to pretend that the greatest philosopher, the *seal* of the philosophers as Mohammed is supposedly the seal of the prophets, never wrote the essays that destroyed the *fundamental basis* of philosophy as it was known up to that time.

I refer, of course, to David Hume.

Let's start out by taking a peek at what ol' David had to say about philosophy, given that he was, after all, a Famous Philosopher.

9.1 Philosophy is Bullshit

Now, if you've *studied* philosophy (as I have, from time to time), you'll know who Hume is and what he did[5]. On the other hand, if you are a professional philosopher who (like Harlie) relies on having a few fundamentally unanswerable pseudoquestions around to work on for a meager living (in which case, my dear fellow snake-oil salesman, you have my deepest sympathies, based on my own long, pecuniarily impoverished experience working a crowd) then you'll know what he did *and* you'll be secretly hoping that nobody else does, especially your employers.

The rest of you, listen up now. Hmmm, historical context and punch line, or

[4]It isn't just Hegel. Well, Hegel is *such* a perfect foil, I mean fool. I mean look, greater Germany contributed *plenty* of truly excellent natural philosophers and my own geneology has a significant fraction of German ancestry in it so I'm hardly disrespecting German Intellect – but what can you say that is good about Hegel, Schopenhauer, Nietzsche (now there's a guy didn't just look down into PED but rather jumped right in and set up housekeeping, although viewed as dark poetry some of his stuff doesn't read too badly). Kant and Wittgenstein, especially both should have known better – Wittgenstein was Russell's student and Russell definitely understood the inevitability of Hume's conclusions *and* made important contributions in the development of Gödel's theorem. It isn't possible to "transcend" rational thought and it isn't about language. It's about pure logic. In particular, it's all about the *basis* of logic, *axiomatic reasoning.*

[5]If not, you can probably learn at least a wee bit by looking at Russell's little book online and googling for a wikipedia reference such as: http://en.wikipedia.org/wiki/David_Hume. This is actually a lovely article and summarizes quite a lot of Hume's basic contributions to philosophy beautifully.

punch line and then historical context. Let's try the latter:

David Hume is the philosopher best known for proving, beyond any possible doubt, that *Philosophy is Bullshit*.

To be more explicit and precise (although I do love a nice, pithy, sound-bite) he proved *rationally*,*mathematically* that most of the questions asked by philosophers from the very beginning simply couldn't be answered, if by an "answer" you meant that you wanted something that could be proven using the methodologies of logic, mathematics, and pure reason. If you like, he deduced that our knowledge of reality is based on two things:

- Our empirical experience of existence, as of *right now*, the act of *perceiving* itself (in the present tense only).
- Axioms, from which we could derive and conclude *whatever we like* about the reality presumed to underlie our ongoing instantaneous consciousness depending on what axioms we choose[6].

Hume alas didn't emphasize the latter point in precisely these terms, but remember, he lived about 100 years before the discovery that axioms of even something as fundamental as geometry could in fact be varied to produce *new* geometries. He therefore relied on the prevailing language of his time and *reasoned* amazingly consistently that aside from what we are experiencing right now we can prove damn-all nothing from reason alone.

As we have taken such pains to assert, axioms are *not* self-evident truths, they are *fundamentally unprovable assumptions*. That is, personal opinions. That is, hot air, moonshine, speech out of your nether regions, *bullshit*. We know what *we are experiencing right now* and every thing else is *inferred*. I have no problem at all with the inferences – my axioms allow, nay, *require* them. Hume was less easy – it bothered him to "know" so little even as he (like us all) went about his quotidian existence as if he knew much more.

Humian philosophers such as Bertrand Russell also worked on the principle of inference, that is to say, induction. Russel argues in *Problems of Philosophy* that there is a *probabalistic* element to the law of induction, that if we recall that certain things have been always observed in some particular association in the past, that there is an increased *probability* that they will be observed in the same association in the future. However, his argument in favor of this principle is weakened by two critical things.

[6] Yes, I really mean the italicized part. If you've ever watched, for example, Monte Python's Life of Brian you should deeply understand my point.

First is his acknowledgement that the law of induction (in whatever form one chooses to state it) is in fact an assumption that cannot itself be proven by reason or human experience. To attempt to prove induction itself as a basis for reasoning out of what is "probably true" on the basis of induction ("induction seems to work so we can prove that it is probably true using induction?") flogs the question to its knees begging for its very life, and while so *much* of what has been put forth as "philosophy" is nothing more than question begging, Russell was too honest to be comfortable with it. We will have much to say about this later, although we will discuss the axiom known as the law of causality as the basis of our utilization of the law of induction, as induction *can* be said to follow from causality, but induction without causality is frankly very worrisome.

Second, and perhaps more serious, is his abuse of a *mathematical* concept – probability – in a metaphysical argument or statement. At the very least this is sloppy beyond all reasonable bounds; at worst it is simply egregiously incorrect and misleading. It is worth taking a moment to digress on this subject.

Considerable work has been done on the mathematics of probability. There is trouble *even* in mathematics right from the start. For one thing, there are two very different definitions of probability that often lead to the same numerical result but which have very different axiomatic developments. One is the frequency definition, where the probability of an event is explicitly defined to be the number of occurrences of the event divided by the total number of trials in which the event *could* have occurred, in the limit that the latter goes to infinity. While this is a perfectly reasonable definition, it leaves one with a number of serious problems such as the best way to *compute* the probability of nearly anything from a finite number of trials.

The second is the Bayesian theory of probability, based loosely on Bayes theorem (and developed in applications to physical science by Jaynes and by Shannon's Information Theory). The mathematical details of Bayesian analysis, while interesting, are not important to us here. The idea is that Bayesian analysis provides an explicit (if controversial, as it appears to rely on several additional assumptions or axioms in application) way of ascribing a probability as a *degree of belief*. It is *only* with these additional assumptions that *either* interpretation of probability yields a prediction in the form of a statistical inference.

Neither of these definitions, then, can be made to apply to the concept of inference itself without more axioms to bolster it, and *with* those axioms the statements they make about real-world probabilities are very precise and limited. Just to give you a tiny bit of the flavor of some of the problems that one can encounter, imagine an urn containing balls of some unknown color(s)[7]. The urn belongs to a guy down the street named Polya, if you care; it is "Polya's Urn"[8]. You reach your hand in and draw out four white balls in rapid succession.

What is the probability that the next ball you draw out is white?

This, in a nutshell, is the problem of inference. The problem is that *there is no completely satisfactory answer that we'd all agree on a priori* for this problem. There are too many things we don't know. We don't know how many balls the urn contains (could be as few as four, right?) We don't know how many *colors* of balls that the urn *might* contain other than white, although I can get around that by considering them all to be "non-white" if they are classical balls and not quantum particle balls with peculiar statistics (which, alas, exist in tremendous profusion in every atom of existence). We don't know how the urn was prepared – it might have been picked out of a large number of urns that were filled with white and nonwhite balls according to uniformly selected random probabilities (this is what makes it *Polya's Urn* in proper fashion and solvable by a pretty application of Bayesian analysis that is extremely relevant to quantum theory). Or it could just be a single urn filled by a curmudgeonly individual who doesn't like non-white balls (he was once beaned with an eight ball while playing pool) and won't under any circumstances place them in urns. In the real world[9] I could even be reaching my hand into the urn to draw another ball and the Sun could explode, blasting both me and the urn into a plasma before I actually draw another ball!

In fact, I have no idea how to compute a probability that the next ball will be white (or that I'll live to draw another ball) without making a *bunch* of assumptions – that the urn has more balls and that the sun won't explode before I draw the next one being just two of the more colorful (sorry) ones. Somebody else that made different assumptions might well get a different, and equally justifiable, answer. By the time we've *specified* enough *unprovable prior conditions* to get a unique and mathematically defensible answer to this *trivial* problem in induction, we've basically created a whole Universe of axioms.

All human knowledge borne from experience (or rather our apparent personal and tribal/cultural memory of experience) is relatable to this simple example. It doesn't matter if we've drawn out ten *million* white balls in a row – the next ball

[7]All the best examples in probability theory involve urns. God knows why.

[8]Polya was a rather famous Hungarian mathematician, who did a number of things with probability and is also famous for his work on problem solving methodology. Unfortunately he's not Greek, so I couldn't frame this as "What's a Grecian Urn".

[9]Loosely speaking, of course.

we draw could be black (and the hundred million balls following that). Or the sun could explode, destroying the urn and all undrawn balls, making the color of the next ball drawn μ.

Now, much as we all like to argue about whose axioms, whose prior assumptions, are "right" or "good" or "bad", the sad truth is that *reason* cannot provide us with any answer to these *pseudoquestions* for even this simple problem.

We conclude that even if one considers purely abstract mathematical examples where one can *rigorously justify* the use of the term "probably" we have to *specify the underlying assumptions on which a particular computation of probability is based* and those assumptions themselves are *not statements that can be asserted to be "probably" true.* Sadly, we must conclude that saying that a rational system is probably correct is as much Bullshit as is saying that it is inevitably correct or provably *in*correct. Now it isn't clear (to me, given my laziness and unwillingness to look up any evidence one way or the other) if Russell was familiar with the actual mathematics of probability – Bayes' theorem, Shannon's theorem and all the rest – but it seems unlikely given his casual use of the term "probably" in the context of a discussion of the basis of knowledge of all things (and elsewhere in those writings I *have* read).

Given that not even *statistical* statements of truth or falsehood – which are much weaker than the law of exclusion where something is true or false but never "probably true" or "probably false" – can be made without an even *larger* (and more controversial) set of axioms than those of simple deductive logic, perhaps we should spend a bit of time examining some of the most prevalent of the *fundamental* axiom sets upon which our understanding of things *is* based. We'll get on that in a moment. First, though, I want to address an important issue.

Out there I can almost hear the cleverest readers starting to snicker inside. If I conclude that Philosophy is Bullshit, and this is a work on philosophy, isn't this *entire book* just *bullshit*? Of course it is. My wife would have told you that before you bought it, if you'd only thought to ask her. Sorry though, can't get your money back. Philosophers have to eat too, and if nothing else you can view the book as the capering of a jester for your personal amusement if not edification.

More seriously, I'm asserting that Hume's proposition is *true*, that it is *correct*, even though the *proposition itself* states that Philosophical Propositions (including this one) Cannot Be Proven Correct (without the use of unprovable assumptions). Is this not a problem?

Amazingly (and this may be my single original contribution to Western Thought in this entire document) the answer is *no!* Hume's assertion is *nothing* *more than a example of Gödel's self-referential logic!*. In fact, it asserts that the fundamental basis of any philosophical system is:

> The fundamental basis of any philosophical system cannot be proven.

Whoa, you say. That looks suspiciously like something I read a chapter or so ago. We can *analyze* this statement quite simply. If it is false, then any philosophical system *can* be proven using pure logic. Things that can be proven are true. If this assertion is true, then it *cannot*, in fact, be proven which is a contradiction so that this philosophical system cannot be false.

However, the usual logical flip-flop *terminates* at this point. There is *nothing wrong with it being true*. We just cannot *prove* that it is true. We know that it is not false. We cannot *prove* that it is true, but it certainly *can* be true and in fact it seems manifestly obvious that it *is* true – we can "know" it to be true without being able to prove it, since if it is true it is *consistent* but if we were able to prove that it is true then it would be false which *also* seems like it would make it true. We are forced to conclude that the fundamental basis of any philosophical system of pure reason is inevitably *self-referential* and must be *true but unprovable*.

Fortunately, mathematics has given us a term that beautifully describes things that are true but cannot be proven!

Axioms[10]!

This is the ultimate ontological argument. I have shown that all philosophical systems are based on something that must be unprovably true as a truth itself, without proving it (as it cannot be proven). However, any attempt to *doubt that it is correct* (as our good friend Descartes would have us do) is foredoomed to failure and that way madness lies. It is a madness that has consumed thousands of years of the effort of thousands of philosophers, all generating their own peculiar brand of Bullshit as they search for a Philosopher's Stone to turn the dross uncertainty of an axiomatically reasoned world (with its presumed true but *unprovable* axioms) into the fool's gold of rational inevitability.

Ain't happenin', my fellow humans. We are doomed to live within our senses, nothing more, and to *know* nothing beyond what we are *experiencing* save by inference and deduction and reasoning based on unprovable *assumptions* that might be correct, might be incorrect, but can never be proven.

[10] Ta-da-BUM!

It is worth spending a *bit* of time now on one of the most important and pervasive classes of manifestly self-referential axiom sets, one that attempts to resolve the problem posed above by adding *one more axiom.* I speak of the Axioms of Religion. Which religion? Any religion. The axioms of organized religion share *memes* in order to survive as *social superorganisms.* They bear some close examination.

Chapter 10

The Fundamental Axioms of Religion:

Questions concerning God and the soul – whether or not God exists, whether or not we have immortal souls, where we came from, where we go when we die – are perhaps the most "important" of the pseudoquestions invented by mankind (measured by how much we care about the answers). They are also in some sense the most unanswerable of all of the unanswerable questions. We have axioms that work pretty well at describing the Universe in a way that leads us to believe that we understand "something" about how it all works, how it all is put together, but these axioms fail when applied to the concept of God.

Hume argued very convincingly that empirical proof, entering our knowledge through the narrow window of our finite senses, can never suffice to prove the infinite. Not the infinite in space, not the infinite in time, since we can sample neither one. In particular, however, Hume focussed on the infinite concept we call God. It is fairly easy to see that no observations, no experiments, suffice to empirically *prove* the existence of God. If a thundering voice comes out of the sky telling us to bow down and be afraid, is it God? Is it an advanced race[1] as of Space Aliens (maybe even space aliens who are here To Serve Man[2])? Only

[1] I believe that it was Arthur C. Clarke who pointed out that any sufficiently advanced technology is indistinguishable from magic or Godlike powers. Historical examples abound, as do Science Fiction stories such as *A Connecticut Yankee in King Arthur's Court*. If I went back a mere three hundred and fifty years and flicked my Bic in the wrong crowd – that is, nearly any crowd on Earth at the time – I could end up being burned alive or revered as a God or Shaman, depending on whether or not I was packing a few hand grenades and an Uzi with several spare clips along with my Bic.

[2] Reference to *another* moderately famous Science Fiction short story by Damon Knight that

completely consistent empirical proof of Godlike Power *throughout all space and all time and beyond* would suffice, although I'm sure a really plausible alien could go a long way without being suspected just as Cortez went a long way in Mexico without being suspected.

Rational proof is even more out of the question, since any attempt at a rational proof will require axioms, and axioms are, as we've hammered home repeatedly in this book, not provable. Even *given* a fairly reasonable, not too controversial set of axioms, *many* attempts at proofs, many attempts to even *discuss the concept* of God involve self-referential categorical superlatives and rapidly leave you tied up in Gödelian knots.

OK, so it's difficult. OK, so it is more than difficult, it's *impossible*. None of this has stopped humans from trying their best to work out answers that *work* for them. God as a *concept*, as a possibly imaginary Father Figure or Mother Figure, has been very, very good for the human race, a good that outweighs even the not insubstantial amount of bad that has come along with it. God (in almost every culture on Earth) has been closely tied to the *ethical* and the *political* evolution of the human species, largely because religions have been closely tied to the evolution of social structure of humans living together, which requires both political structures for decision making and ethical systems to form the glue that keeps us all from killing each other on a whim. Sometimes, at least.

A culture that is *too* self-destructive of its own members does not survive and is supplanted by cultures that are more conservative and beneficial. There is therefore survival pressure on religions (as a dominant part of a culture) to be *socially beneficial*, at least within the context of the surrounding competing societies[3].

Later we'll look at axioms associated with political and ethical systems that attempt to be beneficial in the same way explicitly independent of any religion. These have arisen fairly recently, although the marriage between church and state was never perfect even throughout the millenia it endured. Regardless, and politics filed for a divorce a few hundred years ago and has been bumbling along on its own ever since, and since states that are at least *overtly* free from any single dominant religion have thus far been more successful than those states and cultures that are dominated by religion, the idea of religious freedom has gradually spread to the point of being reluctantly embraced even by certain

got made into an episode of *The Twilight Zone*. Told as a cookbook...

[3]Technically, to be fit enough to survive it only had to be *relatively* beneficial, which historically has often meant that outsiders got their hearts cut out at the altar *first*.

religions. For the moment, however, let's look at the axioms of religion as the memes of a "living superentity" in and of itself.

This requires that we look carefully at some fundamental concepts of religion – the notion of God, of course, but God per se is one of the *least important parts* of any *successful* religion. Religions that *just* talk about God and not about how its members should behave, cut their hair (or not), have their foreskins removed (or not), how and when it is OK to have sex, how much money one should plan on giving the local priesthood – they just don't make it.

This thus makes sense, but even if you doubt it it is perfectly evident empirically from examining any religious scripture and just cutting out and weighing amount of text spent discussing *God* in and of Himself compared to the amount of time they spend discussing *what God wants us to do*, that is, sin, ritual, duty, history of the past (and how Bad Things happened to them as didn't believe in the Holy Scriptures), and the history of the future (and how Bad Things gonna happen to them as don't believe in the Holy Scriptures). More than ten to one. Maybe even a hundred to one.

10.1 The Common Memes of Religious Scripture

Religions are all about *socio-memetic*[4] *scripture* and very little about *God*. This of course makes perfect sense. First of all, I don't care if you are me or you are Moses, you don't know diddly about God – I'm working on establishing as a fundamental principle the fact that you don't "know" much about anything at all, however much you choose to *assume* about everything. God may or may not be beyond human perception (I have an open mind on that and am in fact personally inclined to think that God is *not* beyond human perception in at least a projective and inferential sense) but it is absolutely certain that God as a Superentity is *subtle* in the Universe. Either you see God *everywhere*, including the only place you can really look, the only place where *you* see anything at all, or

[4]I could, of course, write a whole section of this book on memes alone. Or I could plaigerize (even more than I am already) from other books, like *The Lucifer Principle* by Bloom. Or I could just send you to the Wikipedia for a quick lookup and a damn fine article. Instead, I'm only giving this important concept this one lousy footnote, aside from whatever you get out of context as you read, so listen up. For all practical purposes "memes" are to social/human groups (superorganisms) what genes are to ordinary organisms. The encode the organization – get it? Organize? Organism? Common root? Another metaphor is that they are the "program" of a social-neural network computer whose components are humans. There are still other metaphors. Relax. A meme is, fundamentally, pretty much a social axiom or a proposition of sorts that follows from social axioms. All clear?

you see him nowhere, as things seem to evolve in time pretty well according to the Laws of Nature without any outside guiding hand or invisible and undetectable fairies being necessary.

No, instead religions are *socio-memetic superorganisms* that have co-evolved with the many societies and cultures of the human species. Within them, humans have routinely parasitized the intuitive *concept* of God, ruthlessly co-opted God and asserted (as humans, after all) Prophetic Knowledge of God's Word to justify what are, for the most part, scriptural memes.

Like normal humans all share genes for two arms, two legs, one head and one body, have genes that regulate an immune system, the ability to digest food, and even a reproductive system and differ in the *details* of how all of this is arranged and put together into individuals, normal religions share memes for identity, for defense, for growth. Like a human, they are less concerned about the individual health of any cell it its body and more concerned with the health of the superorganism itself. Religions even have an explicit form of "spiritual surgery" for eliminating the "cancer" of members who have the temerity to doubt or try to alter the accepted common scriptural memes – excommunication[5].

Here is a listing of the most important and common axioms of the religion of your choice:

1. The Axiom of Certainty: These Axioms are True.

   This is the Prime Axiom of the axiom sets of all religions, and of course always a handy one to have if you wish to be able to "rationally" derive the truth of your beliefs (ooo, oxymoron city) from your principal axioms:-). At this point you will recognize that this is a self-referential axiom of precisely the sort that leads to a Gödelian knot. As good logicians, we should therefore *expect* to find incompleteness or inconsistency, and not be terribly surprised to find both.

2. God exists, is omniscient, omnipotent, omnibeneficient (at least to Believers).

   Note that this asserts a form of completeness. Gödel shows us that for self-referential axiomatic systems, completeness implies inconsistency. So

[5]Or, in olden days, execution in a variety of usually very public, very painful ways. To prevent other "cancer" cells from forming, of course, should they be actually thinking for themselves. Maybe modern medicine should learn from this – not just cut out cancer cells, but impale them on pins, sear them with fire, force them to recant their cancer down on their knees before crushing them beneath heavy stones, all where the other cells can see them.

we can conclude from these two axioms that *all religions that assert these two axioms are logically inconsistent.* No *terribly* big surprise, but...

3. God has kindly revealed, usually to otherwise unremarkable people given to fasting in caves or living on locusts and honey, by various prophetic and religiously inspired and sanctified means, this set of Axioms, which are axiomatically True (see Axiom 1), Complete (omniscient), Mandatory (omnipotent), and Good (omnibeneficient, see Axiom 2)).

   If you're not dizzy with following the circular ring of reasoning here, the Axioms are True, because they tell us that God told them to us, and what God tells us must be true because among other things God has revealed is that he is a really Good God and certainly would never permit a religiously inspired person to be *mistaken*[6].

4. All other (possibly competing) sets of Axioms are False, except maybe ones that are later revealed by God

   We've identified "self" – that which follows these axioms. We now identify "other" – those that don't. Again, it is left to a dutiful audience to pick up your favorite religious scripture and measure just how much of the prose text is devoted to just how often and colorfully God has smote "other" to lift up the Good Guys, and how when he didn't it was always because the Good Guys were being Bad and worshipping golden calves or something (never mind that a few thousand miles away a population several times as great as the entire middle East was positively *thriving* under a religion that, among other things, worshipped cows).

   This also presumes that the religion in question doesn't have have as an Axiom the following:

5. These Axioms are Complete *as given.* No fair adding more or altering them. Ever.

   Seal of the Prophets, anyone? Or do you prefer John's warning in the Bible? Mohammed and John should have had a talk with Thomas Jefferson, who argued quite persuasively (as one can see graved to the side of his memorial in Washington DC) that we can *never* assume that the Truth as we see it is eternal or beyond question. Boy, has history proven *him* to be right! All human history is an *evolutionary process* to a higher, better, more perfect understanding of pretty much everything, advanced step after painful step

[6] Certainly not about something as elementary and important as (for example) where the world came from and how we came to be here upon it. Or about the future history of Damascus.

over the broken and crushed bodies of mistaken ideas, discarded through a process of natural selection in favor of better ones (often discarded in their turn).

Jefferson of course created a supersociety – one that could change so fast and so powerfully that it literally out-evolved the rest of the world put together, at least until memetic sharing and some elimination of the societies that refused to drink at this particular fountain occurred. Thus far, however, religions have resisted the obvious path to the creation of a superreligion, largely because of this axiom.

6. God exists, is omniscient, omnipotent and *omnimalevolent* to Unbelievers.

   That is, anyone who fails to accept these Axioms as The One True Axioms in their deepest heart of hearts is a Bad Person, and this will be known by the omniscient God, who will then omnipotently cast you into an eternity of Eternal Torment out of the goodness of *His* (emphasis intentional on masculine humanthropomorphism) omnibeneficient heart at some unspecified point after your miserable death.

   In the meantime, he's gonna get you, and your entire *culture* too. Fire and brimstone and pillars of salt. Floods and famines. Frogs and locusts. Deaths of your loved ones. If you haven't ever in your entire life been touched by sadness or grief or misfortune, trust me, it is *prophecied* and like all prophecies of doom and despair, sooner or later it is bound to come true and *when it does* it is because you are *bad*.

7. All Priests Gotta Eat.

   Let's get down to important things, like titheing the priesthood. No kidding, this is an axiom of *almost* all the faiths on the planet. If a priest has to earn a living by the sweat of his or her brow, they become "just like everybody else". This creates an unhealthy atmosphere, one where individuals in the congregation are expected to think for *themselves* and establish and maintain their *own* relationship with God.

   Seriously, the priesthood is the "brain" and nervous system of the superorganism, and therefore demands support from the rest of its cells just as aggressively as your own brain does. Scripture (and unwritten custom) are the rules of regulation as to how this is supposed to occur, but occur it does whether one is a wandering mendicant monk in Japan or a Baptist preacher in Georgia. A very few of the protestant faiths have gone through periods where (from sheer lack of adherents) the priesthood had to work and preach and even made a virtue out of necessity, in Hindu and Buddhist culture it is common enough for working people to also be Brahmins or saints, but the general rule still holds. If its priesthood doesn't derive any *material* benefit or *social* benefit from being a priest, a religion is more likely to fail compared to nearby competitors whose priests are kept fat and powerful.

Besides, preaching is hard work and worth a bit of coin. Speaking of which, as this part of this book is undeniably a sermon, let's put on some suitable hymnal music and I'll get out my electronic beggar bowl. I'm "rgb" at paypal.com, and (especially if you are reading a free copy of this book instead of one you bought in a store) I would dearly appreciate it if you would take just a moment to drop in a small donation. Or even a *large* donation. Heck, go ahead, *endow* me so I never have to "work" again[7]. I can use the money for the betterment of Mankind at least as well as any TV preacher you can name, while conveying these divinely inspired interpretations of Holy Axioms to the less Holy...

8. Religion is *Good* for You

   Finally, all good religions have axioms that lay out rules and rituals for all the phases of human existence. These provide *real benefits* to their members; for thousands of years they were the *primary* source of societal structure, even though a large part of what they necessarily taught was that people should obey their earthly King.

   Scripture regulates how to celebrate birth, how to mourn death. It ritualizes adolescence and coming of age, provides rules for marriage and the raising of children, for the caring for the elderly, the sick, the poor, the widow and the orphan. It defines both proper and improper behavior, duty and "sin" (the latter a catchall phrase for behavior that threatens the superorganism in any way or – to be fair – is considered to be offensive to God in an of itself) and wrap *both* up in Holy Writ – be Good (where Good is what we say it is according to the divinely inspired Word of God as infallibly laid out in this compendium) and avoid Evil (where Evil is what we say *that* is ditto).

   It carefully specifies both carrots – heaven and other (earthly) rewards – to the Good and sticks – hell and other (earthly) punishments to the Bad.

[7] I leave it to your own judgement as to whether or not physicists or computer scientists, who in general have the *coolest toys on the planet*, actually *work* for a living as it is. I am both. On the other hand I'm a teacher, and teaching is damn hard work...

> It spends *most of its scripture* on this one last thing – writing out a *social specification* with Divine justification and only says a few words here and there about the True Nature of God, most of it quite mysterious and beyond understanding. And it never, never attempts to *justify* just *why* God would be shocked and wounded by a woman showing a naked breast in public, why God would give a rodent's furry behind whether two or more member of the same sex choose to stimulate one another to orgasm in some friendly or loving way.
>
> Note that this is really a placeholder for a rather long list of Axioms – too many to list – and that these Axioms are highly differentiated by culture. At one point in time there were plenty of religious cultures that did *not* think that a woman's naked breast (or pretty much any portion of a woman or man's exterior except maybe a few inches square around the genitalia) was all that big a deal. Now there are religious cultures that hide 99% of a woman's external integument[8] and would shoot for 100% if they could practically manage to force them to wear gloves along with a burka. I personally find it pretty difficult to believe that *God* cares either way, except possibly for thinking that it is pretty *stupid* to wear a full-body-armor coverup in the world's hottest climates and (possibly) a tiny bit *evil* to treat women in general like chattel.

Add whatever additionals axioms you like, of course, and they are provably true, see Prime Axiom. According to the scripture and more extreme adherents of at least some of the religions described by these Axioms, I am doubtless doomed and destined to Eternal Torment for the "sin" of *daring to doubt* that which *I do not know* to be true, that which does not *follow from reason* according to *my own* Prime Axioms.

To them it does not matter that I "doubt" nearly everything including my own axioms (however much I choose to assign to them a degree of conditional belief, to live by them as an act of *faith*). It does not matter if I live an otherwise blameless and even praiseworthy life, loving my neighbor, being kind to children and pets, giving to the poor, and even loving *God*. According to the Axioms above, one either loves God *in the prescribed way, with the permitted rituals, while obeying and supporting the priesthood* and above all, *acknowledging that the scripture followed by the adherent is literal truth and beyond all questions* or one goes straight to Hell without collecting $200 as soon as a lightning bolt comes along to smite you out of your sorry, sin-laden existence.

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[8]That's "skin", y'all. What point is there in having a vocabulary if you never use it?

I, of course, choose to doubt this. Even worse, here I am *writing out this doubt*, communicating it to others in what I hope is clear and uncomplicated prose[9], clearly hoping to *convince others* to become, if not openly apostatical[10], at least wise enough to replace the *Axiom of Certainty* with the *empirical observation of doutability*. Just this one act – acknowledging that it is *possible* that your axioms, your *assumptions*, yes even those assumptions about *God and the World* that you hold most dear *could be wrong* is all that it takes to potentiate a personal transformation that could lead you – anywhere[11].

Maybe the transformation will take you right back to your original faith. Maybe you *will* become an apostate of that faith and adopt another. Maybe you will stop using scripture of *any sort* to tell you what and how to believe and pray and live, and start to use your *informed reason* instead. Whereever you end up, though, I strongly suspect that you will never again[12] claim moral certainty or be intolerant of the beliefs of others, however crazy you might find them.

This is one of my open goals in this work. Intolerance, especially religious intolerance practiced by adherents to some religion, especially religious intolerance practiced by adherents to some religion that have by any means assumed a disproportionate degree of *political power*, is *openly dangerous* to humans in both the religion itself and (especially) the broader society of unbelievers. This is a matter of historical record; in fact it *dominates* much of the historical record.

If God indeed created us with Free Will, then *by what right*[13] do *men* seek to take it away, when it is plain to see that nobody can be certain that the religious scripture they are imposing on others by force are *correct*. I'm perfectly comfortable with *you* wearing your metaphorical burka woven from scriptural

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[9]Words like "integument" aside, of course. Look, I *told* you what it meant. My kids have to build up their vocabulary for their eventual SATs so we use big words around the house.

[10]Sigh. Apostasy is "the act of renouncing your religious or political beliefs".

[11]Potentiate I say because most people are well enough defended in the beliefs they inherit from their parents and native culture as children, which after all fit them "well enough", like an old pair of jeans or a particularly comfortable burka. Even after they come to understand intellectually how *infirm* our basis for understanding things intellectually or otherwise really is, it takes a little something, a spark, a word, having a soggy banana squished right onto your head unexpectedly, to actually bring about the Zen experience of Enlightenment. Which is not rational, per se, it is experiential. This experience is common to *all disciplines* – scientific, religious, political, sports, work – and it tends to happen to the prepared mind, paradoxically at a time when it is *un*expected.

[12]Assuming that you ever.

[13]It should be carefully noted that the answer to this rhetorical question is that humans have the "right" to do anything they want and can get away with, literally. This statement is thus emotional (and practical) persuasion, not logic.

axiomatic threads if you don it to cover your natural state of naked, ignorant wonder with the illusion of moral or religious or scientific certainty of your *own free will*, but I damn sure don't want it forced on *me*, any more than you would want me holding a gun to *your* head while saying "strip". I mean hey, nobody's *making* you read this book[14].

10.2 Memetic analysis of the Superorganism

However much it might seem otherwise, there is not the slightest hint of tongue in cheek in this presentation of the Fundamental Axioms of Religion. I am dead serious. Each of these axioms is there for a *reason*, after all. In general, the *fundamental* reason is the socio-memetic process of evolution that led the religion to be *successful* and *survive* the stiff competition with other religions.

The first axiom is pretty obvious. How far would any religion get if it went around saying something like: "These holy scriptures are pretty much what Isaiah and Moses and the rest of the boys sat around and made up one day over a tasty cup of fermented grape juice while trying to get the Chosen People to follow them and do what they needed them to do so that they didn't get slaughtered by the Philistines or the Egyptians or the Assyrians or the Phoenicians or the Romans or any other barbaric outsiders, and they kind of made sense in a lot of ways and seemed to work for a desert culture with at best primitive medicine and limited natural resources, so the Chosen People kept them."

"We hope you like them and adopt them too in spite of the fact that there isn't a lot of danger from the Assyrians any more and we don't live in the desert and have modern medicine. We'll even make you an honorary Chosen Person if you do, and we *think* that however much you suffer for your Beliefs, you'll *probably* Get your Reward in Heaven." No, to survive in any competition with more assertive religions, a religion *needs* to be assertive itself. It *needs* the Prime Axiom and will state it any number of times just to make sure that no possible reader of the scriptures can possibly miss the point that the axioms are true

[14] With the deepest, most profound apologies to any high school or university students where in fact, somebody *is* making you read this book. Tell you what. You can quit here. Tell your professor or teacher that I said so. Chances are that they'll be so impressed that you were actually *doing* your assignment so carefully that you got to this footnote and read it that they'll send you out to play frisbee in the bright afternoon sun with tears in their eyes. I do, however, *invite* you to finish the book off on your own just on the off chance that you might find it interesting or informative or useful or because your teacher is *still* going to *hold you responsible* for knowing what is in it whether or not they "force" you to read it...

without doubt, and that to even *think* the word “probably” or “maybe” is a Sin and to think words like “doubt” or “maybe not” is a *big* Sin.

The second axiom is actually almost never openly stated, openly written down. God is generally portrayed at least to the masses as a Human, just a *Super* Human[15]. This worked well enough when the “world” of most humans' experience was at most a few weeks travel in any given direction – perhaps a thousand miles square. A million square miles is a lot of territory, but is very definitely *finite*, and religions almost without exception placed this territory square in the *center* of all creation, usually quite literally with the rest of the Universe revolving around it[16].

It doesn't work so well for a visible Universe some *twenty-seven billion* light-years across, where a light year is around *six trillion miles*. Hmmm, a bit of multiplication suggests a spherical radius of around 10^{22} miles, a volume on the order of 10^{67} cubic miles, and there is no real reason to believe that we *are* in the center, or even that there *is* a center per se[17], so the volume could go on, and on, and on. Real infinity (or even Really Big Numbers that like to *flirt* with infinity on their days off) are a bit scarier, and the notion of this really really big male human figure that is *bigger still* that this volume – infinitely bigger, even including its invisible, possibly infinite, extension – starts being really kind of laughable. Especially if you take that “in his image” stuff seriously and envision God as having human-style genitalia[18].

So the omniscient, omnipotent, omnibenevolent thing are generally *inferred* from scriptures that are less explicit than this or from obsequious[19] prayers that generally praise His infinite power and wisdom and presence [20] and from the

[15]The “elect” on the other hand, sometimes get a bit of freedom to speculate on this, but when they do they *always* tread a fine line between orthodoxy and heresy. Some really great heresies have been invented in Christianity, for example, in just this way. Not surprising given the Gödelian traps and axiomatic contradictions, given the socio-memetic requirement of keeping it simple for the masses which *supercede* a silly thing like logical consistency.

[16]Every human on the planet should read the letter of Saint Bellarmine to the Carmelite provincial Paolo Foscarini (a public supporter of Galileo and the Copernican model of the solar system). To make it easy, I include a copy in an Appendix

[17]On the other hand, “every point is in the middle of an infinite line”, right? As I like to tell my students about the time we cover Galileo and Copernicus, the Church and Aristotle and most teenagers are right after all and the entire Universe *does* revolve around your *own, personal* navel, just the way that you see it.

[18]No, seriously. Don't think about that. Pull yourself together, man! Elephants have really big ones too, it doesn't mean that yours isn't big enough!

[19]I'm going to let you look this one up. It'll be good for you.

[20]Right before asking His Help in averting disaster, providing enough to eat, avoiding pain and death, and so on

prominently displayed conclusion that *whatever* God is, He Made All This. Including us. Usually with a fairly explicit and *completely unbelievable* (but *divinely inspired* and hence *beyond question*) story about just how he did it.

This is just as well, because one gets into *such* trouble with all of the above and Gödel and even plain old logic. Logic *hates* absolutes, because they are *so easily* led into contradiction and paradox and besides, nobody ever states the absolute premises correctly. It isn't "All men are mortal", it is properly "All men who have already presumably died were, as far as we know or have heard about, mortal, and we *suspect* that there is a rule that will eventually cause all men living to die too". Of course this doesn't sound anywhere nearly as impressive without the absolute *all*. Religion has a double handful of trouble with these axiomatic properties of God. For example, being omniscient, God knows of all real Evil. Being omnipotent, he *could* end it. Being omnibenevolent, he *wants* to end it, that being the kind of thing an omnibenevolent being might oughta do, and we certainly spend an *awful lot of prayer time* on God asking him to do that which in principle his omnibenevolent nature would have him doing without being asked. The truth is, we *don't* believe that God is all of those things or we would *never* pray *for* anything at all – we would be quietly certain that all things are for the best[21].

Yet Evil *apparently* exists[22]. Yep, there is a real problem there, one that no amount of "and it all works out in the wash", or "God permits Evil because without Evil there could be No Free Will" makes all better, at least not to anyone who experiences misfortune or human Evil directed at their own person or the persons of their loved ones.

The same problem exists with the concept of the *devil*, the anti-God proposed in many religions both to provide dramatic tension and as a *source* of, as the

[21] Just like Voltaire's *Candide*.

[22] Although one way out of the quandry is that it *doesn't* exist, and that all that we see of Evil in the world is ethically equivalent to the scripted out acting in a gangbusters widescreen Horror movie, all full of rape, robbery, murder, disembowellings, beatings, eye-gouging, genital electrocution, genocide, and topped off with a healthy dose of sickness and old age, earthquake and hurricane and above all death, untimely death. All *acting*. The ones getting hurt, they're not real, they're just extras, constructs, they have no souls. One day we (those of us *with* real souls) will all sit around some metaphorical bar in heaven drinking heavily of Perfect Beer and laugh about it.

prime cause of Evil[23]. Supposing that the Devil[24] exists, he (presuming that it is somehow *masculine*) exists because God Made Him. If he has free will (an Evil free will, of course) it has it because God willed it, both the freedom and the Evil. God could *un*will him at any instant. Even retroactively to the beginning of time, since God must live *outside* of ordinary time.

In fact, if God is truly omnipotent, then *any* act of creation or uncreation is little more than a whim – it cannot require any energy- or matter-like finite resource unless God is bound into the stuff of the Universe, with a "physics" of Its own, and necessarily less than omnipotent etc.

Truthfully, God in Its most abstract concept as the bearer of these infinite properties has a hard time *doing* anything at all, as change implies a state of less than perfection (in physics or elsewhere) and besides, *time itself* is just another dimension of the Universe and not the kind of thing to which God as an *infinite being* could be bound. In some sense I "like" the notions portrayed in the Vedas, that God in this sense is timeless and motionless, a state of pure being, and that for anything *interesting* to happen this being has to split itself into parts and create time, duality and change so that anything at all fun can actually *happen.* Of course with the fun comes its dual twin, not-fun.

So perhaps scripture is wise to stay away from this. It fails to show us the Face of God except where that face is anthropomorphic at worst or plain old Human at best. The Holy Ghost, the Atman, the Soul of God, is left unspoken, undescribed save indirectly and in hushed tones and by the elect and the daring, and otherwise left to be a mystery to us all. The religious superorganism has a soul, after all, and that soul *is God* for better or worse, and as such is just as indescribable as *your own* soul, for all that you experience it[25].

Which leads us to the *axiom of prophetic revelation.* Religions have a serious problem even given axioms 1 and 2 (which God knows justify absolutely any

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[23]Given that God is Good, it *really helps* for Him to have a Fallen Guy to take all the blame for Evil, even though any bruised four year old can tell you that if Johnny (18) is beating up on Tommy (4) with Dad (40, and supposedly strong and in charge) sitting there just watching it all happen, Dad is probably drunk. Besides, Dad *could* have decided to have just *one* kid – Tommy – and not bothered siring Johnny at all, or maybe sent Johnny off to military academy where he can get picked on by upperclassmen and taught to Be a Man. The devil is at best a straw man, and this is *morally* All Dad's Fault, unless there really is a higher Good being served by things being the way that they are, pain and suffering and Evil and all.

[24]Let's give the concept its own capital letter as this being is often portrayed as being gifted with God-like powers only somewhat less than those of God, at least as far as screwing around with human affairs is concerned.

[25]What the hell does *this* mean? Don't ask me.

drivel[26] in the known Universe being inserted as unchallengable fact if you take them seriously). How do the scriptures *get* from God to Humans?

Well, *one* perfectly reasonable way would be for God to manifest Itself directly to each human person and, every time they Sin, whack them in the buttocks with a holy lightning bolt while stating in thunderous tones what their Sin was. If they are blasted away into smoke, so what? God can reassemble the smoke in the blink of an eye into a properly chastened human[27]. God has plenty of capacity for timesharing, after all – infinite capacity. Or he could just manifest himself as a white haired old man an in a gentle tone describe the torments in eternal fire that await them should they persist in their Evil Ways[28].

However, this would, apparently, be too easy. Even *I* in all my doubt would have a hard time doubting a personal agent who could routinely generate lightning bolts aimed at my more delicate parts whenever I thought Bad Thoughts, or if a pair of Personal Angels manifested themselves *right as* some girl bent on Wickedness with me permitted me to get to third base and began, in quavering tones, to tell each of us individually of the rich punishments that would await us if we persist. No such luck.

No, God reveals his holy scripture through – wait for it – *humans.* Holy Prophets, actually. Or Rishis, or Gods Themselves but in a human avatar, sometimes to one of the masses, sometimes just to the elect. These carefully selected humans – some of whom were "good" before their selection and a few of whom were "bad" before their selection – are given Holy Truths and are expected to preach them, to write them down, to cause them to be given the Holy Stamp of Approval, and eventually to make the cut into Scripture, the memetic blueprint of the religion itself.

This leads to all sorts of problems, as one might expect[29]. For one thing,

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[26]Which is obviously an anagram for "r devil", suggesting some sort of cosmic message that some of the axioms inserted r (from the) devil, or maybe "r d evil", suggesting that religions r d(oing) evil. In which case they should be revil'd. I'll go take my medicine now, OK? You don't have to quit reading.

[27]Works for my dogs, anyway. Well, ok, it *doesn't* actually work with my dogs, it works with *some* of my dogs, the ones that do not Sin and stay in the yard God gave them as delimited by the action of their zap collars. Dogs too stupid to learn from being autozapped often end up buried, as one of mine unfortunately is, out beneath a peach tree somewhere, after being hit by a truck on the highway of life while chasing deer and having an otherwise *great old time.* I'd say it was evolution in action if it weren't for the fact that they are all fixed anyway. There's a moral in there somewhere if you can find it.

[28]I've tried this, too, with my dogs. Doesn't work as well. Some sort of language barrier, however much they like the attention. A cat, of course, spits on either method. Literally.

[29]The dog metaphor, for example, is now getting really strained. Only in Gary Larson

Religion A's prophets are Religion B's blasphemers and heretics (and vice versa) , almost by definition. Common humans are simply expected to be able to tell the *true* religion on the basis of axioms 1 and 2, on pain of posthumous torment (or in some cases prehumous torment, in the event that you choose B and fall into A's hands) should you choose incorrectly.

I can only put myself into the place of one of the prophets or saints, say, Joan of Arc. I hear voices in my head (I *do* hear voices in my head, it is part of how I think or am able to sing along with the radio while I drive). How do I know those voices are "me" (whatever the heck that is) or "God" (ditto, actually) or "delusions associated with undiagnosed schizophrenia"?

Prophets and saints rely on *preternatural knowledge* which is another way of saying that they just "know" that the voices in question are those of God. Joan of Arc *knew* that God wanted the French to slaughter the English more than He wanted the English to slaughter the French; God *wanted* there to be a few more centuries of bloody war in Europe. Sure. But Joan was a bit too close to the heretical even for the Church and in those days excommunications was just the *beginning* of the surgery on the body religious when cancer was discovered...

Anybody out there who thinks that people who "know" they are always right are *ever* likely to *be* always right a) are not married; b) have no kids; c) have never taught; d) really *mean* to add "when they agree with me". You all are invited to visit *any website* (Google will provide you with dozens) devoted to the real-time prophecies of every religious would-be-prophet, borderline personality and undiagnosed schizophrenic in the country. Well, at least those that have access to the Internet and the particular delusion that God is talking to them personally all of the time and warning them about the evils of radio towers and the need to get Orgone Blasters to ward off the devil[30].

I myself really cannot even judge; what they hear is in their heads, I only hear what is in my own. I'm pretty sure that the only voice I hear inside *my own* head is me, even when I'm talking to myself with one part of me gaming out God's position on Things using that axiomatic reasoning thing and some assumptions I can live with. But then, when I predict that 2005 will have a cold winter (as will most years for the next thirty years or so) I rely on a knowledge of *Gleissberg cycles* and *Maunder-type minima* and not prophetic dreams. And I don't dream

cartoons would Ginger come up to Sally and tell her "The Master has revealed to me in a mystical revelation that you are to give me all of your Chunks and then lick the fleas out of my fur." Riiiight.

[30]I am not making this up. Google on Orgone Blasters if you don't believe me. Visa card in hand.

of or prophecy two really bad hurricanes hitting in November because that is just dumb, however impressive it would be if it ever happened and I prophecied it. Bet on enough long shots, sooner or later one will come home, eh, and then the fact that you've lost your house, your wife, your job, and are living underneath a bypass somewhere from all the best you *lost* will all be forgotten.

For another, these "prophets" of whom they speak, they are *human beings* are they not? Now *I* have a hard time convincing myself that the world I see is really there – I have to think about it a bit[31], as it might not be so. If I work through it all and decide "yes, the world I see is Real Indeed" then my next step is to figure out what I know or can deduce about it from various possible sets of axioms. I work through *that* and choose Science as the basis for the personal knowledge of my *own* faith because it appears to work and openly embraces my state of doubt. I then try to think about God, but am told to *stop* – don't do that. God's Holy Word was Revealed to a fat bald man who lived in the desert[32]. Those words were remembered for generations, written down and modified by generations more, and finally incorporated in a body of Proclaimed Truth. I'm supposed to *believe* this, without *any possibility* of validating it? Not even the conditional belief sort of validation possible to science?

One looks at (for example) the following:

> An oracle considering Damascus. Behold, Damascus will cease to be a city, and will become a heap of ruins. Her cities will be deserted forever; they will be for flocks which will lie down and none will make them afraid. (Isiah 17:1-2)

Now a wonderful thing about prophecies about disaster – the fact that they haven't happened just means that they haven't happened *yet*. This is one that hasn't, more than 2000 years after the prophecy. Damascus has stood, undeserted, one of the world's *oldest* continuously inhabited cities, for most of recorded human history. But hey! *Sooner or later* it will doubtless all come true. Here's another radical prophecy, this one my own:

> An oracle concerning Earth. Behold, the Earth will cease to be a Planet, and will become a cloud of glowing gas. Her inhabitants will be long gone and forgotten; her matter will be absorbed by a dying star.

[31] Let's see, "is the world I see really there?" Decisions, decisions. Yep, it is. Guess it wasn't that hard after all.

[32] Actually I don't know about the bald part. Or the fat part, which is actually pretty unlikely come to think about it. Really, who had cameras back then?

The difference between the two is pretty obvious. The first is useless and by any sane measure, *incorrect*. Isiah was doubtless all pissed off at (As)Syrians because they were the dominant culture and his wasn't, so he predicted the fall of Damascus. So safe! So practical! A prophecy that was bound to come true eventually and eventually was almost certainly going to be long after he died, but in the *meantime* oh, all the reputation such a bold prophecy gave him personally, all the heart that it gave his followers!

The second is just a plain old scientific prediction, based on the *observed and well understood* life cycle of stars like our Sun. Eventually it will burn out. As it does so, its core will collapse and its outer gaseous layer will expand as it becomes a "Red Giant". At this point its outer surface will engulf the orbit of the Earth, which will long since have boiled away to Earth-vapor. The End, beyond any possible non-miraculous redemption. We can even tell roughly *when* this will happen, where Isiah was understandably vague about just when this collapse of Damascus was going to occur. Hey, maybe (with George Bush II in office as I write this, rattling spears at Damascus) it will be Real Soon Now.

However, Holy Scripture does *not share the axioms of Science*, certainly not as *prime* axioms. Isiah doesn't *have* to be proven absolutely correct on one, single prophecy to be considered a prophet, and the *failure* of *many* of his prophecies to come true is discounted as nothing – they just haven't happened yet, or they did happen but we missed it. Huge amounts of human energy are spent trying to figure out just which world historical events those prophecies were *supposed* to refer to so that they can be proclaimed to have been validated by the associated faith[33]. Prophets that turn out to have bee correct, sort of, if you look at things just right, only *some* of the time are an embarrassment.

Given the *complete lack of a standard of truth* for any word in any Holy Scripture other than its self-proclaimed infallible correctness, these first three axioms leave little room for any debate. That is their purpose. They *defend the memetic integrity* of the religious superorganism even though we all know that the scriptural words were written out by *humans* every one.

The fourth is an *offensive* axiom, directed at *competing* religions. They have, without exception, their own prophetic works, their own Geeta, their own cultural recipes, their own vision of God. They also *all claim* divine inspiration and infallibility. It is therefore necessary to cause each believer to *differentiate*, to become part of the One True Body of the socio-memetic superorganism (and hence be cherished and protected, within reason) or to become Other and be converted

[33] Nostradamus, anywone?

(forcibly or not), rejected, reviled, crucified, impaled on a stake, burned, blown up by a suicide bomb strapped around someone's waist, or just plain slaughtered.

Sorry to be so negative, but historically that's just the way it is. In addition to the Crusades, over a hundred thousand people died during the partitioning of India into India and Pakistan, and India and Pakistan (both nuclear powers) are arguably the world's most likely candidates for the next nuclear war that will kill *at least* millions (North Korea, of course makes this only a bit more than an even bet). There is a militant movement in modern Islam that is utterly intolerant of Other even within the general culture of Islam where major wars and genocidal acts now routinely occur over the differences between Sunni and Shi'ite, let alone the differences between either one and Christian or Jew or Buddhist or Hindu.

The basic point is that the world's successful religions are perfectly capable of mounting both an offense and a defense against competing religious superorganisms, and in some cases they don't mind spending the "cells" of their bodies – human lives – like water to achieve a goal of primacy or even regional ascendency. They fight *wars* and *kill* and *die* (all acts that tend to be more or less considered to be fairly serious kinds of "Sin" by axioms elsewhere in the religious scripture, proving fairly conclusively that consistency is *not that important* to adherents of any religious faith) over minor differences in the *details* of their scriptural axioms, and of course over the very real political and personal power that ascendency brings to its leaders and the perceived benefits that it will bring to those relatively minor cells within the body of the faith(s) that survive.

The next axiom is one of completeness. At one point in time religions did not have such an axiom – it is a relative newcomer. Some religions even have the *opposite* axiom and *expect* new revelations. However, the more aggressive of modern religions have found it very useful to lock in their axiomatic dogma in such a way that new revelation is impossible, so that change is actively resisted by the entire superorganism. Changes still happen, of course, but by rejecting changes *a priori* by claiming that e.g. "Mohammed is the seal of the prophets" (so that no prophets can EVER come after him) or creating a process for change that is so slow and tedious that it takes literally *centuries* to acknowledge that Galileo was right and the Catholic Church wrong about something *any kid with a telescope could see for themselves*, they prevent any sort of ecumenical dilution of the differences so carefully created by the previous axiom.

In this way again they retain identity. One word for a member of the Catholic Church who uses birth control, thinks that married priests, woman priests, and gay priests are really OK with God, who isn't opposed to the idea that other people should decide for themselves if abortion is right or wrong for them, that the pope isn't infallible and maybe should be elected by a somewhat more democratic and non-patriarchal process is: "protestant". By maintaining the Catholic Church's archiac, patriarchal viewpoint on most of these issues (in spite of a remarkable lack of actual scripture addressing most of them directly) they *differentiate* from the protestant churches. By maintaining their *own* private keys to spiritual identity, those churches remain independent of each other.

The rest of the axioms serve fairly obvious memetic purposes. Enough bad things happen to people that all successful religions learn to exploit their fear of bad things by claiming to have a formula for affecting the basic processes of good and bad fortune. New Orleans is hit by two devastating hurricanes. Is it inevitable, given that the devastation was largely caused by the fact that the city was built right next to the sea and below sea level, on the shores of one of the world's most active sites for hurricanes? No, it was *God's Will*, caused by all the folks who live there who smoke and drink and show their tits to strangers on the stage. All the *good* people who were killed there, or lost their homes, or their jobs, were guilty by association, all the *innocent children* who suffered were guilty of the *original sin* committed by Adam and Eve and hence bound to be punished along with the rest. So *turn to God* (the line forms at the left) or *this will happen to you.* Note that this ploy is used more aggressively by the *smaller* religious sects, as they rely on recruitment of new members to grow at the expense of the larger, older, better established sects. But it is a constant subtext of nearly every sermon.

Feeding the priests goes without saying. In fact, a religion usually needs an extended economic superstructure to function as a superorganism in the colony of interrelated superorganisms that make up any society. It needs money to spend *as the church* not just donations to support a local priest, and a *centralized infrastructure* that is both literally and figuratively the "head" of the church. Some of the world's religions have less centralization and some have more, but it is hard for any religion to get by one priest at a time and without any centralized mechanism for preventing scriptural drift and heresy.

Finally, all religions *do* provide many, many real benefits to its members. This is a memetic necessity. The body of the superorganism has to remain healthy, strong, vital, in order to survive the competition with its neighbors. In fact, the more the competition, the healthier (historically) those members have grown. When there has been only *one* religion, enforced without choice by means of sword and noose and pyre, religions can get away with being pretty damn hard on their members. However, that creates fertile ground for heresy and schism and the formation of new religions that promise to treat its members better. Would Christianity have gotten anything like the traction it did in Rome if slaves who converted to the local religion where immediately freed and made citizens? Promising rewards *after* this life made the process of conversion even easier, as a religion didn't even have to deliver a better life right away.

Still, marrying and burying are what religions do best. We do all share an intuitive idea of God, of the importance of things, at the very least of the importance of our own lives and those of our loved ones to us. Humans take great comfort in the rituals and the beautiful promises of Religion, and Religion in turn more often than not *does* deliver a measure of peace and a sense of belonging and a set of rules that permit people to live together in harmony.

This isn't a bad thing, not at all. My purpose is *not* to try to destroy religion, or even to suggest that religions are a bad thing. It is to point out that they are all about worshipping *scripture*, not *God*, and that, if you look at that scripture with objective eyes, most of it is self-serving in completely understandable ways and for completely understandable reasons, and there is *no good reason* that I can think of for preferring one set of scripture over another, since there is *no reasonable* (or even understandable) *standard of truth* for their *axioms*, and there is an open and callous *dis*regard for their obvious failures and inconsistencies.

Let's now return to the topic of axioms per se for a moment, and compare how the axioms of religion and the axioms of science, both "religiously" applied, lead to very different views of the same phenomena in the same Universe. Although I personally *prefer* one of these views, I cannot prove it is right, nor can I prove that the religious view is wrong.

10.3 Religion versus Science: Axiom Wars

I have had the direct pexrsonal experience of "discussing" *my* understanding of the history and origins of the Universe (based on the Axiom of Science including causality and all the rest, introduced and discussed at length elsewhere) which leads to the Laws of Physics and the empircally founded knowledge accrued in the other sciences, compared to the understanding of various *other* people, of the history and origins of the Universe based on The Axioms of Religion as embodied in (say) the Old Testament, in particular Genesis, defended by one who believes without doubt that the entire Bible is literal truth, divinely inspired, and incapable of being in any fundamental error because a good and loving God would not permit such a thing as a deceitful Bible to Be[34].

I conclude that the Universe is oh, 13.7 billion years old give or take a few percent. *They* conclude that it is a few thousands of years old.

I point out patiently the entire coherent structure of reasoning (Maxwell's equations, parallax, stellar dynamics and Cepheid variable stars, the Hubble constant, rates of radioactive decay, geological and paleontological evidence), from axioms through observations on to conclusions, that leads me to believe that whenever I look up at the night sky, light that is around a million times older than that falls on my face .

They patiently point out that the Bible in general clearly and repeatedly states, from the Commandments on, in any number of divinely inspired prophetic statements, that its entire content is divinely inspired and infallibly, literally correct. Therefore, if all of my science is producing answers that disagree with any portion of the Bible, then *it must be wrong.*

In some detail (as we talked through, in a very civil exchange, each of these points): If radioactive decay rates show the Earth to be older than a few thousand years, they must have changed or maybe I just don't understand the initial conditions. If there is a layered, apparently evolutionary fossil record buried in rock all over the world, it just proves that there once was a Really Big Flood and all the antediluvian beasts that didn't make the Ark settled out sorted by a curious mix of weight and density and size that simulates an evolutionary trend and were chemically turned *rapidly* into to stone by processes that we don't understand or that might have occurred more quickly then because the chemistry of the time was *different.*

If the night sky shows light that *appears* to have come from far far away and long long ago, then either the Universe was created with the light already on the way or maybe the laws of physics *changed* and light was a lot *faster* in the beginning. *Even if all our current observations of physical laws and the temporal sequencing of biological events is totally, incredibly, twenty-significant-digit kind of consistent* what *reasons* do we have for believing that physical laws haven't changed over time according to a *higher* law? How do we know that "outer space" is even *there* and not some sort of far closer boundary created by God to *simulate* a vast Universe, which really would all just be wasted anyway since we are his *only* creation and the Earth is all that we need.

[34]While, on the other hand, having no visible problem with war, genocide, hurricane, earthquake, sickness, disease, death, or any of the *other* equally self-certain, self-serving religions on the planet. But I digress.

No fooling, and this is, sadly, not a joke. I *wish* I were fooling. If nothing else, I've learned that as soon as one discovers in a debate of any sort that your opponent/partner has *different* Prime Axioms, unless you share the Axiom of Open-Mindedness (discussed below), the wisest thing to do is immediately terminate the discussion, back away slowly (possibly with one hand on your wallet and another on a small but powerful handgun), and go do something *useful*, like doing a crossword puzzle, or taking a nice long nap, or playing World of Warcraft until your mouse-hand is sore.

At least those things will improve your mind[35] and are unlikely to get you beheaded, burned at the stake, pilloried, broken on the wheel, enslaved, or just plain beaten up and left for dead – all of which have happened at one time or another to the loser of what *should* have been an open-minded and fair philophical debate[36] between holders of different axioms. Including repeatedly, religious axioms, where the "debates" were, for example, known as crusades.

The damnedest thing is, of course, that I can no more prove my axioms than they can prove theirs, and hence *both our conclusions are in some deep sense equally irrational.* Maybe the laws of physics *have* changed over time in a way that (precisely) cannot be detected now. Formulated this way, *how can I prove otherwise by any experiment or experience, by definition?*

We thus run up against the good old Pit, once again. Any question or proposition, pushed up against its axioms, becomes unanswerable, unprovable, doubtable. The inevitable conclusion of this (or any other) reasoning chain about the Universe is that *no* question can be answered save conditionally. Conditional conclusions can only be based on *belief* in the truth of the premises, where that belief *cannot be validated, ever.*

We thus see that far from mocking religion as being "less rational" than science, that *both* science and religion are based on *faith* – the faith that your prime axioms, however unprovable, are reasonably consistent (where consistency at least can be explored by pure reason) and correct, where correctness is beyond proof.

Belief is belief, whether it is belief in the Laws of Physics or the Book of Genesis. Both are, alas, Bullshit. *Useful* Bullshit in the case of the laws of physics and in my own *personal* opinion *useless* and even *evil* Bullshit in the case

[35] Debateably, in the case of playing WoW.

[36] Also known as "open intellectual war". Nobody said that philosophers were sissies. Well, actually, that probably *has* been said from time to time, but only because Socrates gave the rest of us a bad reputation by meekly drinking hemlock instead of rousing the disgruntled youth and taking over in a revolution against the establishment.

of Genesis, but Bullshit either way.

At this point I firmly hope and *believe* that I've jarred the Scientists who are reading this out of any belief, conscious or unconscious, that a pursuit of knowledge through science doesn't rely on faith. I also hope that I've the Religious people who are reading this (the ones that haven't gathered on my front lawn to throw me in on top of a fire built out of my own books) are jarred out of any belief, conscious or unconscious, that their own personal *religious scriptures* are in *any way* superior to those of any *other* religion's, at least as far as rational knowledge, provability, *plausibility*, or empirical validation are concerned. God does not come out of a book. Not even this one.

This leads us to ask the following, very important question. We now can see that we *cannot* use reason to decide between competing axiomatic descriptions. All arguments devolve to "Is so!" "Is not" "Is so" "Is not", where there opinion tie is fundamentally unable to be broken as things stand.

In order to break the tie, in order to be able to choose our axioms *wisely* if not *rationally*, we have to look not for knowledge but for wisdom. In particular, we need some axioms *about axioms*, a way of *rating* axiom sets so that we have some way of deciding that one set is *better* than another. These *meta*-axioms can be accepted or rejected as easily and arbitrarily as any of the axiom sets they are intended to judge, so we cannot hope to persuade by logic or reason. Let's try something else instead.

Chapter 11

The Fundamental Axioms of Science

Chapter 12

The Fundamental Axioms of Human Society

Chapter 13

Critique of Specific Philosophies

In this chapter we'll examine a few "famous" philsophies and try to figure out *why* they are Bullshit (or as our English friends might say, "Bollocks"). To some of you, this will feel a sort of like euthanizing old but beloved pets – you don't exactly like having to do it, but you know that it is something that simply has to be done.

A few of you, on the other hand, will be screaming *yes, yes, yes,* finally, kill the bastards, pour flaming gasoline on the remains and piss on the ashes. I'd suggest out of sheer kindness that you go wipe the foam from your mouth and take your medicine now, then assume a lotus position and say a mantra for an hour or two before returning to read further. Nothing is served by having a stroke or biting somebody when you're in this condition (however much I might sympathize).

To others (especially those who are *still* hovering over the Existential Pit of Despair) this will feel like I'm sawing through the last threads of the last ropes that sustain your very existence and you'll get very angry. If your Prime Axioms are those of Religion, especially one of the warrior variants with strong and aggressive sociomemetic scriptures, you may may be mouthing Jihad and looking for a belt full of explosives, or warming up the stake in the courtyard.

Or if you're a gentler soul, you'll write me to point out how everything I say is well and good, but *Kant's* philosophy or *Wittgenstein's* philosophy or *Russell's* philosophy or the Catholic Catechism or the Koran or the Gita is actually all right and Not Bullshit. Wrongo, Mary Lou. Show me a conclusion of any sort, however humble or proud, about the Real World without an unprovable axiom behind it (other than the *empirical observation* of your own existence in *real time*) and I'll cheerily plant a wet one right on your keister.

Most of them, for example, tacitly assume that the Universe is a *causal* sort of place with *relationships* and *identity* and *time-sequential ordering*, and that *human beings exist* (note carefully the plural) so that things such as language and logic are at all relevant or have something to do with the stuff of *reality*. Sticks and stones may break my bones but words will never hurt me – there is a lot of wisdom in aphorisms, however much they too are bullshit as *knowledge*.

A very few of you (mostly professional philosophers) may be praying that I leave *something* untainted, *some* branch of philosophy that might be viewed as Not Bullshit because you rely on it for a living. Hey, guys, relax. I'm not after your jobs. Besides, the vast public realized that philosophy is Bullshit long, long ago (likely pre-Hume) and likely will never read this simply because it *sounds* like a work on Philosophy.

Now, observe how I cleverly side-step the trap yawning at my logical feet. Obviously *this work* is not a work of Philosophy, because if it were, it would be Bullshit!

Hmmm, *this* work is a work on *mathematics*. Everybody already knows that mathematics is empty of meaning save in the most abstract of senses, so that your jobs are safe. Just refer any complaints over to the Math department. Or perhaps it is a work on meta-philosophy, the foundations of philosophy itself, where we conclude that nope, sorry, gosh we feel bad about taking your money for a few thousand years, but pure reason (however great and useful it appears to be) cannot forge any *necessary* connections to an external reality.

OK, let's get serious. Joking over. The *real* conclusion that a thinking person *should* draw from this work is that understanding this work in particular may be *the most important thing they ever do*. Not as *knowledge* (we are simply doomed to a life of uncertainty as far as non-provisional knowledge goes) but as *wisdom*. Philosophy may well be Bullshit, but philosophy is *important*. Philosophy embraces *everything we know* about the world, which is why it simply won't do to leave that knowledge up on crumbling cinder blocks and termite-ridden pillars carved with the ancient runes and tribal customs of vanished, failed cultures.

If you *think* about it (and yes, I will continue to hold your hand and try my best to provide some guidance for that thinking) by taking a sledgehammer to those cinder blocks, by setting fire to the pillars and burning them up, termites, runes, and all, I'm bringing the T-bird of knowledge *down to earth* from where it has been sitting rusting away. Freed from the rubble, the baggage, the smoke and the mirrors that have kept it out of service for so long who knows, maybe it will even *soar into the heavens*[1] not as certainty but as faith.

Recall that I've several times stated that my *ultimate* goal is to *set you free*, where "freedom" can mean nothing more nor less than *free to choose what you believe*. All that I do in this chapter is my very best to show you that for all the fancy clothes and pseudo-logical language, all philosophies are *beliefs* as *fundamentally* silly as belief in fairies. Or if you prefer a more precise and less loaded word than "silly", as *irrational* as belief in fairies. Until one agrees on some particular set of axioms, all philosophies one might discuss are extended loaded answers to loaded questions, liberally mixed with circular reasoning, question begging, self-referential logic, and social memetics that stinks of the culture from which it is drawn and isn't even vaguely logically *consistent* with any given set of axioms. That is...

Bullshit!

13.1 Why Descartes Proof of God's Existence is Bullshit

What follows is a dilettante's guide to the history of Enlightenment, stopping off here and there to visit some Famous Names or Results in the development of philosophy. Modern philosophy in the West went from a state of near-complete religious domination (where nearly the only philosophers acknowledged to exist at all from the times of the Greeks were religious ones such as St. Anselm or St. Thomas Aquinas (and look what their philosophical musing got for *them* – sainthood!). The Church more or less endorsed much of the philosophical musings of the Greeks because they were free from the taint of religion and "safe", and provided the illusion of answers to many non-God questions.

We will skip at this point the various details of the work of (in no particular order) Francis Bacon (arguably the father of Natural Philosophy and all of modern science), of Kepler and Tycho Brahe, of Hobbes and of Galileo – all contemporaries of (on the early side – they were all a bit older but overlapped) Descartes. However much I enjoy telling this particular story in physics class (because they are all relevant primarily to the development of natural philoso-

[1] In case you haven't figured it out yet, I'm quite fond of the metaphor, yes I am. Shaken, not stirred.

phy as I discuss later) they, and Copernicus, and the countless alchemists, and Columbus, aren't immediately relevant to my thread of examining axiomatic, deductive reasoning and the real world.

We'll skip ahead to the philosopher who might well be called *the father of rationalism* (so much so that it is properly referred to as *Cartesian* rationalism), a monster mathematician as well as a philosopher, to one of the first men to attempt to apply the methods of *pure reason* to the Really Big Questions such as the SUW.

I refer, of course, to Renee' Descartes.

Descartes' personal life is of little interest to us here. He was French. We was born in 1596 and died in 1650 (when a man named Isaac Newton was seven-plus years old). His family was well off (the sine qua non of early philosophers was independent means or at least sufficient wealth from a real job that it provided them with liesure time for philosophizing). He was educated by the Jesuits.

Somewhere in there he learned that he was a genius with an aptitude for mathematics and focussed his energies on mastering mathematics and philosophy. He wrote a Theory of Everything, but (possibly out of fear of the Church, who had just whomped Galileo upside the head with the threat of a stake piled with firewood for daring to suggest that anyone with eyes and a telescope could *see* that the Earth was Not In The Middle) he abandoned it unfinished. He then went through with writing and publishing several works and appendices on both mathematics and philosophy, which are generally unexciting except for three things – he invented *coordinates systems* for the first time providing a *quantitative frame* for geometry; upon this rock he invented *analytic geometry*, a prerequisite for the eventual development of physics and the calculus by Newton, Leibnitz and others, and he wrote *cogito, ergo sum* (I think, therefore I am) as the basis of his attempt to *prove using pure reason* (of which he was inordinately fond, possibly because he was so damned good at it) that everything is the way that it is because it must be, because there is some *rational* basis for it all.

He didn't just want to understand reality or prove the God exists using something like the Ontological argument[2], he wanted to *derive* it.

To help us forgive Descartes, note that he worked in a world where the Church still had a habit of really hurting those that opposed it (at least in their perception), and where the population of the world was small enough that we tended

[2]Which *anybody even then* could see was Bullshit, but just in case there are any holdouts – and there are – I beat this dead horse a bit later on myself. Of course it never was very politic to criticize the conclusions of a Saint unless you were a bigger better Saint.

to have only one or two geniuses born into the appropriate social class at any given time. Doubtless there were other polymaths alive out there (other than the not-so-mathematical folks on the short list above), but they probably were tending goats on some hillside in Spain or Italy wondering why goat hair made interesting patterns when it was being rained on. Also, scientific communications were slow and what now might take days to report to the world then took at least weeks and sometimes (where the New World was concerned) years.

To give true and proper *credit* to Descartes, in the process of reinventing geometry for the first time since its original invention, he fell in love with the very *concept* of axiomatic reasoning, and his work necessarily preceded the serious reanalysis of the axioms of Euclid and the discovery that they were flawed in many ways[3]. To him axioms were still, to a great extent, self-evident truth, but he nevertheless knew full well that he had to work from axioms of one sort or another.

So Descartes set out to determine what he "knew" with absolute certainity, so that he could use this as the axiom set from which to proceed in his reasoning process. The axioms he sought and adopted were very much of the "self-evident truth" variety, because he wanted his conclusions to be as well-founded logically as those of Euclid – he wanted a veritable geometry of Being, including a theorem of Deity (as he was a profoundly religious man[4]).

So he proceeded to figure out what he could *doubt*. If something was dubious or doubtful, it couldn't be an axiom, right? When he was done, what was left would become the axioms of his rational system.

Descartes rapidly realized that when you got right down to it, there was damn-all that one couldn't doubt when one tried hard enough. Can I doubt that the sun will rise tomorrow? Certainly! Maybe it will, and maybe it won't, we

[3]Hibert found some 23 axioms were required to fill in all the gaps left by or presumed by Euclid and his successors.

[4]Hard on cats though. Even very bright people can be *so* silly. In the East, the question to the master is "Do dogs have Buddha Nature?" (souls, loosely speaking) and the answer is to whack your student upside the head with a dog, or make an inscrutable remark about the wind whistling through holes in heads. In the West, it was Descartes announcing that "Cats have no souls" (Buddha nature, loosely speaking) and – apocryphally, at least – throwing his cat out of his upper story window to demonstrate the lack of moral sin inherent in killing a cat. Mmmrrrrreooow-splat!

I prefer the more interesting questions of whether or not Buddha had Dog nature and whether Descartes' cat landed on its feet, shook its head a couple of times, and moseyed off to philosophize to the extent its spirit permitted on a warm sunny wall belonging to a cat-lover far away from Descartes. Perhaps Voltaire's, if it's nine lives stretched out so long...

can know nothing of what hasn't happened yet. Can I doubt that I ate lamb for dinner last night? To be sure, everyone knows that human memory is fallible. Perhaps I ingested large quantities of hallucinogenic drugs last night and just *fantasized* that I ate lamb for dinner. Perhaps an Evil Fiend hypnotized me into believing that I ate a dinner of lamb. Perhaps I was rendered unconscious in my sleep for exactly one day, and I actually ate lamb *two* nights ago but haven't figured it out yet. Perhaps what I ate was mutton, dressed up like lamb.

And so it goes. Can I doubt what I am seeing? Surely. Again, hallucinogens, particularly vivid dreams. Look at Keanu Reeves in The Matrix, moseying along thinking in perfectly good faith that he was a computer programmer living and working in a clean, urban world, only to wake up and discover that he was only a power unit in the Matrix (and later discovering that the world in which the Matrix resided might well *itself* be in a higher order Matrix, starting off a potentially infinite chain of layered meta-realities that would gladden Hofstadter's heart). That which I see can be imagined, that which I hear can be projected, that which I feel or touch can be simulated. The external reality that I *believe* these sensory impressions correspond to *could* be real, or they could all be some sort of metaphorical Matrix. They could even be both!

The past is thus uniformly dubitable – perhaps I was created moments ago with *memories* of the past intact. Could I tell? No – the memories I have don't even always correspond to *other* people's memories of the same events[5]. The future is dubitable as I haven't even the continuity of memory to help me with that which has not yet happened. Most of the present is dubitable, because I know it only via my senses and they are not trustworthy.

The one thing that I *know*, that I *cannot doubt*, is that I exist. I cannot doubt my own existence unless I exist. To think, to doubt, even to dream is to exist. So it is with me. So it is with you, as you think over these words. *Cogito, ergo Sum*[6]*.* And so it was, I imagine, with Descartes.

Descartes now had his one irrefutable truth, his Axiom, and proceeded to try to derive Everything from it. For a good mathematician, he botched the job horribly.

His reasoning went as follows: I exist. My existence must have a *cause.* My existence cannot be its *own* cause because it just isn't up to snuff – my awareness

[5]Presuming of course, the reality of the other people and their memories of an objective past. Both of which are, of course open to doubt. Individuals who are married will no *precisely* what I mean, here.

[6]I think therefore I am.

seems to wax and wane with sleeping and waking, I have been unconscious altogether, my existence seems altogether ephemeral and insubstantial when viewed as a self-sufficient cause, so I must have a cause "greater" than myself[7], since I'm so obviously flawed and imperfect and not-so-great.

Hmm, cannot be anything in the world I see (historical evidence to the contrary, sorry Mom and Dad... you're just dubitable) as this just puts us onto one of the pathways to the Pit of Existential Despair as even if I use "the laws of physics" as a Prime Cause they just aren't great enough. Indeed, none of this is any better than I am at causing things without itself needing a cause, assuming that it is there at all. Even if my cause really IS something my mother and my father did one night long ago, *they* needed a cause, and that cause needed a cause, each cause greater than the one before. The whole world would need a cause. The whole *Universe* would need a cause. *Physics* would need a cause. Must be something greater than me and the whole existing Universe and Physics besides (if either one exists, of course, which I find dubitable)!

I know, let's call this Greatest Cause, this prime cause, a Guardian[8], oops, no, I meant *God*. As the Greatest Cause it clearly must be perfect and good and all-powerful and all-knowing and all-self-referential and everything like that because (shades of ontology) if it wasn't I could *imagine* a greater cause that was *more perfect* on to the limit of *infinitely* perfect (Descartes with his number line almost certainly had a nice appreciation of infinity). Surely this *perfect* prime cause, this *God* wouldn't cause *me* to exist (the one thing I cannot doubt) but fake me out with a non-existent Matrix because that would be a lie! So the world I see is real, it exists too! Hooray, I don't have to be a solipsist! My memories must be real[9]! I've just proved the logical necessity of God and All Observed Creation from just one itty bitty Axiom (in the self-evident truth sense), the indubitability of my own existence!

Ain't I cool...

Not. Descartes made mistakes by the fistful. His biggest was in *not listing all of his axioms* and the fact that *axioms are by definition (as assertions) dubitable.* Also, *cogito, ergo sum* is *not* an axiom – it is something *different*, something that the world had only very, very *begun* to realize was the basis of a *new* kind of conditional knowledge, one that actually worked. It is an *empirical observation.*

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[7]I smell the remnants of his Jesuit education and probable influence by St. Anselm's Ontological argument in spite of himself, since this smacks of imagining something so great that existence must be one of its great characteristics.

[8]Sorry, obscure literary/cinematic reference. I'm not telling which.

[9]Except for the ones that don't agree with those of my wife...

More on this later.

Descartes' entire discussion is thus a subtle form of the fairy argument – by the time you start arguing over whether or not you require a greater cause than yourself or not you've already lost the battle for pure reason no matter what you decide. Let's help him out and write down (and doubt) a bunch of his *unwritten* axioms, starting with the show stopper:

- Reality is a Causal Kind of Place – the Law of Causality. All things require causes. All things are themselves causes. The Universe is a Causal Chain. Mind you, I'm kind of fond of this axiom and will include it in any sane axiom set that I offer up in the bazaar – even people who openly believe in *magic* believe in causality, they just include demons and spirits and angels and the Hand of God and chanting obscure ritualistic formulae while turning widdershins skyclad holding a sprig of oak and an athame in the general roster of causes.

- Causality is time ordered. No kidding, this *is* an axiom, and there are pretty good reasons (that is, physical theories such as relativity with quite excellent experimental support) to believe that this *is not true* and in fact Causality (as expressed in actual laws of physics) is *time symmetric*, so that the only thing that gives time its arrow is *entropy*. Note that from a time-symmetric point of view it makes as much sense to argue that God is *now* causing Descartes to exist back *then*, causing him to assemble out of the dust of his grave into flesh aging backwards as film rewinds. I leave it as an exercise called "giving yourself a headache" to sit down and try to visualize God *causing* anything at all from *outside of time's stream*. Hmmm, kinda hard to work out the kinks, isn't it? To "cause" something in any sort of *human language sense* (as opposed to within the *mathematically expressed* laws of physics) it is all but impossible to separate out the concept of precedence, although in physics dealing with a much more symmetric view of time actually appears to be both necessary and remarkably straightforward[10].

- Causality is *ontologically* ordered. This one is just plain nutso – there isn't

[10]For physics and math groupies, contemplate either outgoing wave and incoming wave Green's Functions, or (my favorite) advanced and retarded Green's Functions and Dirac's truly marvelous paper on Radiation Reaction. Or write me for some even better references, e.g. Barut, McManus, Wheeler and Feynman. Or think about the Generalized Master Equation, whereby any *closed* quantum system is in a *stationary state* until it is split into a system plus a (stochastically described) bath.

a shred of evidence for it, nor is there any possibility of defining a proper ontological ordering. This is the axiom that Descartes invokes implicitly when arguing that his cause must be "greater than himself". What means this word, "greater"? The importance of Using Set Theory to begin to set up a system of rhetoric and reason is glaringly obvious. It requires mathematicians to expend quite a lot of energy just working out conditions for establishing the notions of "greater than" and "less than" in *ordinary arithmetic and the number lines*. In reasoning about discrete sets where *quantity* isn't relevant but rather *quality* is, one needs more or less one axiom per relationship established. For example, consider the set of fruit. Is an apple greater than a pear? How about a banana? What about *two* bananas – would you trade them for a fresh kumquat?

We now *have* axioms for something called "causality" in physics that works the way causality should, intuitively, work. There is no *greater than or less than* inherent in it – all interactions between all particles in the Universe are *equal* in greatness as regards *quality* of "cause" (the interaction) and differ only instantaneously and dynamically with regard to *quantity* of cause (the strength of the resulting force). Physicists don't look down on Gravity, for example, just because it is all wimpy and everything compared to the Strong Nuclear force.

- That the termination of an ontological chain of ever-greater causality must be *God*. I can certainly doubt this and assert that the Universe is manifestly (that is, empirically) self-sufficiently necessary and is its own Prime Cause, precisely as it stands. What you see is what you get. Nobody standing outside of time making things like four-dimensional Universes happen in *meta*-time. Nothing *sentient* about it, it just is. I'm not arguing for either one – merely pointing out that this is the *theistic* assertion and can be doubted so thoroughly that its opposite, the *atheistic* assertion can equally well, and equally irrationally, be considered a Prime Axiom. An atheist could *call* the Universe God if you like but it isn't the omniscient, omnibenevolent, truthful God of Descartes, it is more like a self-sufficient Machine lacking the one *essential* property of Deity, one possessed even by *evil* Gods, that of Sentience.

- There are then a large number of 'small' axioms implicit in the remainder of the argument. That God has created an *external reality* independent of you wherein you exist. That God has created more than *one* other being (you) in that reality so that *other people* exist. That what you see in this external reality *is* real, that when you look out at the stars they really are

> what they appear to be and not a complicated boundary condition on the electromagnetic and gravitational field just out there at the edge of the Solar System, which is in reality the Entire Universe[11]. That the past is pretty much like the present. That the future will be pretty much like the present. That inference and induction have some relevance to discussions of things like "God".

The argument is at best a *conditional* argument, then, which should come as no surprise at this point as all arguments are basically conditional upon the premises and axioms and reasoning method used. It is *further* flawed by its use of self-referential constructs – all questions about God that one attempts to answer via any sort of ontological condition are intrinsically self-referential as they require comparisons of a class that is, by definition, incomparable. Descartes most basic argument is that because he remembers (with his possibly false memory) that things within nature *appear* to have causes, that causality *itself* (as expressed in the laws of nature) must have a cause. This is applying set-theoretic rules not to objects within the sets but to the sets themselves *as* objects in the theory, looking for (quite literally) the set of all causes that are not in the set of things that are caused.

We have seen in fair detail that this makes the conclusion to this sort of reasoning null even *aside* from the conditional nature of his premises – it isn't just possibly correct or possibly incorrect, it is the class of reasoning that can lead to *undefined or null conclusions* – wrong at the level of a Gödellian knot.

It is Bullshit.

Note well that bullshit or not, Western Civilization is built on top of science which is built on top of Cartesian Rationalism. There is much of Descartes' arguments that one might *want* to adopt as part of your set of prime axioms, as long as in *fairness* you recognize that you can't prove them and that his *argument* in terms of God as a Prime Cause is interpretable at best as poetry or statement of faith, not as logic. It is perfectly reasonable to believe in God. It will never be rational.

[11]Prove that it isn't. You can't, can you. I mean that you *really* can't – Green's theorem in four dimensions says so, because $\int_S = \int_{S-\Omega} + \int_\Omega = \oint_{\partial(S-\Omega)} + \int_O mega$ where the latter results from integrating by parts to convert the exterior volume integral of some closed four-dimensional domain Ω into a surface integral over a consisten four-dimensional boundary condition. This is a fancy mathematical way of stating the same kind of thing I was saying in English when I asserted that I might have come into being (memories intact) a second ago and might disappear (memories disappearing with me) in a second or two where from the *inside* of my thread of existence I Could Not Tell.

13.2 Why Solipsism is Bullshit

Descartes asserted (as an axiom) that he could not doubt his own existence because to doubt implies a doubter. Everything else, the entire Universe itself, might exist only as a figment of my overheated dream-state imagination, a Matrix-like existence simulated for an audience of One, leaving him, like Pink Floyd's character in *The Wall*, wondering "Is there anybody out there?"

One possible answer is no.

It is well known in philosophy that this belief is *logically* unassailable. How can you prove me wrong? First of all, you are a figment of my overactive imagination, a bit of beef gone bad, as Scrooge might say, so only *I* can prove me wrong[12]

This (solipsism) is the worst of all possible Bullshit philosophy. It is the kind of thing that makes ordinary people think of philosophers as Jackasses (according to the previous definition). It was the sort of thing that Johnson was once cheered for "disproving" (not really, of course, but who cares) in open debate by banging on a table (where he should probably thumped his opponent's head, although that would only have proven that he was a masochist, not that he was wrong).

There ought to be something wrong with it but it appears invulnerable even as it is absurd. What is *really* wrong with it?

For one thing, it is not terribly easy to reconcile true solipsism with our experiences of the Universe, at least when those experiences include Pain or Pleasure. It might answer one question (what is the nature of the universe) by an axiomatic fiat consistent with your one real empirical observation – that you exist there is no doubt if you try to doubt it, but it is only an *axiom* when you assert that *only* you exist. An axiom that is very difficult to reconcile with a number of provisionally and conditionally observed facts without *more* axioms, this time about the diseased state of your own mind.

Take me for example (since I'm *certain* that I'm here and you might be figments of my imagination).

If I am the only thing that exists, and the Universe is My Oyster served on a figmental half-shell, then why cannot I be surrounded by beautiful houris who

[12] Just in case this is correct, I'm sitting here trying as hard as I can to think up a *huge* number of people who are going to appear to buy this book so I can convince myself that I'm getting *filthy rich* on the proceeds and can buy that imaginary yacht I've always been pretending to dream of. Righto. Works for me...

do nothing but peel me half-naked grapes (or peel me grapes, half-naked, better yet) at a whim? Why do I have to plod along typing this instead of just wishing the lines onto the page? You see, Solipsism *alone* isn't a sufficient axiom. I need more. I need axioms to explain why I sometimes hurt, why my eyes are gradually failing as I age, why I *age*, why *bad things happen to me.* Sometimes very bad indeed.

I also need axioms to explain why my perceptions of what is nearby are so limited, but my perceptions of what is going on thousands of miles away through the glass teat of a television tube are crystal clear, complex, different, and correspond perfectly to what I see when I visit Paris, the Parthenon, India. Why and how I manage to be some sort of *split personality.*

If all of this is a figment of "my" imagination, then I've successfully managed to split myself into at least two incredibly separate beings – the artist that is constantly making up the story that I find myself embedded in, and the audience (the "me" that is typing this on what appears to be a laptop computer obviously created by my artistic half). The watcher within that watches the watcher watching, so to speak. Since I *never perceive* the artist directly, how do I know that it is "me"?

Indeed, consider the artist further. I run computer simulations of physical models as some of the research that I do in physics. In these simulations, I "create" a virtual world of microscopic entities. Each is labelled with coordinates that specify the "'state" of my little mini-world. There are rules whereby they operate. Computer games played by my children are very similar, at a higher order. They hold a virtual terrain superimposed on their internal coordinates, and have many "sprite"-based components and characters. Those characters, objects, devices all have independent programmed personalities, probabilistic behaviors, an underlying "physics" of their interaction with each other and their surroundings, and a "plot" that unfolds as the game proceeds. I am not my computer models, the computer games are not my kids.

As they increase in complexity, to the point where a *whole world* is perfectly simulated with *perfect consistency*, the artist itself complexifies, its non-audience "self" splitting up among all the virtual selves it creates. If all of these (you who are reading this, and your dogs and cats too) are really part of the artist, and the artist is equated with the audience, then Solipsism is isomorphic to *Pantheism.* We are *all God*, split into all that is. Somehow a Western Solipsist (driven to explain why he cannot bring a loved one back to life no matter how hard he tries) ends up as an Eastern Hindu, accepting that Brahma split himself up to create the Universe (one fragment of which is him, all of which is still Brahma and eternal).

, but now you are wise and see the game I am playing with you. Axioms are neither true nor false, they just are. Premises, that is. Logically there are many ways to convert one into another, adding an axiom here, altering an idea there, ultimately dividing by the zero that is their informational content and proving whatever you like in conjunction with an undefined null set. Axiom sets *can* be inconsistent. Axiom sets can be *consistent* (or not), but they or the conclusions derived from them may not correspond to what we directly experience (and hence require special axioms to resolve the conflicts, which are then overcomplex and ugly).

So we see that Solipsism isn't logically provable. Sure, it isn't disprovable either (really) but *nothing* is provable or disprovable so that is irrelevant. What *is* (to me, and I hope to you) are *two things*. First of all, when somebody starts the Solipsism Game with you (where they assert that they are all that exists and dare you to disprove them) whack them upside the head – not too hard now – and cry out "Bullshit"[13]. Second of all, not disprovable or not, Solipsism is an *ugly* philosophy. We find people who live as if they were the center of all being ethically repugnant. We consider them to be narcissists, sociopaths, characterological people who want to be the center of all being and are hence incapable of love. We feel *sorry* for them, when we aren't being terribly angry at their immaturity (all children are born solipsists and departing from the philosophy is one of the main signs of the advent of real human maturity).

"Ugly?"

Isn't this a treatise on logic, on knowledge?

Yes, sort of. However, as you can plainly see, logic is *flawed and finite*. It can *never* provide knowledge on anything but a provisional basis. It only answers loaded, artificial questions. So we need to find a *practical* basis for choosing axioms, especially axioms that we eventually add onto the Obvious axioms that nobody sane doesn't really secretly believe[14].

Solipsism does have one very important virtue. Since it basically takes Descartes' argument and stops right after observing "I am" and before the point

[13]Or "Thus I refute you" if you want to emulate Johnson.

[14]Where I mean that literally, as disbelief in e.g. Descartes axioms above is a form of practical insanity that will (*I* firmly believe) leave you dead, first time you walk off the top of a building thinking that *this time* gravity might not work. *You* believe whatever you like, but try not to splatter all over my shoes...

where Descartes gets into trouble drawing *conclusions* from that empirical fact and (for better or worse) is *completely different* from there on, since it is impossible to *disprove* solipsism rationally, it serves as a lovely tool for helping folks to see that all the *other*, more sensible-seeming philosophies, are *also* Bullshit as they can't even logically refute a solipsist.

13.3 Why Science (Natural Philosophy) is Bullshit

Yes, in a section or three we'll get around to religion, and show how religion, especially organized religion, is *philosophical* Bullshit however useful or useless you might perceive of it to be from a socio-memetic or ethical point of view. However if I did religion right now I'd be accused of being a Godless Scientistic, and since I'm actually a *Godful* Scientist I figured I might as well smash my own dolly before smashing anybody else's.

So just what is this "Science" thing of which I'm about to speak? I'm so glad you asked.

Science should properly be called by its true name – *Natural Philosophy.* It is founded on the very simple idea that if you want to know how Nature works, to find the deepest possible answers to all of those Big Questions, the best way to proceed is *to ask it.* Metaphorically speaking, of course.

The asking and answering of questions in science has been reduced to a ritual. Although Real Science is, in fact, not always or even usually done in strict accord with it[15], the key step, the step of deciding what one is permitted to conclude, is known as the Scientific Method.

Nearly all students in the West are exposed to the Scientific Method in the form of questions on various quizzes and exams that ask silly things like "what are the steps of the Scientific Method" as if it is a recipe for knowledge like a recipe for chocolate cake[16]. In a nutshell, the Scientific Method is all about

[15] Sorry, but Real Science is often done using things like pure thought, dumb luck, random experimentation (the Monkey approach), serendipity, admixed with all kinds of social-interactive scientific-memetic exchanges and a certain amount of intellectual theft in the down-home rastiest genetic optimization process the world has ever seen, except maybe the one that evolved us and that is – marginally – more fun on a Saturday night. It goes *way beyond* just formulating hypotheses and trying to experimentally test them.

[16] This is often done in the unfortunate context of the Science Fair, also known as "the place where I had to come up with a truly mindless experiment about feeding chipmunks different brands of popcorn and learned that a) chipmunks *hate* popcorn, all brands, and b) science is *really boring and irrelevant* and strictly for nerds". If secondary school students built just *one*

formulating propositions (hypotheses), doing *empirical experiments* to test them on the basis of *data*, and then formulating conclusions drawn from the *data* by the process of *statistical inference* that might support the hypothesis, contradict the hypothesis, fail to resolve the hypothesis one way or another, lead to new hypotheses (and a new round of funding). They key terms here are *hypothesis, data, inference, conclusion* liberally interspersed with funding, publication, and paperwork.

Here are the axioms of Natural Philosophy:

- The Law of Causality. It is hard to formulate hypotheses about nature that answer questions like "do chipmunks like popcorn" without imagining that if they do or if they don't there must be some *reason* behind it. Reason and Cause are nearly synonymous in English, at least. Hmmmm. However, we make a number of assumptions *about* causality as well, such as:

- That Causality is temporally ordered. Sure, some physics experiments relax this, but the vast bulk of all science presumes that effects follow causes temporally. We don't generally view the premature death of chipmunks due to heart attack as causing the consumption of large amounts of saturated-fat drenched movie theater popcorn, nor do they die of a heart attack because they will (would have?) eventually eat(en) it.

- That Causality is describable by *Natural Laws* that are themselves effectively *invariant* over time. Note what an *incredible* act of intellectual hubris this is, and how *precisely opposed* it is to the notion of a whimsical God who routinely violates Natural Law with miracles of the second type (defined elsewhere in this book). It is, however, the basis for induction and inference.

- That those Natural Laws are expressable in a language that is *mathematical* in nature and hence inherit all sorts of logical and mathematical baggage from set theory, geometry, the calculus, functional analysis, statistics, and more, that is *far more precise* than the clumsy expressions possible in English, Latin, or any other social/human language. Even quantum phenomena that are (as far as we can measure) stochastic (probabilistic instead of deterministic) have mathematically determined probabilities.

Tesla coil capable of arcing lightning three feet out into the air of the room (frying computers for ten classrooms around and just *looking* as powerful and dangerous as it in fact is), you'd have them winning the Nobel prize in physics within a decade. Science *is* fun, and it should be *taught* as if it were fun. But I digress. Again.

- These are the basis of The Law of Induction. That the future will be pretty much like the past. If I drop ninety-nine pennies and each one falls, we *presume* that a) the hundredth penny we drop will fall; and b) there is a *reason* that it will fall, and that reason will persist into the indefinite future and that mathematics will describe its action in some quantitative way. Note that the Law of Induction is the *precise point* where Science becomes Bullshit, as one cannot prove the law of induction by induction – just because things always *have* apparently behaved in the future like they did in the past doesn't *prove* that they will in the future. Proof isn't the right word. However, it is certainly *reasonable to believe* this as long as one recognizes that it is a belief.

- Although it isn't quite a *strict* axiom, there is a distinct bias in favor of Natural Laws that are *simple* and *elegant* and *beautiful*. It isn't enough to just formulate *any old* hypothesis. Otherwise one can *always formulate* a Fairy Theory[17]. This may be a strictly anthropocentric requirement – we want the Laws of Nature to be things that we (as humans) can *understand*. At least in principle. Eventually. Maybe by some *really* bright humans, anyway, if not ourselves.

- The Laws of Nature are *consistent*. This is not a trivial axiom, thanks to Gödel. Choosing consistency may well be expected to cost us completeness. This is especially possible in the realm of quantum theory, as quantum theory forces us to give up the *classical* notion of completeness as one of its axioms right from the beginning. Cliche' or not, there may well be things that Man was Not Meant to Know, at least all at the same time.

These look a lot like Descartes' axioms, but without all the ontological mumbo-jumbo and fleshed out with the ideas of induction as a viable means to knowledge. On the basis of these (and still more, this list is just the highlights

[17]As I will describe below, a Fairy Hypothesis says something like "Invisible fairies whisper in the ears of chipmunks in a secret language and cause one chipmunk in three to love butter-soaked popcorn enough to leave their chipmunk-families and try to hop on the front fenders of popcorn trucks as they make their delivery rounds every morning, resulting in the observed carnage of chipmunks on the streets." Even if you design a perfectly beautiful experiment that catches on film movies of fat little popcorn-fed chipmunks jumping at the fenders of popcorn trucks and being squished, is it evidence of invisible fairies? Is it *really* evidence about the inner psychic state of the chipmunks at the instant they jump? Maybe they just suffer from self-esteem problems due to their un-chipmunkly portliness and want to End it All and choose the instrument of their unhappiness as the means.

and not exhaustive) axioms, scientists propose hypotheses leading to coherent, organized theories that are eventually validated by experiments[18].

By now you should know the drill as well as I do. On the basis of what *logic* should we believe in Causality and all the rest? No fair answering something irrational such as "because it works" because "working" is something that is validated using induction, and the logical validity of empirical induction cannot be logically proven by induction. Besides, empirical induction can be (and often has been, historically) *mistaken* – it is not a razor sharp knife, merely sharp "enough" to carve out, over time, a consistent picture of the laws of nature *as they are written by the Hand of God* on the blank page of the Universe for all to read who have the wit to do so, no need of a prophet's license or an accompanying Holy Scripture.

There is no *logical* reason to believe in Causality, Temporal Ordering, the validity of the Law of Induction. They are Bullshit, in the precise sense that we cannot prove them to be true, as they are things we have to *assume* so we *can* prove things to be (provisionally) true. I can certainly imagine them to be *false*, and some of them might even *be* false – there was a time when people wouldn't have admitted the possibility of probability, for example[19] and the issue is still, really, unresolved. Well, in truth, I personally have a hard time *actually* imagining e.g. the Law of Causality to be false but can *sort* of

[18]The word *validated* in Science has a funny meaning that has led to much confusion. To give you a hint, nothing is ever *proven* in science, and no good scientist is ever *certain* that any given theory is true, no matter how good the evidence. The proper way to view scientific "proof" is a state of *conditional belief*. That is, when I say "I believe that Newton's Theory of Gravitation is a proven fact" and is in fact a *Law* of Nature, what I *mean* is that "I believe that no reliable experiments have ever discovered Newton's Theory of Gravitation to be inconsistent with their results in at least the non-relativistic, non-quantum mechanical arena, where *many* such experiments with macroscopic gravitationally attracting bodies have been performed any one of which might be expected to egregiously fail were the Theory egregiously wrong, and with the understanding that I might have been lied to about those experiments, that experiments to determine whether or not antimatter gravitationally *repels* matter have not yet been done and that they (or the discovery with sufficiently accurate probes of a deviation from $1/r^2$ at short or intermediate or very long distances, or anything else one might thing of) might prove it one day to be wrong." Which we don't usually write all the way out because it is pretty long, and everybody who *paid attention* in their science classes instead of spending the time reading their favorite piece of scripture and praying for their teachers' souls *already knows it*.

Next thing you know, some numb-nut who obviously *was* such a student in their youth is claiming that the "Theory of Evolution" or the "Theory of Gravitation" are "only theories and not proven facts" so that other theories like the "God designed and build the human eye out of plasticine using his own strangely anthropomorphic eyeball as a model" theory should get equal time in the schools. *Right...*

[19]Einstein's famous "God does not play dice with the Universe", for example.

manage it by thinking of *apparently* ordered states embedded in an infinity of random configurations – a sort of a monkey-typing-Shakespeare sort of acausal Universe. Not too "likely"[20], sure, and it has a hard time dealing with my self-awareness, but given infinity to work with lots of unlikely things are possible and the Universe itself is nearly infinitely "unlikely" to be the precise way that it nevertheless is...[21]

Yet they *do* seem to self-consistently work. We thus find ourselves in a philosophical mire. We can ignore the axioms above, sneering that they are not provable and only one possible set of axioms out of a practical infinity of possibilities and hence are unlikely to be correct. However, *if* they turn out to be correct, one prediction they make is that ignoring them will result in my almost immediate demise as I try to eat my laptop as if it is a sandwich (crunching up all those arsenic-bearing IC's like popcorn) or walk out into traffic imagining that right *now* it is possible that the cars are soft and fluffy and that I've grown so hard and massive that the cars will bounce right off. People in fact do these things (usually after ingesting large amounts of hallucinogens) and certainly *appear* to die or at least get very badly injured when they do. When I've ignored the Laws of Science in the past (assuming that my memory is in fact real and the past I remember actually happened in some approximation) I've gotten *really badly hurt* myself and remember the pain. My *brainstem* remembers something of this pain and automatically compensates for my movement while I walk without falling down. Humans are apparently *programmed* to learn Laws of Nature – fire burns, falling hurts, disobeying parents causes bottom-swats – from pain and experience as anyone who has ever been a child or raised a child should well remember.

So for *no good reason* (if "good" is supposed to mean "rational") I *choose* to believe these *unprovable* axioms as my own Prime Axioms, Axioms with a capital A. Or perhaps for every *good* reason. Perhaps they are a statement that is true but unprovable, just like this book. Mind you, they aren't *enough* – I add

[20]In quotes to emphasize the fact that this word is basically meaningless without axioms that tell you how to compute probabilities and more axioms to tell you how to compute probabilities relevant to *anything concrete*. Russell made this mistake in *Problems in Philosophy* and I'd prefer not to repeat it, so once and for all, quotes or not, the word "likely" is always used in the same way I use "reasonable" – utterly unprovable and irrational, but somehow sensible for all of that. That's "probably" – eep – the way Russell meant it as well, but he should have said so, somewhere.

[21]One of my favorite mathematical paradoxes – imagine a dartboard and a dart with an infinitely sharp tip – a tip consisting of a single mathematical point. There are an infinite number of points on a dartboard, and when the dart is randomly thrown at the board the probability of hitting any particular one is therefore zero. Yet *some* point is hit – the probability of hitting the dartboard itself is unity. Hmmm, possibly the purest Zen koan imaginable.

a few more axioms that also seem to work, at least for me – but they are *most* of what is needed to provide me with what appears to be a basis for *conditional* knowledge of the Universe, which is as good as it gets.

13.4 Why Logical Positivism is Bullshit

I'm actually sort of fond of logical positivism (LP). In a way, a large portion of this entire work is devoted to a process that *sounds* like an enormous crowd chanting "L-P! L-P! All for none, and one for me!" Or worse, LP on steriods, LP with rabies, LP foaming at the mouth and writhing on the floor near your ankle, snapping at invisible flies.

Not exactly. You see, LP (taken at its face value and with its original and customary proposition) is an axiom that *cannot* be made consistent with *any* axiomatic system. For those who came in late or don't remember, LP appears to be the ultimate extension of Hume's empiricism; it incorporates the empirical process itself into the logical process of determining if any assertion is correct, any question is meaningful. It asserts that:

> A statement is meaningful if and only if it can be proved true or false, at least in principle, by means of the experience[22]

Because of the fairly obvious connections with the scientific process, LP is a favorite proposition in science classes (especially those on quantum theory, as LP is at the very root of certain interpretations of quantum mechanics and in fact was first stated at very much the same time that quantum theory was being invented and axiomatized). In science it is often expressed as the proposition that questions that cannot be empirically answered by means of a measurement or experiment *have no meaning*. Curiously, questions that are perfect reasonable ones in our classical experience such as "where is that baseball and how fast is it going" are by this criterion *meaningless* in quantum theory, where one isn't permitted to ask "where is that electron and how fast is it going". At least if you want a sensible answer.

The notion of *pseudoquestions* in the work above, things that might look like questions that can be answered, but really are just sounds, verbal constructs and their associated psychological perceptions that *resemble* questions grammatically, is clearly ripped off righteously from LP. There, however, the resemblance ends,

[22]The Internet Encyclopedia of Philosophy, http://www.utm.edu/research/iep/l/logpos.htm

particularly with respect to the question of meaning. Pseudoquestions are not *meaningless* – we all understand them perfectly well. This is the *fun* part – we *do* understand them but they *don't* have answers one can find by means of pure reason alone, and hence their answers will *always* be founded at some level on an unprovable belief, on an axiom.

But, but, but... you sputter[23].

Yes, there is a razor inside the apple, and it is foolish to take a bite. As we saw in the last chapter, any attempt to establish empirical "proof" as a standard of ultimate knowledge both requires dozens of unprovable axioms to establish the basis for empirical proof itself (I've only written down the most important ones above – there are plenty more, recalling that the mathematics required *alone* for Real Science has several distinct and quite large sets of axioms and definitions) and is inevitably self-referential and hence *by its own standard*, meaningless, as as I will now proceed to show.

Formal Proof that Logical Positivism is Wrong

- LP is the proposition (or can with little effort be formulated as either a proposition or question with identical semantic content) that propositions can be assigned meaning if and only if they can be proven by means of experience (at least in principle).

- Nothing can be proven by means of experience; all proofs based on experience require axioms to define what "proving" something on the basis of experience itself means, and the resulting use of the word proof is hence doubly conditional – conditional on one's accepting the unprovable (by experience or any other means) axioms and then conditional *again* on the basis of experimental evidence.

- LP itself (as a proposition) cannot be proven by means of experience, in principle or otherwise, beyond the admittedly highly meaningful proof of our own existence. Not only does "proof by experience" require axioms such as causality and inference to define "proof" by experience, but *no* possible experiment could prove LP to be correct any more than an experiment could prove the law of induction to be correct. It is an *axiom*, one of many possible, equally unprovable assertions of ways to determine truth, falsehood, or meaning[24].

[23] Or *should* be sputtering, that is. C'mon, now, give it a try.

[24] I might just as easily formulate as an alternative axiom that the only way to determine

- LP requires still more axioms to deal with ambiguities in just what the phrase "in principle" means in regard to experimental proof.[25], and *they* cannot be proven experientially or otherwise *either* without begging the question or loading the question.

- Therefore, LP is meaningless. I don't know what you mean when you say that meaning can only be ascertained by the possibility of an experiential proof as that statement has no possibility of an experiential proof.

- I understand perfectly well what you mean anyway. So not only is LP meaningless, LP is *incorrect* as well. It is an example of a statement that is unprovable but *wrong.*

This last conclusion is really quite obvious. LP is very lovely as long as you don't use it to define *meaning* in anything like the way it is used in English in everyday speech, but rather in a specialized sense, heavily dependent on axioms akin to those of not just science but quantum theory (that is, *difficult* science). Everyone who is (still) reading this understands perfectly well what a proposition like "God exists" means, at least as well as they understand the proposition "A star exists that is outside the event horizon of my own perception"[26]. *Neither* of which are *in principle* determinable by experiment.

Unfortunately, the problem with event horizons extends all the way back to *every event in space-time*[27]. In the strictest possible sense of physics, nothing can

whether or not a statement is meaningful is to see if I understand it, if it has any meaning to me, *whether or not* I can prove it by means of experience. Or that a statement only has meaning if it can be proven by a passage in the Bible. Or that *nothing* has meaning. Or that *everything,* all propositions, have meaning, if only as themselves. This is an axiom in the "unprovable assumption" sense because it is *not* the only possible criterion of meaning and indeed is a little bit of an odd one by the standards of the dictionary and the cognitive process itself.

[25]Is a question "meaningful" if it could *in principle* be answered by a suitable experiment or when it *is* answered by a suitable experiment? What about *classes* of experiment? Science is *all about beliefs* of what *will happen* in some future time based on observations of the past, yet one cannot use LP as a mechanism to prove that the future will be *like* the past even *in principle.* Without a lot more axioms, almost any nontrivial question becomes "meaningful" only after it is answered. This is simply nonsense – nobody uses the term "meaning" in that way. I can perfectly well understand questions such as "was Frodo a virgin when he left on the Quest of the Ring" that cannot, actually, be answered by experience even in principle. LP confuses the meaning of the word "debateable" with the meaning of the word "meaningful"' and gets them wrong either way.

[26]...and equally likely have a *very hard time* understanding why one cannot ask where an electron is and how fast is it going at the same instant in time to arbitrary precision. As I believe Feynman once is alleged to have said, "Nobody understands quantum mechanics..."

[27]For the non-physics-groupies out there, an "event" isn't something like a black-tie soiree;

be proven by experiments in physics save by interactions, and those interactions instantaneously exclude nearly all events that aren't on the light-cone of any given event. That is, not just the "things you can see", but the *things you are seeing*. LP applied *religiously* leads you straight back to Hume's far earlier conclusion – all you can *know* (if that kind of knowledge is the only definition of "meaning") is *what you are knowing* by means of your direct empirical sensory experience. Everything else is inferred, and hence meaningless. We're right back in the Pit.

There is one more extremely humorous argument against LP that I discovered indirectly reading one of the world's great unpublished books on probability theory and inference by Jaynes[28]. In this text Jaynes points out one of the differences between verbal reasoning and boolean logic with the following example:

- "Mr. A, to affirm his objectivity, says 'I believe what I see'."
- "Mr. B retorts: 'He doesn't see what he doesn't believe'."

These two statements are formally equivalent in logic, by the way, which is the point. They of course *mean* very different things, nearly opposite things.

What a beautiful example! When a Logical Positivist asserts that they only find meaning in what they can empirically validate, what they really mean is that they will deliberately *blind* themselves to *obvious* meaning in all cases where meaning exists but empirical validation is impossible. The Logical Positivist very clearly is confused as to the meaning of the word "meaningless" in English and common discourse. It is a synonym (not exact, of course, but more or less) of the word "inconceivable", and we've already poked a bit of fun at the too-free use of the term "inconceivable".

rather it is a single four-dimensional space-time point $(\vec{x}, t)$.

[28] Jaynes was a master of both quantum electrodynamics and statistical mechanics and in fact developed a model I studied and used myself in application to resonant optical systems. His "maximum entropy" approach to the generation of probabilities is, as you should recall from earlier chapters, in my opinion the *best* way to axiomatize the process of inference in *all of science* in part because it *works* to allow one to derive statistical mechanics and thermodynamics that (self-consistently) empirically works.

I am indeed fortunate to have a copy of his 1994 draft, and hope to see it published one day. Jaynes did not derive his results from a consideration of sets, which I think may have been a mistake in his analysis of *logic itself*, but otherwise his reasoning was transparent and quite lovely – he certainly clearly exposed his axioms (and pointed out the fallacies in many alternative sets of fallacies) as he went along. Jaynes makes precise what Russell rather sloppily referred to as "probable correctness" or "plausibility", which guides *real* human reasoning far more than the actual rules of logic.

Let's poke just a bit more. Inconceivable literally means that one cannot form the concept within one's mind. There are *many* ways that this could occur, of course. Also, they are all *personal* ways – empirical observation is technically limited to one empirical observer at a time, at one instant in space-time – *I* find meaning in what *I* can conceive. Finally, only some of these ways are related in any way to empirical evidence or observation, which is why Logical Positivism is just plain wrong.

For example, when I hear somebody speaking Chinese it is *meaningless* to me, literally *inconceivable* to my own personal mind.

By this point you, dear reader, should easily be able to understand all of the reasoning above and even figure it out for yourself. The sad truth of the matter is that *nothing* can be *proven* by means of experience, as Hume observed about *two hundred years* before LP was invented. This, of course, means that making a proof by experience the heart of your philosophy *as if* it could then lead to some insight about the real world is a really, really bad idea, unless you're doing it as some sort of cruel practical joke on generations of students and Academic Deans, or are a bored philosopher down the hall from some quantum theorists and want to have some fun stealing their *practical* concepts, stripping off all the unwritten axioms, and putting forth the result as something new and different in "philosophy"...(which is what I rather think is what happened).

As usual, Hume's result is perpetually and eternally *forgotten* by every school of philosophy that has erupted since his time. If it weren't forgotten, there would be no new schools of philosophy, of course – we *could* just accept the notion that we don't really "know" anything but that which we are perceiving *now* and *can't* really know anything but what we are perceiving *now* plus whatever we *choose* to infer on the basis of our personal axioms, and spend our philosophical energies constructively in looking for a set of axioms we can all agree upon, in living with them, in playing all sorts of games inferred and deduced from them, *without* the impossible burden of having to "prove" them right.

Of course, it's hard to blame poor Craig, poor Carnap, et. al. for LP, or to blame all the *rest* of the philosophers from the eighteenth century on who have tried to sweep Hume quietly under the rug. Philosophers have to eat too, after all. Still, it is the hope and intent of this work that once people come to really *understand* Hume and the Bullshit Nature of Rational Philosophy, they can start working on an *axiomatic* philosophy where we can replace the impossible notions of *logical necessity, proof,* and *completeness* with notions that really *are* derived from and akin to the axioms of science: *degree of belief, consistency* and *esthetic* *sensibility.*

Empirical proof, even the wishy-washy kind permitted by the "at least in principle" in the definition of LP above is ultimately founded in the *metaphysical* propositions known as the Axiom of Causality and all the rest. By connecting empiricism with knowledge, we conclude that we know Nothing.

Well hell, we already knew *that*...

On to more fun stuff about what we Don't Really Know.

13.5 Why the Ontological Proof of God's Existence is Bullshit

OK, I've stomped on science and empirical theories of meaning and found the former quite irrational and the latter meaningless, which was all great fun. The anti-scientists have doubtless been chortling and rubbing their hands together as I bash all the nasty things given as *reasons* that their personal religion made no sense.

Time to balance the equation. Religion and magic and miracle (and human experiences of all of the above) are actually *not* exempt from the stomping – if anything, they tend to be even deeper – piles of you-know-what *from the point of view of being rational.* Note carefully that I make no statement at all about whether or not they are *reasonable* or whether an intelligent person might or might not have faith in a Deity much as they might have faith in the Laws of Physics. I will *make* such a statement, but later, only later.

Religion itself is way too big to be adequately whacked on with just a few little subsections – it gets a chapter of its very own elsewhere. Here we'll stick to picking on certain *specific* arguments advanced in what might be called *rational* religion – attempts to prove the existence of God as a logically necessary thing, for example, or to argue that science itself should lead one to conclude that God Exists on the same foundation that it leads one to conclude that Gravitation Exists.

We'll begin by drowning a baby kitten, as supposedly "rational" proofs go – the Ontological Proof for God's existence attributed to Saint Anselm. Saint Anselm wishes to convince a fool who can understand the *idea* of God as a being greater than which cannot be conceived that disbelief in God is *logically inconsistent* with their understanding. He *attempts* to do this using premises that are axioms of the "self-evident" sort – axioms that cannot sanely be questions as being obvious truth.

Of course they are nothing at the kind.

Let's go over the argument itself in very rapid summary. Then we'll go over the usual objections to it, as they're fairly humorous in and of themselves. Then we'll crush it without mercy.

1. Let us suppose that you (the "fool", by implication the rational fool who understands the idea of God but refuses to believe in God, sorry) *understand* the concept of God as a being that is the greatest possible being. By this you have to *understand* that it is not possible to conceive of a being greater than God.
2. (The idea of) God thus "exists in your understanding".
3. You can conceive of this being existing in reality, that is, not just in your understanding. If you can understand the *idea* of God, you can imagine that God Exists outside of *just* your understanding.
4. But (hang onto your logical hats, folks) something that *exists in reality* is *greater than* something that just exists in your understanding. Therefore either you *couldn't* really conceive of the idea of God in your understanding (a possibility that doesn't seem to have occurred to Saint Anselm or most of his critics but that seems pretty reasonable to me) or...
5. God must exist in reality, because a God that exists in reality is greater than one that exists only in your understanding and God is the greatest thing you can conceive of.

I'll now pause for an ellipsis for you to go to the refrigerator and get a cold beer to clear your head...

Fine.

Let's see, counterargument. First of all, let me note that most traditional counterarguments lose enough of the game that they fail to convince a rabid St. Anselmite. That is because there are a slew of premises and axioms buried in this argument that are by no means self-evident, but if you try to address the argument itself instead of the premises you've already half lost. So perhaps his argument *might* convince – a fool.

Let's give an utterly simple counterargument that actually is logically quite sound.

1. Suppose that God does not exist and in fact is a contradictory concept in reality, just as "infinity" is not, actually (in reality) a number because it does not obey the same rules of arithmetic and logic as the other numbers. This possibility has to be admitted or else the argument above begs the question[29].

2. Let us suppose that you *think* you understand the of God as a being that is the greatest possible being. By this you have to *understand* that it is not possible to conceive of a being greater than God, just as one *understands* that it is not possible to conceive of a number greater than infinity[30].

3. However, it is not possible to actually conceive of contradictory concepts in reality – they are inconceivable. So in fact, one really is a *fool* this time as one is simply *wrong*.

This latter argument doesn't disprove God's existence (remember the initial conditional statement). It simply shows that there isn't anything contradictory about God *not* existing *and* a fool being able to conceive of something that he thinks of as God. The fool could simply be mistaken.

This is really a fairly powerful argument. After all, if there is no God in reality, then our imagination of God isn't going to "make" there be one! And in case an St. Anselmite out there wants to challenge the metaphor of infinity and claim that it actually is a number that exists (just a *different* kind of, um, *bigger* number) permit me to say that *no* number exists outside of our imagination! Numbers aren't externally real, dummy, they are an entirely semantic construction that exists only inside the mind. Show me "the number one" out there in nature. Catch one in a "number trap".

My *favorite* imbecilic counterargument (one that gives up far too much, for all its good intentions) is the following:

1. Let us suppose that you (still the fool, sorry – I hope you don't mind...) *understand* the concept of a Vampyre as the worst possible bloodsucking undead being that could ever be conceived

[29] Which it does, of course. Duh...

[30] Except, of course, that not only are there at least two kinds of infinity, with one "greater than" the other and both infinitly great, but through many quirks of mathematics many of the "fool's" intuitions about infinity are just plain wrong. For example, one might think that there are "more" (a larger infinity of) rational numbers than there are of integers (think about it). One would be wrong. Think about it some more.

2. (The idea of) Vampyre thus "exists in your understanding".
3. You can conceive of this Vampyre existing in reality, that is, not just in your understanding. If you can understand the *idea* of Vampyre, you can imagine that the Vampyre exists outside of *just* your understanding.
4. But gee, a Vampyre that *exists in reality* is *worse than* (more evil than) something that just exists in your understanding, incapable of giving a single living being a single undead bite. Therefore either you *couldn't* really conceive of the idea of Vampyre in your understanding or...
5. The Vampyre must exist in reality, because a Vampyre that exists in reality is Eviller than one that exists only in your understanding and Vampyre is the Evillest bloodsucking undead thing you can conceive of.

This attempts to convince the St. Anselmite of the absurdity of the argument by counterexample, but of course it fails because the St. Anselmite considers the theoretical limit in "greatness" to be accessible (by God) but that you cannot, in fact, imagine the greatest (worst) possible Vampyre because no matter how wicked or more horrifying and bloodthirsty a Vampyre you imagine there can always be a wickeder one imagined (and eventually portrayed in yet another Ann Rice novel). Limits such as these (they say) do not converge to something *inside* the set of all things that exist *except* in the case of God.

Needless to say, to normal human beings (especially those with some mathematical talent) this is completely absurd. It is akin to saying that if you apply an inductive process of successively adding one to any finite number you can imagine to create a greater one, the limit of this process reaches ∞ in the $+x$ "good" direction – where ∞ is considered to be a number in spite of the fact that $\infty + \infty = \infty$ where for all *actual* nonzero numbers (no matter how large) $x + x = 2x \neq x$. However, in the $-x$ direction, sorry, the limit point is *outside* of the set of numbers – $-\infty$ doesn't actually exist.

You can make variants of this argument that apply it to anything you like. Books, coffee tables, bottles of fine wine, sex godpersons of whatever gender you prefer. No matter *what* X you can imagine, you can at least *claim* to imagine the greatest possible X (I spend a fair bit of time contemplating the greatest possible sex goddess, for example). In all cases, greatness in real existence of a sex goddess is clearly superior to greatness in imagination. Furthermore, greatness in real existence of a sex goddess who has made herself my humble slave is better still!

So where *is* she? Why isn't a bottle of the *finest wine* at my elbow, why aren't my feet propped up on the most *perfect coffee table*? Ontology clearly demands that all conceivable superlatives be real just as I imagined them but on steroids, right?

A big pile of cow-flop, that's what this is. Actually, the *biggest conceivable pile of cow-flop!* Now *that's* ontology!

Still, because of the focus in both of these counterexamples is on the *argument* instead of the premises and structure, the argument (in any given real philosophical forum) invariably ends in a *draw*. The kind of "draw" that exists only in bad western movies and in children's back yards, that is. A crackle of caps simulating gunfire, and then the eternal: "I shot you first." "Did not." "Did too." "Did not." with neither side ever conceding defeat and with *both* sides utterly irrational as they both embrace a prior, unstated and utterly indefensible premise the question itself can be meaningfully *addressed* with logic *either way*.

Let's try to do better still.

At this point it is pretty *easy*. Let us simplify this argument and reduce it to the following two statements:

1. God is the greatest thing that can be referred to in a proposition like this one.

2. Real things are greater than things merely stated in propositions.

Therefore God exists as a real thing, Q.E.D. This strongly resembles:

1. This statement is truer than any other statement that has ever been proposed.

2. Real truths are truer than statements that are merely true propositions.

Therefore the first statement is true! In fact, it is the truthiest truth that has ever been stated!

Not. What is this "truer" of which I speak? All true statements are *equally* true – a thing is true or it isn't[31]. Both statements are simply self-referential assertions where *neither* statement is *correct* however much they assert otherwise.

A light dawns. The Ontological argument is a Gödelian knot! With a boatload of unwritten premises (describing what the simple term "greater than"

[31] If we're being sticklers for logic and laws of thought here, and if we're not why are we playing with syllogisms in the first place?

means takes a fair amount of work in pure mathematics, which is *vastly easier* than it is in the case of deiological enquiry). Premises or knot[32], we should *expect* problems with consistency or completeness from arguments of this type *independent* of the underlying premises.

Ultimately, there is something almost creepy about the ontological argument – it smacks of "magic" dressed up as logic. Saint Anselm was effectively claiming that merely stating something (or "understanding" it or "imagining" it) could somehow make it real, if only we could imagine a superlative attribute such that real existence is greater than nonexistence in the space of the attribute. The creepiness is our mind unconsciously and intuitively recognizing a Gödelian knot when it sees one and blowing a juicy raspberry.

St. Anselm was sadly mistaken. No, we cannot lift ourselves up on *logical* bootstraps to a knowledge of God, any more than we can lift ourselves up on *real* bootstraps down here on the level of the mundane. As anyone older than roughly three years of age knows, the sensory stream they identify as "reality" is not precisely the same as the one they call "the imagination", and tantrums in the one gets you no more than wishful thinking does in the other[33].

There are many more ways to attack the argument. Yes, we can imagine God any way we like, and as we are doing it God exists in our imaginations, but there *may well be no* "reality" outside of our imaginations for God to exist in – we certainly cannot prove *rationally* that there is one however profoundly we may believe that there is. Again Saint Anselm's "proof" fails, as his assertion that a thing that exists in reality is greater than a thing that exists only in your imagination is clearly incorrect if there *is* no reality outside of your imagination. Whatever you *believe* here, you are left without anything like *rational certainty.*

Or, if you prefer, take the "understanding" of God by the fool. A Logical Positivist would argue that in fact the statement "God exists" has no *rationally provable* meaning unless we can imagine empirically proving that God exists by means of some experiment. As Hume pointed out very convincingly, we *cannot* prove the existence of an external omnipotent omniscient omnipresent God by *any* experiment – we are limited in our experiments in space and time to the finite reach of our senses in finite time, and any finite quantity vanishes in comparison to the Infinite. We can no more measure God by experiment than we can measure the volume of infinite space with a teaspoon, infinite time with a single turn of an hourglass. Arguments about whether an infinite God exists are no more

[32]Sorry. I'm a bad, bad man.

[33]Or as my mother liked to say, "If wishes were horses then beggers would ride..."

meaningful than the question "is the Universe infinite" to a Logical Positivist. That is, both are *totally meaningless*. Whatever you think about the arbitrary axiomatic basis for Logical Positivism, that's a far cry from rationally proven as clearly alternative assumptions for "meaning" exist that – however consistent or inconsistent they may be – nullify the argument.

Of course this too is Bullshit, as is the whole discussion. Axioms, axioms, everywhere, and not a fool can think – at least not "rationally" – without them. The absolute truth of the matter is that we can certainly try to conceive of God. We can try to conceive of infinity. In both cases that which we try to imagine is beyond the reaches of our immediate perceptions, even those perceptions of our own thoughts and sensory input – they are doggedly concrete, and finite, and real (however fancifully so).

You, of course, must draw your own conclusions, but I feel justified in saying that *this* fool, at least, does *not* fully understand either one. Noting carefully that while I'm not the world's greatest expert on infinity, I *can* and *have* done quite a bit of algebra and calculus involving infinite sums, infinite limits, the need to carefully take ordered limits *because* infinity is more of an operational description of limit taking than it is an idea. So I'm far from being a math-averse dummy as far as infinity is concerned as well. In the case of both God and the Infinite, my imaginings, as part of my overall perceptions, have *no logically necessary connection* with any presumed Reality except that those *perceptions themselves* exist – in my mind as I'm perceiving them – without doubt.

Here's a bit of pure personal opinion, unbuttressed by anything like a *rational* argument however much you may or may not find it *reasonable* in an undemanding and intuitive sort of way. If we are to find God in the Universe, there is quite literally only one place to look. That is the only place we *can* look, the "place" where we *see*.

Western Philosophy (and religion) has only tried half-heartedly to look there, being distracted by scripture and political power and concern with the external world. That place is at the core of *our own* being, the spot where the *experience* of reality is undeniably *happening* in a way that is *beyond all logic*[34].

[34]This isn't to pick on the West. The East does a better job of looking there, but they do just as bad a job at getting hung up on scripture and politics and human beings and other bullshit. This is with the notable exception of Zen, which would attempt to teach you *precisely the same conclusions* as this entire book by reciting just the right Gödelian koan to you as a perfect haiku and then, while you are still in a logically stunned state, whacking you with a banana. Unfortunately, I couldn't get the publishers of this book to distribute it with a banana so you could whack yourself. Fortunately, they are readily available at any supermarket and are even

Note that I do not *attempt* to rationally prove this.

Nevertheless, if you (dear reader) actually exist, and are reading these words in a continuous perception of light, and touch, and sound, and taste, and smell, and are thinking about them, and hold them in your mind, *you exist* as you are experiencing your existence, your thoughts, your *total Universe* at every instant of the *now*.

This is beyond all need for rational proof, as you will readily see the first time you are whacked in the head by an overripe banana so that the pulp oozes down into your face and makes you look and feel all silly and not at all the person you have carefully clothed yourself in flesh and possessions to be and – for an instant – *precisely centers you* in the here and now of your own existence, naked even of your body.

Where you go from there is literally up to you.

13.6 Why the Intelligent Design "Theory" is Bullshit

So we see that the Ontological argument for the existence of God is nonsense, a fact that you doubtless *intuitively* appreciated on your way to the fridge for a cold one (or possibly a banana), trying to get the buzzing about greatness and existence out of your ears. It is time to turn to another favorite argument for the existence of God – that of Intelligent Design (ID), a.k.a. the teleological argument for God.

ID is the (metaphorical) hydra of all God-arguments. Its head has been cut off by science and reason ninety-nine times but it just grows back and tries to bite you in the ass all over again.

On the one hand, I'm sympathetic. It is perfectly *reasonable* to believe in God based on the miracle of existence, even if one *does* restrict one's knowledge of existence to the moment you are existing and no more. Anything, every moment of our lives, is miraculous without exception as you meditate upon μ.

Besides, Science is Bullshit, if your standard of *non*-Bullshit is something

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cheap. So at your convenience, please get a slightly overripe banana, and while puzzling over Gödel's theorem and improveable axioms and the Pit of Existential Despair, whack yourself on the head with it (or get a loved one to do it for you from behind your back – it is better if you don't know exactly when you're going to get whacked on the head by a banana in Life) hard enough that the pulp squishes and oozes down onto your face. It won't hurt, and the exercise isn't at all silly. I promise, you will then be Enlightened. As soon as you stop laughing.

that can be rationally proven, so the hydra's *mythical* heads are cut of with a *mythical* sword. The fact of the matter is that logic cannot answer the question *either way*, so the fact that there is a disagreement indicates that there is a disagreement about the *axioms* upon which the arguments are based either way. Both are conditionally valid according to the axiom sets of the arguers. Neither can be unconditionally proven.

So why all the fuss?

It is because proponents of ID utilize a subtle perversion of the axioms of science themselves to arrive at their conclusions. They wish their conclusions to be advanced as a *scientific theory*, not as a result of pure logic. They claim that there is *empirical evidence* for the existence of Go-, um, oops, they try not to use the "God word" because then ID would become a *religion* and not something to be taught in science class – so let's say "an Intelligent Designer" and let those good old Capital Letters say it all. They're perfectly content for that designer to be space aliens from an advanced civilization *or* God, especially if *you're* the one who then goes "gee, given a choice between E.T. and God, what to choose, what to choose..." and (of course) makes the "right" choice.

To me this is the silliest thing imaginable. First of all, as we shall see, I used the word perversion *deliberately*. There is *no* scientific basis or empirical basis for the conclusion that there is an intelligent designer based on the evidence (usually evolutionary evidence) that they cite, at least none that would ever under any circumstances convince an unbiased scientific observer, and to get to where they can conclude that there is, they play fast and loose with silly things like the supposed difference between a "theory" and a "fact". As I clearly explained, there *are no scientific facts*. Scientists use the word "fact" to mean "an assertion that is so thoroughly borne out empirically that their degree of conditional belief hovers around nine-nines or better" as in "it is a fact that this penny will fall if it is dropped" because of their firm belief in Newton's *Theory* of Gravitation.

Second, they ignore the *essential* point to focus on an almost irrelevant set of details. The essential point is that *there is a Universe at all* not *any* particular detail of that Universe. We undeniably exist. We are (while we are exist*ing*, in present tense, as an immediate empirical experience) *not-*μ*!* Given this *miraculous truth*, they need to focus on crap about watches in the desert and the eye? Screw that. Time for the ol' banana, but a boatload of bananas won't suffice to Enlighten the unprepared mind. As long as they cling to their scriptural preconceptions about God, as long as they cannot free themselves from a need to clothe their arguments in the moth-eaten trappings of Science (which has its *own* set of rational problems and limitations to deal with) they will continue to be an annoyance to both scientist and philosopher alike.

Let's review the argument in very simple form, since it is pretty mindless.

You are walking in the (metaphorical) desert and encounter a watch. It is a nice little watch – Mickey's hands with their paint still fresh and unchipped, the band unfaded by the merciless desert sun[35]. It is even ticking away.

Can you be forgiven for looking around to see if the buzzard-pecked corpse of some poor human is lying nearby, possibly shot in a drug deal gone bad and driven out into the desert to be dumped[36]? Is it not the most natural thing, now that you've found the watch, to assume that there must have been a *watchmaker*? One with abominable taste, no doubt – watchbands should never be that particular shade of mauve – but whence a watch without a watchmaker?

So (the argument continues) look then at the human eye (or pretty much any structure in living beings at any phylogenetic level) and you'll find natural structures that make the watch look like the cheap piece of badly engineered crap that it is. Whence an eye without an eyemaker?

Time to line up the usual suspects. Lessee, we are assuming without doubt the law of causality, temporal ordering, and so on. Yep, the axioms of science and Cartesian rationalism, as they are so ably demonstrated at least three times every week on CSI (Crime Scene Investigations in this city or that). This must be CSI Los Angeles, and a team will doubtless appear momentarily to take the watch and run various forensic tests on it.

So whence an eyemaker?

First of all, we inherit a bullshit conclusion along with the (pseudo)science of their argument, so "bullshit" is a completely justified conclusion regardless. But this is a Bullshit Conclusion even *within* science. Why?

Because Science doesn't assign global models of causality without being able to fill in and test the *details* of the hypothesis, the theory. This is an example of a *Fairy Hypothesis* by which I do *not* mean that the proponents of ID are all gay, but rather that there is *no difference* between asserting ID under these circumstances and that every human eye is assembled in the womb by invisible fairies that guide and put every single molecule in just the right place to build an eventual human. They are wise fairies, and they hold in their little fairy hands an exact blueprint for the finished product. Sometimes they get all confused

[35]You can see that I'm a repressed writer of fictional prose, right?
[36]See?

and use the wrong blueprints or two different sets of blueprints and the result is unfortunate, but usually they manage to carry all those amino acids to just the right places and tack them in place with molecular glue.

Urk, you (should) say. Why fairies? Why intelligent agents? Aren't the *natural action* of *intermolecular forces* good enough to describe that process of growth? No, I answer. Look how *complex* the eye is. Expecting an eye to "just assemble itself" in a sea of component molecules is like expecting a watch to assemble itself out of a bucket of watch parts, like expecting Shakespeare to emerge from the random meanderings of crazed monkeys banging on antique typewriters! There must be intelligence or all the molecules would never *naturally* get to just the right places. Random chance alone could *never do it*.

This little parable should suffice to show the essential emptiness of their argument because the *eye gets built* in the womb where we can "watch"[37] it take place and understand it as it happens. Random chance does *not* do it, according to science. It is a random process, sure, but the randomness is *structured* by underlying biochemistry (or more deeply, by biophysics) that follows *simple* rules to produce *complex* structures. The "fairies" of intelligent construction are replaced by the "forces" of nature, that somehow "know what to do" and do it without direct intelligent intervention.

Now *I personally* think that this is equally miraculous – perhaps even more miraculous than invisible fairies floating around in my guts or my wife's womb, and certainly more ethically understandable. I cannot sensibly blame blind chemical interactions for the cancer I get when my cellular biochemstry breaks down with age, but I could certainly blame intelligent fairies for being *evil* if they choose to kill me off with a long drawn out cancer.

This exposes a second flaw in the argument. Most of the ID proponents who accidentally find themselves reading this book and who haven't long ago burned it and run off to pray themselves free from the Sin of reading it are probably going "no, but we don't argue about the assembly, only the design". I, of course, focussed *deliberately* on the assembly, since the whole point of the *watch* is that we infer a *watchmaker*, not a watch *designer*. Maybe Disney licensed the watch design from Timex. Maybe we could reframe the whole metaphor around a statue of a bull instead of a watch, and cleanly split the inferential argument for who designed the bull that was the model from the inferential argument for who was the sculptor who carved the statue.

The point is, that based on the *complexity* of the watch compared to the

[37]Sorry, I just can't help it.

surrounding desert, we imagine (correctly) that it has a very unlikely design. However the *assembly* of a complex object out of component parts is just as unlikely as the *design process* whereby it became complex, at least until we see it in action unattended by any directing intelligence. The single greatest flaw in the ID argument is that it has as an unstated premise the axiom that only intelligence has the capability of creating things that are very unlikely. Subject to the usual scientific axioms, this is just not true. Mathematics, physics, chemistry, biochemstry, psychology – we learn over and over again of processes that can spontaneously self-organize into complex structures, and we have long since learned and experimentally validated *the* model which almost certainly put the damn watch into the desert, the model of Evolution.

Evolution is amazing. If the ID folks weren't all hung up on trying to salvage Christianity from the ruin of its mythology (which is their fairly transparent agenda, after all) they could perfectly reasonably argue thus: I *believe* that God exists, not as a rational conclusion beyond all doubt or some sort of scientific argument but because *I exist* as an *experiential existential truth*, and that's a *miracle*. Evolution is a miracle. The laws of physics are a miracle[38]. Every watch, or eye, that exists is a friggin' miracle because it self-assembled out of *stardust*, some of which came together in just the right way to stand up and walk around and eventually sit down and type these words, seeing them with stardust eyes and peering occasionally at a stardust watch to see if it is time for bed yet as it writes.

ID as a pseudoscientific conclusion is based on a complete lack of understanding of infinity and likelihood and science itself. Frame it as a scientific hypothesis – invisible fairies created life according to an intelligent design. Now how would we prove this to be true? What experiments could we perform? The fairies are invisible, so we have *in our hypothesis* excluded one whole class of experiment we might have done – finding the fairies themselves and asking them and accepting the fact that (as intelligent beings) they might lie. So we are left with indirect evidence. What evidence *do* we have for the way life developed?

Well, there are these *fossils*. In fact there are *two kinds of fossils* – the ones in the ground, frozen in a temporal strata that can be dated with reasonable accuracy in a variety of ways that are in reasonable agreement, where "reasonable" means "reasonable according to the axioms of science and the accepted

[38]Note well that I'm not asserting that these miracles "must have been performed by God". Personally, I think that evolution, physics and the Universe *is* God, and that our hands and eyes are God's hands and eyes. Nope, can't prove it. Can't prove the Law of Gravitation or that the scientific method is "correct", either, but I tend to believe in them too...

conclusions of the scientific process" in many disciplines. In addition, there are the fossils in our genes – the fossil DNA that is buried inside our chromosomes, which is a *different kind* of temporal record.

Both, when one looks at them, tell a *consistent* and *compelling* tale of *evolution* – a process of gradual refinement of design, with occasional bursts of rapid change primarily around times that the ecosystem is stressed by little things like teraton-of-TNT-equivalent falling asteroids. A *model* of evolution as a genetic optimization process involving mutation, genetic interchange between individuals and natural selection works in the computer laboratory, on the mathematician's note pad, and in the halls of our hospitals and the pigsties of our farms well enough to *completely explain* the emergence of antibiotic-resistant strains of diseases, *new* diseases with unique new DNA patterns all their own, soot colored moths in England (that blend in with the soot colored walls for camoflage) post the industrial revolution where before that revolution they were white, and lists of potential direct mail targets that are several times more like to buy a credit card when contacted than an individual selected at random.

That is, *evolution models work* to produce new things and to optimize old ones. They work by taking relatively small steps in lots of random directions and efficiently sharing (by crossover and exchange during selective reproduction by survivors in a stressed environment) the *information* in their genes. Evolution works in the marketplace. Evolution works in society – this book discusses socio-memetic evolution of religions themselves as one of its themes. Evolution works in science and engineering and computer design – new ideas are built out of old ideas and shared, successful designs are propagated and old designs abandoned to "death" when they become obsolete.

There is *no doubt* that evolution works (aside from the usual healthy conditional truth doubt that any scientist has about even evidence they can see with their own eyes and so on). It is as much of a *fact* in its own mileau as the Law of Gravitation is in physics.

Fairies could of course be present and the prime cause of *anything at all* (including evolution and the effect of the Law of Gravitation) but as long as they make it behave like

$$\boldsymbol{F}_{12} = -\frac{Gm_1m_2}{r^2}\hat{r}$$

we will have to rely on *other axioms than just experiment* to reject the Fairy hypothesis in favor of Gravity.

The argument of ID boils down to: Gee, the eye is *really complex* (an observation we can all provisionally accept, why not). It could never have come about by chance (an absolutely unproven and unprovable statement – a pure assertion, axiom of the highest order). It must therefore have been engineered (another axiom – it isn't clear that "engineering" in the sense of ID is the only alternative to "random chance"). *We* (the ID supporters) can never prove the ID hypothesis, but *you* (the supporters of evolution and science) cannot prove that it false, either (true enough, since science can't prove *anything* true or false, but irrelevant since science has long since created an overwhelming degree of conditional belief that their argument is *silly)!*

The argument of science is: Gee, nature is *really complex* and got that way before there *was* any such thing as engineering – it was quite complex thirteen billion years ago at the very beginning of its current cycle. From what we can infer from many observations, some of its most mysterious complexity was built right into its initial conditions and determined by the first few seconds of the Universe's *existence*. To arrive at this conclusion we extrapolated the *empirical* conclusions of many experiments to get a fairly accurate (we believe) picture of just what went on as the degenerate unified field broke its symmetry and formed nucleons and electrons and atoms and eventually molecules. Anyone is welcome to review those experiments and arguments and they can easily be duplicated.

Further series of observations on the develoment of life from the fossil and geological record paint an amazingly detailed picture of a process of evolution through flawed reproduction with natural selection. Much of the evidence can be viewed in any large metropolitan museum and is presented nearly every week on various television channels – there are no secrets and the arguments are consistent and well-supported. These experiments and observations strongly suggest that all the complexity we see today in the physical, chemical, and biological worlds is inherited from those initial conditions and some relatively *simple* microscopic interactions!

We, as proper scientists, can never *prove* any of this, but we can *damn sure* assign it a very high degree of conditional belief because we can *fill in all the steps* from the beginning to the now with *understandable processes* that can be *independently verified* by suitable experiments and which *consistently* lead to a practical and functional understanding of the world we live in. Steps along that road are constantly challenged (in an evolutionary process, actually) and only ones that *consistently* are verified experimentally continue to be believed as scientists overall value truth more than they value any given hyptothesis, even their own.

See the difference?

We see that at its heart, this is a *religious* dispute, not a *scientific* dispute. It is in fact not credible to assert that complex objects can only arise from ID, from active hands pushing little blocks into reasoned places. Every snowflake that falls is empirical evidence to the contrary unless you want to assert that their beautiful and staggeringly complex forms are assembled by Fairies.

Nor is it credible to assert that the evolutionary record *requires* ID as a *necessary step* to explain gaps or sudden changes – computer modelling of genetic optimization processes and sampling theory are more than adequate to explain both phenomena. It is fairer to ask the following question – if we did *not* have scriptural reasons to believe in not only God, but a particular *vision* of God, one that makes Men out of Clay with his own Hands, would we ever, ever, ever interpret the fossil record, the genetic record, the words written (in at least a poetic sense) by the *real* hand of God upon the stuff of the world for all to read who have the wit to do so, as evidence of fairy watchmakers sitting around designing eyes and the appendix and nipples on men and bodies that age and die and animals that are in a constant war for survival where the winner (as the "fittest") takes all as far as mating and passing on their genetic complement is concerned?

The answer is a quiet, unassuming *no way in this or any other Universe!* The fossil light from the stars is billions of years old. Positing intelligent designers *less* than God (say, space aliens) leaves you with a problem in logical recursion – where did *they* come from? The saying "Ontogeny recaptitulates philogeny", while perhaps not an absolute truth, works amazingly well all the way down at the level of the DNA of all living creatures. The fossil record is inevitably incomplete but where it exists it is amazingly consistent. *Every single thing* that is credibly examined using the axioms of science the *right* way leads one to conclude that the current scientific picture of the history of the Universe and evolution of species is in general correct, however possible it is that it is erroneous in small specific details. ID is just another religion, based in a fairly heavy handed and obvious way on discredited scripture, and as is the case with all religions, it relies heavily on a single Gödelian axiom – "This axiom set is correct, and all other axiom sets must give way before it."

This *may* be appropriate to teach *as* a religious view in some appropriate venue. It is *dark evil* to suggest that it be taught as "science" in our schools.

13.7 Why Religious Scripture is (without exception) Bullshit

13.8 Why Life, Liberty and Pursuit of Happiness is Bullshit

13.9 Proof by Silliness: Fairy Philosophy

Part III

Axioms

Chapter 14

Meta-Axioms

A meta-axiom is an axiom *about* an axiom, of course. It is like an axiom of set theory where set theory is the *basis* for arithmetic, or geometry, or the sorting of fruit.

However, this is *not* (as I keep pointing out) a work on mathematics or even logic per se, it is a work on the axiomatic basis of philosophical knowledge to help us dig our way *out* of the Pit of Existential Despair that we find ourselves in as we realize that we know *nothing* certainly, beyond all doubt.

Nothing, that is, but the instantaneous fact of our awareness.

However, *Hume himself* (as the Father of this sort of empirical skepticism) was the first one to admit that nobody can live in a state of perpetual doubt. Being a solipsist may be *logically unassaible* but that doesn't mean that it isn't *stupid* all the same, as has been demonstrated both in Eastern Koan and by Johnson's fist thumping on the table[1].

So do not expect to find in this chapter anything like an argument that the meta-axioms presented below are *inevitable truth*. They are not. They are merely wisdom. Wisdom is itself a possibly loaded term, so let me be specific. Wisdom in the sense that if you think about it, *anything* that you choose to believe is chosen on some sort of grounds. What are those grounds? They are basically a kind of intuition, one that is (accepting things at face value, seeing the world just as it is, accepting without question the flow of space and time that our watcher within sees through the differential process of sensory input and memory) doubtless linked in all sorts of ways to the way we evolved (as

[1] And by my own Zen contribution to mankind's wisdom, the squashed banana dribbling down from your scalp to your mouth, leaving behind a kind of slimy trail.

creatures that don't accept this without question tend not to survive for very long), to the very *experience* of self-awareness in what appears to be a body that needs to be fed, and cared for, and that can experience great pleasure or horrible pain.

Wisdom, not knowledge, is what at least some of the *Eastern* religious philosophies are all about, specifically Zen. Only in a state of great personal clarity and self-awareness is it possible to use your intuition to judge axiom sets fairly and see if they "work" for the world that you see (at that time) most clearly.

The following are a partial list of the meta-axioms *I* would suggest that you use in your daily lives to guide your choice of prime axioms and your judgement of the axioms of others. None of them are really knowledge, few of them involve anything like logic. Some of them are almost as anti-logical as they can get! However, for all of that, maybe there is just a hint of self-evident truth about them. Or, if you prefer, self-consistency. I'm hoping that they merely state to you in clear terms that which, when you think about it, you already "know" without knowing or caring how or why you know it.

I urge you to give these meta-axioms a try; start to use them as the basis of questioning your own personal beliefs and axioms. This process may prove so uncomfortable you blind your inner eye and return to a state of absolute adherence to one of the old sets (likely the one you were raised with). Or you may find it exhilarating and liberating – for the first time you may find yourself actually *understanding* your own beliefs; why you believe what you believe, what the *consequences* of your beliefs are.

You may find, for the very first time ever, that *consistency* of your belief set becomes important to you, rather than practicing the sort of spiritual schizophrenia experienced by many Christians, Moslems, and Jews, for example, when trying to reconcile "irrefutable" scientific evidence that the Universe is 13 billion years old or thereabouts and that we all evolved on this planet over roughly a billion years with, say, Genesis as supposely unquestionable truth.

Let us therefore begin with perhaps the most important meta-axiom – one this whole article has been working towards:

14.1 The Axiom of Open-Mindedness

This work in some measure is intended to open up this world to you, dear reader. If you have read carefully, you at this point should realize that there are things that look like questions but aren't. I can write "Is there a God?" and it looks like a question, but this question cannot be answered in any way that can be "proven" correct. Any answer you like can only be asserted with *no possibility of proof either way!*

This leaves you with a bit of a dilemma, doesn't it? Should you or shouldn't you decide (as an act of deliberate, irrational will) to believe in God? This question is at least framed in the right *order* – God first, then religion – instead of the wrong way – religion first, shaping God to fit – but we know *a priori* that we cannot rationally defend either answer.

One approach is to assume that the answer is yes, and see how the worldview that you derive from the assumption (together with other assumptions – axioms – you add along the way) works out. Then assume that it is no and repeat the process. Then just see which system you *like* the most.

That's right. I'm not going to ask you to adopt *any* particular set of axioms as "obviously right" as I have no idea on earth which set are "right" in the sense of absolute truth myself. In fact, I don't think that any set is "obviously" right – quite the contrary. I think that judging right and wrong is the ultimate piece of the bootstrapping of self-awareness and is both difficult and subtle.

This still leaves you with the problem of deciding what you *like*, and with the possibly deeper issue of facing up to the fact that you *can never logically know* that your choice is absolutely correct.

An honest acceptance of this fact means that you have *no moral ground* for imposing *your* choice on others except insofar as it factors into a social contract. Social contracts are discussed elsewhere below – they don't require any particular belief set to implement, they only require that all of the participants agree as an act of will to participate. Ultimately, they are enforced by the Law of the Jungle and brute force, but if the participants are of good will and keep the contract practical and focussed they can make enforcement largely unnecessary.

This can be framed as an axiom:

> **The Axiom of Open Mindedness**
>
> All axiomatic systems with any degree of complexity are likely self-referential, incomplete and inconsistent (including this one, as this axiom just referred to itself). I will therefore provisionally reject all Axioms or sets of Axioms (but this one) that claim completeness, overtly refer to themselves, or are explicitly and obviously inconsistent.

The provisional part is needed because (as all good jigsaw puzzle or crossword puzzle doers know) one sometimes has to try different pieces in different places to get things write. Sometimes an inconsistency occurs when you try a new piece because a lot of the *existing* pieces are wrong but the piece being tried is right; the only way to find out is to rearrange a bit and try it anyway.

This is a lovely axiom. It asserts that I Don't Know The Answer, and that You Don't Know The Answer EITHER so Give It All A Rest. I might, possibly, adopt an axiom you propose because it is appealing. I will NEVER adopt an axiom you propose because it "has to be correct". It doesn't. It is an *irrational assumption* we make as the basis for further consideration using reason and logic. That's what the word means.

It also is an *anti* axiom, an *axiom killer*. For one thing, it is the exact opposite of the Prime Axiom of scriptural religion. It *rejects* the notion that *any* scripture or human writing or physics textbook or argument is "true without question" or "obviously true" or "self-evidently true". If anything, it is self-evidently true that *nothing* is self-evidently true, a statement that is an obvious Gödelian knot and yet, somehow so very obviously *correct* if we leave out of consideration only a *few* things – the self-evident truth of our own existence, the self-evident truth of this statement in application to *logical axioms*.

If we don't agree on our axioms before we start any discussion on e.g. religion or politics, we are as silly as a plane geometer trying to convince a curved-space geometer that the theorems of plane geometry are correct, as silly as those plane geometers were in arguing that curve space geometry was a kind of *blasphemy* as there cannot be more than one set of self-evident axioms, and so constricting themselves to a narrower universe of reason.

Theorems true in one space are *perfectly reasonably* false in another and vice versa, and there is no *absolute* where space *must* be curved or flat – both are just what they are. They are just "geometries" derived from differing but similar sets of axioms. If this is true in mathematics, how much *truer* must it be in human affairs. We cannot even begin our business of judging axiom sets without agreeing that all axioms are on the table, all options need to be explored.

So I *urge* you to start this process of self-exploration by *opening your mind*. Whatever you've been taught, be it Christianity, Islam, Atheism, Cartesian Rationalism, Communism, or Any-Other-ism (belief) is *not necessarily true or false*, it is *not necessarily right or wrong*. Make yourself into a child again, free from any preconceptions about how the Universe and God "have to be".

Only then you can try *looking yourself* to consider the possible answers and choose the answer that works *for you*, instead of *being told* an answer, or forced by law and social custom into an answer, that may well not be correct or even *consistent*, by *somebody else.* Quite possibly the invisible, historical *dead hand* of somebody else who lived *long ago, far away, and in a different culture.* How silly is that?

14.2 Shaving the Barber with the Razor of Ockham

This section is obviously incomplete, but when it is complete it will talk about how Ockham's Razor – the notion that when presented with a choice of axioms or laws, or explanations, it is wise to choose the one that is the *simplest*, the one that requires the *least* fixing up with new axioms to make them consistent. Note very carefully that I said *wise*, not *correct.* Ockham's Razor can be wrong, and shave the true away as easily as the false.

Ockham's Razor is at its best when it is perceived of, and applied as, an *esthetic principle* instead of an axiom. As such, it can be a powerful tool to use in our search for an axiom set we can *wisely* live with. When presented with two competing alternative axiom sets, knowing that we cannot *prove* either one right or wrong by definition, we can nevertheless choose to believe the one that is simpler, more consistent, sparser, because it is *prettier.*

As such, Ockham's Razor is an *essential* component of both natural science and physics and of latter day scientific pseudophilosophies like Logical Positivism. After all, if you add enough exceptions, if you create a complex enough reality, you can explain *anything* in a way no Logical Positivist can ever empirically refute.

Those complex realities (the "it's God's will" variety of explanation for whatever you like) can only be rejected on *esthetic* ground. Would God create a Universe that required the breaking of its own laws in order for miracles to occur? Well, maybe (Berkeley would say so as the Church requires miracles outside of natural law) but then again, maybe *not* – C. S. Lewis seemed to think not as he put God's word's in Aslan's mouth declaring that He would not break the laws that He made.

Somehow Ockham's Razor ends up being as important as the axiom of causality in determining what we believe in Physics, Chemistry, and many empirical sciences. It isn't enough to construct a theory, we need to construct a *beautiful* theory, one that is *simple* and yet powerful. Why should this be? Why should nature be simple? We can't even say why nature should be at *all* and now we're imposing a constraint of simpliticity and esthetic beauty on it?

Yes we are, and no we can't prove why we do it (and note that it can lead us to make mistakes!) but still, we do it anyway and are proud of it. Or we *should* be proud of it. If you are a human who believes in the Axioms of Religion (for all of their apparent flaws) it is likely because of an esthetic principle – the *beauty and simplicity* of a Universe under God. And it *is* beautiful, and simple, to so believe. The problem comes when locking into the *rest* of the Standard Axioms of religion.

What, precisely, about Hell is esthetic? Or simple? Note that when I even *try* to pick a fight with religion, it is best framed in these very terms – the concept of Hell isn't wrong because I can prove it wrong, it isn't wrong because it couldn't be right (if we live in a Universe with an all powerful, all sadistic God), it is wrong because *I* find the notion of an Omnipotent deity casting a living soul into a state of eternal pain and torture *ugly!* Ugly and inconsistent. To make it consistent, still more properties have be added to to justify this sort of incredible behavior (that we would consider to be outright Evil were we to apply a similar standard to, say, our own children) make it more Ugly still.

Ockham's Razor is a lovely meta-axiom, but as you can see we are already extending it beyond its immediate purvue. Somehow the term esthetics and an associated judgement has crept into the discussion. It seems sensible to go *beyond* the Razor and craft an up-front meta-axiom associated with esthetics itself.

14.3 The Esthetic Principle

Arguments presented in the sections above clearly demonstrate that we cannot *prove* that any given set of axioms is superior to another. Neither do we have any *a priori* basis for judging axioms, certainly not for axioms intended to apply to other axioms or to metaphysics in general. Metaphysical reasoning is an oxymoron. Our meta-axioms must then a) provide a basis for judging axioms that is descriptive, not absolute; b) be "appealing" enough that you, the reader, decide to adopt them even though they can't be proven and are in the end absolutely arbitrary.

Lacking logical necessity, absolute truth, or any other of the bullshit categorizations of "knowledge" we are left only with one of the oldest criteria, one that preceded the scientific revolution, one that in some senses preceded the entire intellectual and philosophical revolution that accompanied the emergence of man from his evolutionary roots. We have esthetics. Axioms can be adopted for no reason other than that they appeal to you, that you "like" them, that *from* the axioms you adopt a world-view *does* emerge from logic and reason that *works*. Axioms that satisfy this sort of criterion *are* the basis of all modern physics and indeed modern science – beautiful laws that actually appear to describe the world around us, always provisionally accepted to the extent that they work, always with Ockham and an absolutely subjective conceptualization of "mathematical beauty and precision" attendent upon the process of their conception and testing.

14.4 The Axiom of Romance

Bearing in mind that there can never be anything like rational certainty in one's belief system, only choices that work more or less well for you as a unique individual experiencing the eternal now of your sensory stream and awareness, with that experience illuminated by a mix of your apparent memories of the past and axiomatic extrapolation of that past into a memory of a continuously unfolding future, there is an extension of the esthetic principle expounded above that I offer up for your consideration. That is the principle of *romance*. I am not referring to romance in the sense of sexual (romantic) love, I am referring to the sense of wonder that accompanies, or can accompany if you permit it, every moment of the adventure of your life.

The Axiom of Romance, as I see it, is poised between the Axiom of Esthetics and the Axiom of Deity, which is precisely where I've put it! When you hung, poised, above the Pit of Existential Despair much earlier in this treatise, the thing that was horrible and almost unthinkable about that position wasn't so much that the foundations of knowledge itself were turning out to be every bit as solid as the Emperor's New Clothes as it was the realization that if we can know nothing for certain, if even the Axiom of Causality itself is just an assumption, then our life seems of a sudden to have no *purpose*.

Life without purpose, life as a cosmic accident in an uncaring Universe (even a causal one), an experience of life that emerges from nothingness like a slowly growing flame, burns brightly for a time, and then gutters out slowly or is blown out in an instant is somehow horrible, unthinkable. It is not just that we live only for an instant and then die (at least in terms of geological times as best as we can deduce them from the many axioms above) it is that our life *did not matter*. The Universe itself is here only for an instant, an eyeblink against the frightening expanse of Eternity as we intuitively perceive it. One day all that is will not be, and even the memory of its existence itself will one day perish, so why bother?

Here is where the utter freedom of one's choice of axioms can liberate one from the utter despair of this line of thinking, from the selfishness and self-orientation on the now that it encourages, from the misery of a life in spent in existential crises. There is no reason to believe in anything, to be sure. However, there is *equally* well no reason *not* to believe in something. They are both equally irrational, but the former is more than a bit *silly* nevertheless, just as is actually acting as if the Universe were not a causal place is silly.

I therefore *choose* to believe that the Universe is *not* a purposeless place. Nor do I choose to believe that it is even a wholly mechanical place, one where miracles cannot happen, where there is no greater degree of organization than that which appears in our simple analyses of nature via the laws of physics, chemistry, and biology that we have deduced. Even within the context of science, such a belief is not inconsistent. The theory of evolution clearly shows us how structure can emerge and self-refine in any sufficiently complex system, and what we learn from reasoning with axioms and mathematics is that *anything can happen*, that the Universe we appear to perceive with our senses could well be a *tiny corner* of all that Is, a place that might well have absolute unbreakable rules (the laws of nature) but that is nonetheless manipulable in the dynamics of a far larger and more complex space by a dynamic intelligence that could have evolved there. Eternity is a long time, after all, and there is a lot of room in infinite space even restricted to the handful of dimensions we indirectly perceive through our sensory stream.

This, then, is the Axiom of Romance. I choose to believe that all things have purpose, that there really is adventure and meaning to be found I believe that love, compassion, behaving in a way that is "good" as opposed to "evil" are all real and expressions of that purpose, things that can potentially enrich every moment of life just as despair and purposelessness and selfishness and evil can poison it. I believe that our lives *matter*. Can I prove it? No. Is it truly inconsistent with the axioms above? In no way, especially give the incredibly limited window through which we experience the apparent external reality. There is room for infinite embeddings of the reality we perceive in higher order realities (as discussed in a lovely braided chain in *Gödel, Escher and Bach* by Hofstader) and that isn't even the *only* possibility. Maybe my beliefs are true, maybe they are false, but regardless, they are *unprovable* by rational means by anything less than complete perception of all that is.

This leads me to the last meta-axiom I wish to discuss. This is perhaps the most controversial of the personal axioms. Some will reject it out of hand (utterly irrationally). Some will insist on it (along with a large dose of memetic baggage that isn't just irrational but unlikely to be consistent or correct). Still others will state the truth, which is that they don't know if it is true or not, but that is *equally* pointless as an observation as that is just as true of the Axiom of Causality which doubtless they adopt. You have free choice here as anywhere, of course, but it seems pointless to assert that this means that you should not choose...

14.5 The Axiom of Deity

This is at least *one* possible extension of the Axiom of Romance, the Axiom of Causality, the Axiom of Esthetics, and so on. One can choose to believe in God (irrationally). One can choose to believe that there is no God (irrationally). One can choose to believe that we don't know if there is or isn't a God (true but pointless). These are the only choices that seem to be available, at least before one starts to modify one's irrational selection with equally arbitrary *attributes* of the Deity one may or may not choose to believe in.

What to do?

I cannot say what *you* should do, but I personally choose to believe in Deity, as a direct extension of the Axiom of Romance. Indeed, it is the Axiom of Romance and something more, an empirical thing. The one thing that I cannot deny is the reality of *my own existence* because it is what I am *experiencing* at every instant of my awareness. Decartes logical extrapolation of Deity on the basis of this single undoubtable fact was invalid logically, of course – no better than asserting "God exists" or "God does not exist" since no empirical evidence could ever suffice to validate the hypothesis to *any being but God!*

This leads us to consider a puzzle. What would existence *be* to Deity. Surely we would not consider pure mechanism, a Universe with no awareness whatsoever that worked like clockwork only, to be alive at all, let alone Deity. No, to the Selves that Are our sensory stream of perception and reason, the clockwork itself is at best inferred, the existential reality is the awareness itself. Deity, to me at least, must be that *romantic ideal* of *Self awareness.*

This, in turn, leads us back to the Laws of Thought, to set theory and all the rest. We introduced the concept of μ, of no-thing, as a placeholder for *nonexistence itself* as a *contradiction* of a Universal set, of that which exists. Existence and non-existence cannot *co*-exist, they are the ultimately mutually exclusive alternatives.

This leads us to an interesting syllogism, the one that is perhaps the absolute heart of Zen enlightenment, the whole point of the problem of One Hand Clapping and all the rest. In the instant of my awareness of Self, whatever and however and whoever that Self might be, *existence is* and hence non-existence is *not*. Deity, as I *perceive* it, is that existence itself. God is that which Is, which *must be perceived to be* as without the perception one cannot infer anything at all in a Universe that is known *empirically*. There is no *time*, no *space*, no *cause*, no *structure*, no *life* in non-existence, there is nothing at all – μ cannot exist in the presence of *any thing* on *both* an empirical *and* on a rational basis.

Thus an interesting, romantic *truth* that is the core of my belief system, one that supercedes even the *miracle* of apparently living in an apparently causal Universe, is the ongoing observation of Not-μ that characterizes my awareness, a state that I equate with Deity on purely romantic grounds.

Mind you, I do not ascribe any particular properties or characteristics to that Deity except on the basis of romance. We cannot know God by means of science, we cannot know God by means of the idiots that the world has called "prophets" (who generally got nearly everything wrong according to most of the axioms that underlie *my* system of beliefs, at any rate). We know God only at the core of our instantaneous awareness of Self, an awareness that must be shared by God. Consequently the impulses that arise from that awareness, the choices that the cusp of Self guides one to, the romantic overlay of compassion and purpose that the Light Within gives to a life – they can none of them be proven, but they do serve to make *my* life a far richer experience than one of mere clockwork.

Chapter 15

You “Are” Your Axioms

We’ve all heard the saying, “you are what you eat”. What you may not realize is that this saying applies just as well to the *axioms* you’ve “eaten” all the years of your life. Let’s begin with a little metaphor.

Suzy lives in a city. Every breath she breathes is laced with particulates: factory smoke, powdered asbestos from all of the cars’ brakes, dust, car exhaust. The food she eats is loaded with sodium and nitrites and fat, the meat comes from animals that are routinely fed antibiotics and hormones that bring about premature menarche in her and cause boys in her class to have low sperm counts. Suzy has no choice; she is only eleven years old and lives with her parents. Her parents have little choice about living in the city, as they make a living there. Still, by the time Suzy grows up she’ll have small but permanent damage to her lungs and other organs, and maybe the seeds of cancer in some of her damaged cells.

Tommy lives in the country. The air is fresh but he breathes in huge quantities of pollen and mildew spores. His house (unknown to his parents) has dangerous levels of radon gas. The family garden is surrounded by treated landscape timbers and he gets a steady dose of heavy metal poisoning from his daily salad. His father regularly doses the garden with malathion and sevin dust to keep off the bugs, and naturally they eat a bunch of that as well. By the time Tommy grows up he’ll have just as much damage as Suzy, maybe more.

In *neither case* do Suzy or Tommy have any clue that they are breathing in and eating death as well as life with every breath and bite. Neither do their parents – or rather, to the extent that they do have a clue that this is happening they don’t care as it is beyond their control and the benefit (breathing, eating) exceeds the risk (dying eventually of causes that may or may not have anything to do with the damage they experienced from the environmental toxins in their lives). It's just the way people live, and we'll all die eventually anyway.

Consider instead the *axioms* that Suzy and Tommy and Raj and Maryam and Yin and Saul are fed from the moment they open their eyes. These axioms are the *memes* of the culture in which each of these kids live and are brought up.

Suzy is fed raw Catholicism – an unhealthy dose of guilt for things she's never done but is nevertheless blamed for by God (obsession with original sin); a perception that as a woman she is inferior to men as men were made directly and first by God, it was Eve (made from Adam's rib) who took the fruit, and consequently women cannot be priests or stand as close to God as men can. She is taught that if she lives a good life *by the precise definition of the church* then when she dies she will go to "heaven", which is just like here but you can have fun all the time and never are hurt, and otherwise she will very likely be sent to "hell", which is sort of like the inside of an active volcano, and you burn alive for eternity without ever actually dying so that the pain can stop.

Suzy is taught that non-Catholics (even other Christian non-Catholics) are "outsiders" and although it is rarely said openly, outsiders have at best a snowball's chance in – hell – of avoiding being sent there, unless they possibly knuckle under and acknowledge that Jesus is their King at the very last of last seconds in which case they get sent along with the other forgiven sinners to "purgatory", which is sort of like here but living in a housing complex where there is nothing to do but work and be miserable, but at least it isn't forever and eventually you get to go to heaven where you can work for the ones that got there right away because they were Catholic and Forgiven and Saints and the like.

Suzy is taught that the one thing You Must Never Do, the sin beyond all forgiveness, is to question the holy scriptures that lay all of this out with its lovely set of rules and regulations, benefits and punishments. She is taught that above all, the authority to decide what is and what isn't holy scripture and what are the current set of rules and what is and isn't are manifest eternal truth is carefully vested in a closed group of men (and only men) whose whole lives have been devoted to the preservation of the entire structure of these rules, their own power, her obedience, and more.

Suzy's church has special terms it applies to church members who openly question scripture – they are called "apostates", or "blasphemers", or "heretics", and the church has in the past been known to do their best to bring hell to earth in dealing with them, with things like torture, imprisonment, maiming, execution, and being burned alive just routine fare over dealt out to the apostates over the centuries. Even heathen were historically accorded (slightly) better treatment as they don't know any better. They were only burned alive and tortured if they were given a fair chance to convert and failed to; otherwise they were made into good Catholics and often as not given jobs working as slaves for better Catholics digging gold and plunder from their native lands.

There are significant benefits to membership in the church and compliance with its rules, and I don't mean to suggest in any way that the Catholic Church is itself evil. It is beyond mundane concepts of Good and Evil, as it is itself a complete set of memetic axioms that define a Superorganism, complete with mechanisms for defense, growth, reproduction, in competition with other similar Superorganisms. Suzy is but a single "cell" in the Superorganism that is the Catholic church – protected and nourished if she is a good cell, punished or expelled or even killed if she is a bad cell. As a good cell, Suzy gains the comfort of a personal relationship with a conceptualization of God, a tiny bit of freedom from the fear of death and pain (or at least a measure of the support and strength required to endure pain and face ultimate death), many celebrations and festivals, a place to marry and a place to bury.

The church does many good things for Suzy as well as for Suzy's community, even the non-Catholics, because many of its cells are just plain good people who never think too deeply about the core structure that holds the church together, about its defenses. Suzy is further blessed in that the church she is being raised in was never more open to change and question than it is today – it is even likely that in her lifetime the world will see woman priests, maybe even a woman as Pope, although that would require what amounts to a memetic revolution within the church itself and therefore is strongly opposed by the specialized human "white cells" that guard the purity of the church's memetic structure.

Tommy, however, is being raised a Baptist. This is sort of like a democratic version of Suzy's Catholic church, with no pope, with elections that go down all the way to the people who make up the church, with a whole lot of rules and rituals either thrown out or modified and simplified. Baptists are all apostates or heretics as far as Catholics are concerned (and of course vice versa) but both are Christian and they share a lot more memes than they differ on. Its not that both groups won't get into heaven, probably, it is more a question of which group will be in charge once they get there, as the Bible openly promises that the meek and compliant will become Kings and Queens in heaven. This is an interesting vision to hold in America, where there are no Kings and Queens at all (or if you prefer, where we are all *equally* Kings or Queens of our own selves and little more). Democratic or not, Tommy is taught that even though he might well be asked to go fight and die to preserve our democracy against Kings and Tyrants around the world, he must bow his knee to Jesus and acknowlege him his feudal King and Lord and do his liege duty to him by following the word of God as laid out in the Bible.

He is carefully taught that the world was created in seven days (all physical and scientific evidence to the contrary notwithstanding), that women are a form of chattel who exist to "obey" their father and eventual husband who is naturally King in his own household and a wee bit closer to God (just like the Catholics), and that the one sin beyond all sins is to question the Bible and all of the rules laid out therein, as that is to question the memetic/scriptural basis of the church itself. Shooting a man, sleeping with another man's wife, lying, cheating, stealing, even sleeping with another woman's husband or a sheep, all of these are forgiveable if you abase yourself before Jesus and pray forgiveness, but questioning Jesus himself or the rights of the Church to interpret the Bible for him is a one-way ticket to eternal fire.

Again, Tommy gains many benefits from his position as a cell in a Superorganism. He gets to see and play with his friends and neighbors in Sunday School, there are other social events, it is a place for marrying and burying and sometimes Tommy learns important moral lessons there that really do help him live a better life. It is a place where his parents can get a helping hand in time of need, and a place where they can donate help to others in need. Tommy, too, comes to learn of God there, even if his vision of God greatly resembles a sort of stern Santa Claus surrounded by clouds accompanied by a slightly effeminate man with long blond hair, blue eyes, and white robes with the coolest birthday ever. Of the Holy Spirit Tommy learns only a bit, that it can work some kind of magic and heal the sick and help you win the lottery if you ask it just right in a prayer.

Raj is being raised in a small village in India as the oldest son of a moderately well-off Brahmin. As such, he from an early age has been instructed in the rites and duties of Hinduism, and has been reading the Vedas, especially the Upanishads, when he isn't out playing hooky with his friends. He reads aloud from the Geeta, which is purportedly the conversation between Krishna (avatar of God in human form not unlike Christ) and Arjuna in the middle of a battle where Arjuna is about to mow down his cousins and their armies like sheep in a great war over just who gets to be King(s) of the World. He learns that cows are very sacred and that killing even for food is a very bad thing but that killing people who kill cows or who might want to kill you or killing to conquer a kingdom that is rightfully yours might well be exceptions to the above.

When Raj is in the right mood, he learns much more. Even though he is taught that there are many, many, many, many gods, three of them MAJOR gods (Brahma, Vishnu, Shiva), he is paradoxically also taught that there is but a single God, the principle of *brahman*, and that this God is not only in all things, it *is* all things, the underlying Unity from which all diversity springs. He is taught that his soul, his spirit, his *Atman* is a spark of this eternal and infinite consciousness, and hence cannot be created or destroyed. He is taught that his soul has cycled through many lives before this one, and that he has gradually been learning how to see and understand God. He is taught that *this* cycle he has a good chance to complete it and remerge with the infinite, as he has been born a Brahman, only one step down from God.

Raj is actually *not* taught that non-Hindus are doomed to anything quite like Christian hell or that Hindus attain anything quite like Christian heaven, rather that hell and heaven are right here on earth and are a natural part of the cycle of rebirth, so that a man might well experience both during each lifetime. His is a life already enmeshed in eternity, and there is therefore time for all souls to remerge with the infinite, there is no hurry. However, Raj is taught to defend his faith and to respect its scriptures with just as much zeal, bloody zeal if necessary, as Tommy.

He too benefits tremendously from his membership in a Superorganism. His religion (via his caste) utterly defines his place in society and the domains in which he can reasonably attain emminence and status. His particular caste is the highest caste and gets certain perquisites, and as always, it provides him with many festivals, wonderful stories, moral lessons, a place to be married or buried, and the rituals that provide us with the spiritual balance essential to a happy life.

Maryam similarly is dosed with the memes of the Superorganism/religion of Islam, Yin with Bhuddism (liberally laced with Zen and Taoist precepts), Saul with Orthodox Judaism. Islam and Judaism are equally vehement about defense of scripture; both place strong restrictions on its members and require significant sacrifices of individuality, but these sacrifices serve to strengthen the memetic structure of the Superorganism and fend off change. They also serve well to defend the Superorganisms against the significant threats from the stronger and larger Superorganisms, all of which are always seeking to absorb new cells by "converting" humans so that they adopt the new memetic beliefs. One group's apostate is another group's convert – humans are in a manner of speaking the “food” of religious superorganisms.

It is hopefully rather obvious that *all* of these children are being fed large doses of *axioms* (for most of the most fundamental memes of all churches *are* axioms, in particular the axiom set outlined above for religions in general) along with their daily Post-Toasties or equivalent. In *no* case are the children permitted, let alone encouraged, to question the axioms they are being fed. Raj has no more chance of becoming Christian than Tommy does of becoming Hindu, barring a chance encounter with the “predator cells” of a religious Superorganism (generally missionaries or itinerant priests) who attempt to exploit surpressed dissatisfaction with one memetic set by replacing it with another.

There is *no reason* for *anyone* to believe that one of these axiom/memetic sets is, in fact, correct. All of them are presented as being the divinely inspired work of good men (and a very few women). All of them “document” miracles done by their gods, their saints, their angels, even their daemons (miracles are the standard works of “magic” that are required to establish Godhood or the higher touched-by-divinity grades of Sainthood). All of them contain a moral code; in fact, within tweaks pretty much the *same* moral code once one leaves off the parts that involve specific religious rituals. Killing one’s neighbor, screwing one’s neighbor or his wife or a hapless sheep, stealing from one’s neighbor (all presumed to be members of the same Superorganismic faith) are all verboten, with special exceptions granted to and by the priesthood. Failing to follow the religious rituals, attacking the religion itself, or being of another faith are all common bases for exception, in some cases to the extent of being open invitations to rape, pillage and burn as long is it is the heathen you’re raping, pillaging, and burning.

In *no case* (certain advanced levels of Hinduism and certain ecumenical movements in the other religions aside) are individuals *ever encouraged* to examine their own personal axioms or especially the axioms of their religion to see if they make any sort of sense, to see if they even are consistent. On the contrary, each faith has specialized individuals whose sole reason for existence appears to be preventing precisely this from ever happening. They are the white blood cells of the body of the Superorganism, and the defend that body by expelling any sort of “cancer” with whatever degree of violence appears necessary. Weak religions that lacked these defences have literally been wiped out by stronger religions that had them, so *no* successful religion (with the possible exception of Bhuddism, although Bhuddism is not, properly speaking, a religion and I’d hate to put even Bhuddism to the sword to the extent required for a full test) lacks them.

This is, I think, a terrible shame. We live in an age of democracy and personal responsibility. The decision of just what axioms we wish to live by is the most important single decision an individual makes in their lifetime, as it shapes that whole lifetime. People are drawn, in a very natural way, towards God, but a single look at any of the world's *religions* suffice to convince one that they are as a general rule *clueless* about God. They are all about scripture and memetic structure supporting the Superorganism; God as a subject of actual unbiased study is beyond them.

15.1 The Axiom of Open-Mindedness

This work in some measure is intended to open up this world to you, the reader. If you have read carefully, you at this point should realize that there are things that look like questions but aren't. I can write "Is there a God?" and it looks like a question, but this question cannot be answered in any way that can be "proven" correct, an answer can only be asserted with *no possibility of proof either way!*

The best thing to do is likely to assume that the answer is yes, and see how the worldview that you derive from the assumption (together with other assumptions – axioms – you add along the way) works out. Then assume that it is no and repeat the process. Then just see which system you *like* the most. That's right. I'm not going to ask you to adopt *any* particular set of axioms as "obviously right" as I have no idea on earth which set are "right" in the sense of absolute truth myself. In fact, I don't think that any set is "obviously" right – quite the contrary.

One of the first things one has to do to decide what you like, to be able to judge, is to come up with a few meta-axioms, axioms to help you comparatively evaluate axiom sets. These are henceforth presented in a list with no particular order. I urge you to give these axioms a try; start to use them as the basis of questioning your own personal beliefs and axioms. This process may prove so uncomfortable you blind your inner eye and return to a state of absolute adherence to one of the old sets (likely the one you were raised with). Or you may find it exhilarating and liberating – for the first time you may find yourself actually *understanding* your own beliefs; why you believe what you believe, what the *consequences* of your beliefs are. You may find, for the very first time ever, that *consistency* of your belief set becomes important to you, rather than practicing the sort of spiritual schizophrenia experienced by many Christians, Moslems, and

Jews, for example, when trying to reconcile “irrefutable” scientific evidence that the Universe is 13 billion years old or thereabouts and that we all evolved on this planet over roughly a billion years with Genesis.

Let us therefore begin with perhaps the most important meta-axiom – one this whole article has been working towards:

> **The Axiom of Open Mindedness:** All axiomatic systems with any degree of complexity are likely self-referential, incomplete and inconsistent (including this one, as this axiom just referred to itself). I will therefore provisionally reject all Axioms or sets of Axioms (but this one) that claim completeness, overtly refer to themselves, or are explicitly and obviously inconsistent.

The provisional part is because (like any good jigsaw puzzle or crossword puzzle) one sometimes has to try different pieces in different places because an inconsistency *could* occur because a lot of the *existing* pieces are wrong, but the piece being tried is right.

This is a lovely axiom. It asserts that I Don’t Know The Answer, and that You Don’t Know The Answer EITHER so give it all a rest. I might, possibly, adopt an axiom you propose because it is appealing. I will NEVER adopt an axiom you propose because it “has to be correct”. It doesn’t. It is an *irrational assumption* we make as the basis for further consideration using reason and logic. That’s what the word means.

It also means that if we don’t agree on our axioms before we start any discussion on e.g. religion or politics, we are as silly as a plane geometer trying to convince a curved-space geometer that the theorems of plane geometry are correct. Theorems true in one space are false in another and vice versa, and there is no *absolute* where space is curved or flat – both are just what they are: “geometries” derived from differing but similar sets of axioms. In particular, we have to agree on a way of judging axiom sets themselves, as a lot of our discussion will inevitably be coming to agreement on a common axiom set so that we can sanely proceed to derive conclusions and make judgements.

So I *urge* you to start a process of self-exploration by *opening your mind*. What you’ve been taught is not necessarily true. Make yourself into a child again, free from any preconceptions about how the Universe and God “have to be”. Then you can try *looking yourself* to discover the answer *for you*, instead of *being told* an answer, that may not be correct or even consistent, by somebody else.

15.2 Shaving the Barber with the Razor of Ockham

This section is obviously incomplete, but when it is complete it will talk about how Ockham's Razor – the notion that when presented with a choice of axioms or laws, or explanations, it is wise to choose the one that is the *simplest*, the one that requires the *least* fixing up with new axioms to make them consistent. Note very carefully that I said *wise*, not *correct*. Ockham's Razor can be wrong, and shave the true away as easily as the false.

Ockham's Razor is at its best when it is perceived of, and applied as, an *esthetic principle* instead of an axiom. As such, it can be a powerful tool to use in our search for an axiom set we can *wisely* live with. When presented with two competing alternative axiom sets, knowing that we cannot *prove* either one right or wrong by definition, we can nevertheless choose to believe the one that is simpler, more consistent, sparser, because it is *prettier*.

As such, Ockham's Razor is an *essential* component of both natural science and physics and of latter day scientific pseudophilosophies like Logical Positivism. After all, if you add enough exceptions, if you create a complex enough reality, you can explain *anything* in a way no Logical Positivist can ever empirically refute.

Those complex realities (the "it's God's will" variety of explanation for whatever you like) can only be rejected on *esthetic* ground. Would God create a Universe that required the breaking of its own laws in order for miracles to occur? Well, maybe (Berkeley would say so as the Church requires miracles outside of natural law) but then again, maybe *not* – C. S. Lewis seemed to think not as he put God's word's in Aslan's mouth declaring that He would not break the laws that He made.

Somehow Ockham's Razor ends up being as important as the axiom of causality in determining what we believe in Physics, Chemistry, and many empirical sciences. It isn't enough to construct a theory, we need to construct a *beautiful* theory, one that is *simple* and yet powerful. Why should this be? Why should nature be simple? We can't even say why nature should be at *all* and now we're imposing a constraint of simpliticity and esthetic beauty on it?

Yes we are, and no we can't prove why we do it (and note that it can lead us to make mistakes!) but still, we do it anyway and are proud of it. Or we *should* be proud of it. If you are a human who believes in the Axioms of Religion (for all of their apparent flaws) it is likely because of an esthetic principle – the *beauty and simplicity* of a Universe under God. And it *is* beautiful, and simple, to so believe. The problem comes when locking into the *rest* of the Standard Axioms of religion.

What, precisely, about Hell is esthetic? Or simple? Note that when I even *try* to pick a fight with religion, it is best framed in these very terms – the concept of Hell isn't wrong because I can prove it wrong, it isn't wrong because it couldn't be right (if we live in a Universe with an all powerful, all sadistic God), it is wrong because *I* find the notion of an Omnipotent deity casting a living soul into a state of eternal pain and torture *ugly!* Ugly and inconsistent. To make it consistent, still more properties have be added to to justify this sort of incredible behavior (that we would consider to be outright Evil were we to apply a similar standard to, say, our own children) make it more Ugly still.

Ockham's Razor is a lovely meta-axiom, but as you can see we are already extending it beyond its immediate purvue. Somehow the term esthetics and an associated judgement has crept into the discussion. It seems sensible to go *beyond* the Razor and craft an up-front meta-axiom associated with esthetics itself.

15.3 The Esthetic Principle

Arguments presented in the sections above clearly demonstrate that we cannot *prove* that any given set of axioms is superior to another. Neither do we have any *a priori* basis for judging axioms, certainly not for axioms intended to apply to other axioms or to metaphysics in general. Metaphysical reasoning is an oxymoron. Our meta-axioms must then a) provide a basis for judging axioms that is descriptive, not absolute; b) be "appealing" enough that you, the reader, decide to adopt them even though they can't be proven and are in the end absolutely arbitrary.

Lacking logical necessity, absolute truth, or any other of the bullshit categorizations of "knowledge" we are left only with one of the oldest criteria, one that preceded the scientific revolution, one that in some senses preceded the entire intellectual and philosophical revolution that accompanied the emergence of man from his evolutionary roots. We have esthetics. Axioms can be adopted for no reason other than that they appeal to you, that you "like" them, that *from* the axioms you adopt a world-view *does* emerge from logic and reason that *works*. Axioms that satisfy this sort of criterion *are* the basis of all modern physics and indeed modern science – beautiful laws that actually appear to describe the world around us, always provisionally accepted to the extent that they work, always with Ockham and an absolutely subjective conceptualization of "mathematical beauty and precision” attendent upon the process of their conception and testing.

Chapter 16

Conclusions

What better way to end than with a poem...

> So choose your axioms wisely my friend, examine them often for leaks.
> Bail them out like a foundering float, burn the boat if it creaks.
> Challenge the cherished old words, my friend, challenge the new ones too.
> Avoid all beliefs that lead you to grief, and keep all the best ones for you.

OK, that was doggerel at best, so I take that back.

The best way to end is with the banana.

Appendix A

Galileo and St. Bellarmine

On April 12, 1615 Cardinal Bellarmine, a man later canonized by the Catholic Church as a Saint and hence by its own inviolable logic divinely inspired and infallible when pronouncing on the true nature of all things, wrote to Foscarini[1]:

> I have gladly read the letter in Italian and the treatise which Your Reverence sent me, and I thank you for both. And I confess that both are filled with ingenuity and learning, and since you ask for my opinion, I will give it to you very briefly, as you have little time for reading and I for writing:
>
> First. I say that it seems to me that Your Reverence and Galileo did prudently to content yourself with speaking hypothetically, and not absolutely, as I have always believed that Copernicus spoke. For to say that, assuming the earth moves and the sun stands still, all the appearances are saved better than with eccentrics and epicycles, is to speak well; there is no danger in this, and it is sufficient for mathematicians. But to want to affirm that the sun really is fixed in the center of the heavens and only revolves around itself (i. e., turns upon its axis) without traveling from east to west, and that the earth is situated in the third sphere and revolves with great speed around the sun, is a very dangerous thing, not only by irritating all the philosophers and scholastic theologians, but also by injuring our holy faith and rendering the Holy Scriptures false. For Your Reverence has demonstrated many ways of explaining Holy Scripture, but you have not applied them in particular, and without a doubt you would

[1] See http://www.fordham.edu/halsall/mod/1615bellarmine-letter.html

have found it most difficult if you had attempted to explain all the passages which you yourself have cited.

Second. I say that, as you know, the Council[2] prohibits expounding the Scriptures contrary to the common agreement of the holy Fathers. And if Your Reverence would read not only the Fathers but also the commentaries of modern writers on Genesis, Psalms, Ecclesiastes and Josue, you would find that all agree in explaining literally (ad litteram) that the sun is in the heavens and moves swiftly around the earth, and that the earth is far from the heavens and stands immobile in the center of the universe. Now consider whether in all prudence the Church could encourage giving to Scripture a sense contrary to the holy Fathers and all the Latin and Greek commentators. Nor may it be answered that this is not a matter of faith, for if it is not a matter of faith from the point of view of the subject matter, it is on the part of the ones who have spoken. It would be just as heretical to deny that Abraham had two sons and Jacob twelve, as it would be to deny the virgin birth of Christ, for both are declared by the Holy Ghost through the mouths of the prophets and apostles.

Third. I say that if there were a true demonstration that the sun was in the center of the universe and the earth in the third sphere, and that the sun did not travel around the earth but the earth circled the sun, then it would be necessary to proceed with great caution in explaining the passages of Scripture which seemed contrary, and we would rather have to say that we did not understand them than to say that something was false which has been demonstrated.But I do not believe that there is any such demonstration; none has been shown to me. It is not the same thing to show that the appearances are saved by assuming that the sun really is in the center and the earth in the heavens. I believe that the first demonstration might exist, but I have grave doubts about the second, and in a case of doubt, one may not depart from the Scriptures as explained by the holy Fathers. I add that the words ' the sun also riseth and the sun goeth down, and hasteneth to the place where he ariseth, etc.' were those of Solomon, who not only spoke by divine inspiration but was a man wise above all others and most learned in human sciences and in the knowledge of all created things, and his wisdom was from God. Thus it is not too likely that he would affirm something which

[2] of Trent

> was contrary to a truth either already demonstrated, or likely to be demonstrated. And if you tell me that Solomon spoke only according to the appearances, and that it seems to us that the sun goes around when actually it is the earth which moves, as it seems to one on a ship that the beach moves away from the ship, I shall answer that one who departs from the beach, though it looks to him as though the beach moves away, he knows that he is in error and corrects it, seeing clearly that the ship moves and not the beach. But with regard to the sun and the earth, no wise man is needed to correct the error, since he clearly experiences that the earth stands still and that his eye is not deceived when it judges that the moon and stars move. And that is enough for the present. I salute Your Reverence and ask God to grant you every happiness.

Lest it is not clear from the above, it is trivial to find *numerous* instances of passages in the Bible where prophets and important figures made statements that *with no possible ambiguity* contradict Galileo's (and Copernicus') model. The writers of the Bible, old and new testament alike, lived in a primitive, ignorant culture and were primitive, ignorant people. For them the world was flat and round, as any eye could see. The sky was a dome, the earth was immovable, and they themselves lived in the middle of all creation. God lived overhead, in heaven, and the underworld was below. The sun and the moon and the stars moved around them, and if the planets appeared to move backwards from time to time, it was because of Ptolemy's epicycles or the direct will of God. Genesis was considered to be literal truth, as was the story of Eden and the fall of *perfect* man from grace, the original sin.

Bellarmine's point is thus well made – if we admit doubt into the validity of the words of the prophets, of the saints, of David and Soloman and Moses and the rest, with respect to something *absolutely fundamental* like this, how can we deny that it is reasonable to doubt it all? Indeed, by his own words it "is a very dangerous thing, not only by irritating all the philosophers and scholastic theologians, but also by injuring our holy faith and rendering the Holy Scriptures false."

What more is there to say? There cannot be any person on the planet at this point who does not know that not only is the Earth not stationary in the center of a tiny Universe revolving around it, but that the *sun* postulated to be a center of motion by Copernicus is *itself* not the center, that *it* revolves around the center of a galaxy of billions of stars so large as to utterly dwarf the solar system, where the Earth itself is an insignficant speck compared to the Sun. That galaxy, in turn, is one small galaxy in a sky filled with galaxies as far as the most powerful telescopes can see, all the way back (in time) to the period when galaxies were *forming* hundreds of millions of years after the Big Bang. Even the most devoted of Christians, ones that manage somehow to hold onto the idea that the Earth is only 6000 or so years old and was created in seven days, no longer think that the Earth is the center of all things and that the Sun goes around it, because there are pictures, eyewitness accounts, television broadcasts, films, and mountains of data and empirical evidence that prove otherwise.

The prophets were wrong. Proven wrong on this one thing *as recorded in holy scripture* is sufficient to prove that their words in that scripture are *not* infallible, they are doubtable. As Ballarmine clearly saw, if the prophets were so overwhelmingly mistaken about this *simple* thing, a mere matter of the true nature of things that anybody with a tiny bit of vision (or a telescope and understanding of mathematics) could see for themselves at any moment, how can we believe them when they speak of miracles, of open violations of natural law? They don't even get it right when they speak *of* those natural laws being violated.

Bellarmine was just as wrong as those prophets. He relied on the *immediate* evidence of his senses to form his conclusion that the earth was immobile, where in truth the range of that vision was like that of an ant crawling up to the top of its mound and concluding that it was at the top of the world itself. His document, in historical retrospect, is a nearly perfect example of the axioms of religion in practical application. The scriptures are absolute truth, divinely inspired, conveyed to us by an infallible, omniscient God. Any theory, any idea, any statement that challenges that must be rejected, and the challenger suppressed on pain of excommunication and death by purifying fire.

Like good little white cells of the memetic superorganism to which they belonged, Bellarmine and the Inquisition of the Catholic Church responded to the "irritating" of its superorganismic body – philosophers and scholastic theologians alike – by surrounding the offending "cancer" cell and forcing it to publically recant and affirm its memetic identity on pain of death. It did so with the following document, in 1633[3]:

> Whereas you, Galileo, son of the late Vincenzio Galilei, of Florence, aged seventy years, were denounced in 1615, to this Holy Office, for holding as true a false doctrine taught by many, namely, that the sun

[3]http://www.fordham.edu/halsall/mod/1630galileo.html

is immovable in the center of the world, and that the earth moves, and also with a diurnal motion; also, for having pupils whom you instructed in the same opinions; also, for maintaining a correspondence on the same with some German mathematicians; also for publishing certain letters on the sun-spots, in which you developed the same doctrine as true; also, for answering the objections which were continually produced from the Holy Scriptures, by glozing[4] the said Scriptures according to your own meaning; and whereas thereupon was produced the copy of a writing, in form of a letter professedly written by you to a person formerly your pupil, in which, following the hypothesis of Copernicus, you include several propositions contrary to the true sense and authority of the Holy Scriptures; therefore (this Holy Tribunal being desirous of providing against the disorder and mischief which were thence proceeding and increasing to the detriment of the Holy Faith) by the desire of his Holiness and the Most Emminent Lords, Cardinals of this supreme and universal Inquisition, the two propositions of the stability of the sun, and the motion of the earth, were qualified by the Theological Qualifiers as follows:

1. The proposition that the sun is in the center of the world and immovable from its place is absurd, philosophically false, and formally heretical; because it is expressly contrary to Holy Scriptures.
2. The proposition that the earth is not the center of the world, nor immovable, but that it moves, and also with a diurnal action, is also absurd, philosophically false, and, theologically considered, at least erroneous in faith.

Therefore, invoking the most holy name of our Lord Jesus Christ and of His Most Glorious Mother Mary, We pronounce this Our final sentence: We pronounce, judge, and declare, that you, the said Galileo, have rendered yourself vehemently suspected by this Holy Office of heresy, that is, of having believed and held the doctrine (which is false and contrary to the Holy and Divine Scriptures) that the sun is the center of the world, and that it does not move from east to west, and that the earth does move, and is not the center of the world; also, that an opinion can be held and supported as probable, after it has

[4] "To give a misleading or false interpretation." Sorry, this is a word that isn't terribly common any more and you probably don't have a dictionary handy.

> been declared and finally decreed contrary to the Holy Scripture, and, consequently, that you have incurred all the censures and penalties enjoined and promulgated in the sacred canons and other general and particular constituents against delinquents of this description. From which it is Our pleasure that you be absolved, provided that with a sincere heart and unfeigned faith, in Our presence, you abjure, curse, and detest, the said error and heresies, and every other error and heresy contrary to the Catholic and Apostolic Church of Rome.

To save his life, his fortune, his family from what amounted to an open threat to murder him unless he openly and publically embraced a *convenient lie*, in the name of *Jesus and Mary themselves*, Galileo signed the following document:

> I, Galileo Galilei, son of the late Vincenzio Galilei of Florence, aged 70 years, tried personally by this court, and kneeling before You, the most Eminent and Reverend Lord Cardinals, Inquisitors-General throughout the Christian Republic against heretical depravity, having before my eyes the Most Holy Gospels, and laying on them my own hands; I swear that I have always believed, I believe now, and with God's help I will in future believe all which the Holy Catholic and Apostolic Church doth hold, preach, and teach.
>
> But since I, after having been admonished by this Holy Office entirely to abandon the false opinion that the Sun was the center of the universe and immoveable, and that the Earth was not the center of the same and that it moved, and that I was neither to hold, defend, nor teach in any manner whatever, either orally or in writing, the said false doctrine; and after having received a notification that the said doctrine is contrary to Holy Writ, I did write and cause to be printed a book in which I treat of the said already condemned doctrine, and bring forward arguments of much efficacy in its favour, without arriving at any solution: I have been judged vehemently suspected of heresy, that is, of having held and believed that the Sun is the center of the universe and immoveable, and that the Earth is not the center of the same, and that it does move.
>
> Nevertheless, wishing to remove from the minds of your Eminences and all faithful Christians this vehement suspicion reasonably conceived against me, I abjure with sincere heart and unfeigned faith, I curse and detest the said errors and heresies, and generally all and

> every error and sect contrary to the Holy Catholic Church. And I swear that for the future I will neither say nor assert in speaking or writing such things as may bring upon me similar suspicion; and if I know any heretic, or one suspected of heresy, I will denounce him to this Holy Office, or to the Inquisitor and Ordinary of the place in which I may be.
>
> I also swear and promise to adopt and observe entirely all the penances which have been or may be by this Holy Office imposed on me. And if I contravene any of these said promises, protests, or oaths, (which God forbid!) I submit myself to all the pains and penalties which by the Sacred Canons and other Decrees general and particular are against such offenders imposed and promulgated. So help me God and the Holy Gospels, which I touch with my own hands.
>
> I Galileo Galilei aforesaid have abjured, sworn, and promised, and hold myself bound as above; and in token of the truth, with my own hand have subscribed the present schedule of my abjuration, and have recited it word by word. In Rome, at the Convent della Minerva, this 22nd day of June, 1633.
>
> I, GALILEO GALILEI, have abjured as above, with my own hand.

There is a possibly apocryphal story that Galileo, in a last act of defiance against this outrageous violation of his free intellectual will, whispered *E pur si muove!* (and yet it moves!) at the trial where he was forced to recant by signing the statement above. It is most unlikely that this was true, as if he were overheard he would without doubt have been publically and ritually murdered by the Church's highest leaders in the name of a god-man who (according to their own myths) forgave his murderers and preached that one should love one's enemy as oneself, a faith based on an explicit commandment from God not to kill, a faith supposedly commited to *truth*.

On October 31, 1992, *thirteen years* after pope John Paul II appointed a commission to examine whether or not the church erred in condemning Galileo to what amounted to both physical and intellectual confinement for the last eight years of his life on pain of death, they finally concluded that Galileo was, in fact, not guilty of any form of heresy. They stopped short of concluding that in fact Cardinal Bellarmine, the pope, and all the members of the Inquisition were murderous criminals intent on preserving unchallenged the memetic basis of their power, instead noting gently that they doubtless "acted in good faith" as they threatened him with immolation.

Thirteen years! The commission was appointed *ten years after* man first walked on the moon, *hundreds* of years after the general validity of the Copernican model was a known truth. The members of the commission doubtless had to *fly half way around the world* to meet, and had to *deal with jet lag* when they got there because of the world's *diurnal rotation* in spite of the Bible's assertion that "God fixed the Earth upon its foundation, not to be moved forever" (Psalms 103), flying over oceans and continents that are, in fact, moving incessantly as the tectonic plates on which we live float around on a sea of fluid rock that occasionally bursts free in a spectacular display of heat and light.

Thirteen minutes would have been too long. The appointing of a commission *at all* was absurd. However, the real issue dealt with by the commission was doubtless not the truth of Galileo's assertions or the falseness of the Bible, it was even now, today, the defense of the memetic superorganism. As the pope himself stated in his announcement of the "good news"[5]

> The underlying problems of this case concern both the nature of science and the message of faith. One day we may find ourselves in a similar situation, which will require both sides to have an informed awareness of the field and of the limits of their own competencies.

I sincerely, passionately hope that we will never again find ourselves in a situation where the Church threatens the murder of those who disagree with its pronouncements, even those who openly assert that most of its rituals, its rules, its laws, its scripture have little to do with God or faith and much to do with preserving:

1. The power structure of the superorganism, especially the power and personal prerogatives and responsibilities of those at the very top, its "brain" or the center of its "self".

2. The scripture itself from any sort of question or doubt. The Church relies on its scriptural pronouncements on miracles and matters of faith being

[5] By *divine providence* I happened to be teaching *gravitation* in an introductory physics class the very day that the announcement was made to the world. I had great fun announcing to my class with a very serious demeanor, that it was at last all right to believe in Newton's theory of gravitation, the Copernican model of the solar system, and that it turned out that Galileo was right after all. The pope Himself had said so!

Sarcasm, sure, but gentle sarcasm, with a point. The *commonly accepted* methodology for determining what is and isn't *knowledge* is directly contrary to that required by *any* superorganismic religion, as therein knowledge must be based on scripture, not sense or science. In the subsequent discussion that followed, nobody in my class was fooled into thinking that Galileo's exoneration meant anything at all to the contrary.

> accepted *without question or doubt* just as much today as it did in Galileo's day. It just can no longer easily get away with murder.

After all, I think that this work would qualify on all counts far more than anything Galileo ever wrote or even thought. If the Church really wishes to form a full understanding of the limits of their *competence* to make pronouncements *of any sort* on the nature of science or faith, they need do nothing but read this book.

In it they will learn the simple truth – neither they in their most pretentious moment nor I in mine are competent to make the least of pronouncements on the true nature of being as if it were an undoubtable truth[6]. We each and every one of us live in a state of humility and wonder as we experience the world moment by moment, living always in the now and trying to make the best sense of it all that we can. Every human soul is equal in this pursuit, and no assertion made by a human being may be proven or disproven by *reason*, as reason itself isn't really reasonable – it is a foundation erected by our imagination, built on top of unprovable assertions.

If they wish to try to make themselves believe that the world is immoveable because Psalm 103 says so, if they wish to make themselves believe that the sun was made to stand still *just to help one side in a trivial war in a barbaric time*, if they wish to believe that the world was created in seven days, that Man is a being fallen from grace due to original sin, that Woman is thereby a tainted vessel unfit to be priest or pope, that *every word in the bible is literal truth* and that if their *senses* and their *reason* say otherwise, they are *mistaken*, I have gone to great pains to demonstrate how this is *individually* their absolute right – all humans can choose the axioms upon which they wish to base their understanding of their lives.

What they *cannot* do, in all fairness, under *any* systems of beliefs they choose, is deny that *it is a system of belief.* Men are fallible, the window of our senory experience is narrow indeed in space and time, and beliefs (however passionately or fervently held, however "obviously true" they might be when viewed with ant-eyes through that window) can always be untrue. Once one acknowledges this, one loses all *intellectual* right, all *moral* right, all *religious* right, to assert competence to judge the beliefs of others with a threat of sanctions, death, expulsion from the love of God. Indeed, with luck they can achieve the state of intellectual *humility* from which true understanding of understanding itself can flow, in which *enlightenment* can occur.

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[6]Except this one, of course, which is not proveable but is true nonetheless.

I personally believe that God exists and has given us the great gift of a functional Universe in which to live, lit within by a spark of Self (or Holy Spirit or Atman or whatever you'd like to call that nubbin of awareness that experiences "my" sensory stream), with a depth of passion that I find difficult to convey in mere prose text. I personally cannot possibly imagine that God is *male* and wishes to be "worshipped" or "obeyed" as if *He* were some sort of distorted supernatural version of a worldly King. I personally would not impose these beliefs on a single soul, but whether or not they are correct, surely it is a grave error to arrogate to ourselves the *right* to judge others on the basis of *their* belief and restrict their exercise of that free will save insofar as is necessary to enforce the *social and political* compacts of humans living together in a society that shares scarce resources. Where in the Ideal (in my opinion) axiomatic formulation of society, humans *freely yield* their "natural" right to rape, to rob, to commit murder to the extent extent permitted in a state of brutal nature in exchange for the protection of society from rapists, robbers, and murderers.

One can never freely yield, in such a compact, the right to hold a belief, only to commit an action. Our beliefs are what they are – inviolable and out of reach. Who in the world today can believe that Galileo *actually* renounced his *belief* that the world moved. He had "seen" it move with his own eyes, strengthened by means of the telescope of his own invention to be ant-eyes no more, written in the motions of the worlds determined by things far beyond the vision or reach of the prophets. And so things continue today.