

Abstracting Chaos: A Universal Goal

My math teacher is in the habit of declaring at regular intervals throughout the course: “If God exists, then he must be a mathematician.” I personally believe in the related, God-involving “clockwork theory” — that some supernatural force, God or otherwise, must have created the universe as we know it, and let its creation govern itself with a carefully-defined set of mathematical laws. Everything is based on mathematics — it is the purest science, the basis of physics, which in turn is the basis of chemistry, and then biology, psychology, and the psyche all in turn. And from the psyche stems the soul and mind and spirit and whatever else we consider the “humanities.”

As a result, we human beings are carefully-calibrated biological masterpieces of billions of years of evolution, and the Earth, the solar system, the galaxy, and the galaxial superclusters all arrange themselves out of the most natural and fundamental forces.

The second law of thermodynamics invites increasing entropy, or disorder; the anarchy of human destruction, as well as the increasing complexity from increased “order” both increase the overall chaos. Love is a hormonal matter, our DNA is our programming language, and reproduction stems from that fundamental existential urge: to *survive*. Numbers — from grades to number of Facebook friends to years of experience — guide human existence. Even literature, a form exemplary of the humanities, should have some degree of scientific knowledge incorporated in: renowned novelist Vladimir Nabokov writes that “a good formula to test the quality of a novel is, in the long run, a merging of the precision of poetry and the intuition of science” (Nabokov 3), arguing that the best formula for literature involves both the writer’s invention and real-world aspects. Nature — in its persistent, logical manner — is everything.

Eventually, the reasoning behind concepts of a fourth dimension or traversing time or skipping space or the ultimate origins of the universe will be unearthed. Anything that we can still attribute to a God for our lack of sufficient scientific knowledge will be explained. Murphy’s Law states that “anything that can go wrong will go wrong,” given the premise that there are an infinite possibilities of existence and an infinite number of things that can go wrong; by this same proposition, anything that can go right *will* go right. Anything that can be discovered *will* be discovered.

By mathematics. By science. But not by words.

Silvia Jones argues in her article “Unspeakable Things” that there are certain types of “ineffable” knowledge, namely phenomenal (sensory) and indexical (deictic) knowledge. But this knowledge is simply outside the scope of ordinary language as we know it; it’s only too easy to express this with the language of mathematics that too few human beings are fluent in (myself included, of course). That “red” that is described by mention of roses or blood or strawberries is actually an electromagnetic wave with a 675 nanometer wavelength (that’s 0.000000675 meters) and a 444 terahertz frequency (that’s 444,000,000,000,000 cycles per second).

Amazing, right?

The answer is yes. It’s a dazzling display of scale. A difference in magnitude of twenty: millions of millions compared to thousandths of thousandths of thousandths. Traveling at the speed of light (which is an interesting phenomenon in itself, a constant speed regardless of the observer’s speed), these wondrous numbers combine to form *red*. A drab three-letter, one-syllable word. Color-seeing people take it for granted, and English speakers don’t see a problem with it being one letter away from spelling (T.) “rex,” “led,” “read,” or “bed.” Nothing there indicates the awesome level of detail there. Of course, etymology or pictographic languages add some level of meaning to language but language is often inadequate to capture an idea.

In programming, the word is *abstraction*. The process of turning a complex conglomerate of physical science principles to form the electromagnetic radiation in the correct frequency to the simple concept “red.” What is, in computing, a series of ones or zeroes (known as machine language, binary, bytecode, etc. depending on the context) can be simplified into *higher-level* commands. Handling of

Abstraction: a detached perspective



Source: "Abstraction." <https://xkcd.com/626/>

that binary is simplified with the use of Assembly. Then, commonly-grouped Assembly commands are turned into a single function in a higher-level language called C, such as memory allocation into the single statement `“malloc()”`. Then, in a language based off of C known as Java, even more complex tasks such as the expression `“new Console()”` establishes a much more complex I/O system that would, in all of the entirety of the console class, have filled dozens of lines in C or hundreds in Assembly. And so on and on.

Eventually a level is reached in which complex algorithms are simplified into very simple and terse statements in higher-level languages, causing not only convenience to the programmer but also a loss of control and lower performance. The result is something that resembles the original task not at all. Take Ruby, for example.

```
> if is_readable? "this code" then print "Yup 'tis Ruby" end  
=> "Yup 'tis Ruby"
```

Yup, that's valid Ruby. And yup, that has its roots back to ones and zeroes. There's much more than meets the eye. Ruby was designed by Yukihiro Matsumoto, a programmer who conceived Ruby as “a genuine object-oriented, easy-to-use scripting language” (Maeda) that wasn't Perl or Python. To create a complex but easy-to-use language is no small feat, and it involves sacrifice of some of the pinpoint precision of abstracted tasks and the lightning-speed of low-level languages such as Assembly that don't have so many built-in abstractions.

What I mean to say with this CS101 knowledge is that our lives are already incredibly abstracted. We humans are highly-advanced creatures based on beneficial combinations of atoms, molecules, cells, and smaller organisms. That fickle, crawling force we call evolution, the progeny of Dalton who was the progeny of evolution itself, gives way to increasingly complex beings.

Self-consciousness. We designate other organisms of the Kingdom Animalia “beasts” and “animals” and “pets.” We see them as inferior and jejune, while we ourselves are the “chosen ones” among animals designed to lead, change, invent. But the other animals are already much more complex than bacteria, which themselves are more complex than organic molecules, which are more complex than inorganic substances and then the pure elements and then hydrogen and then subatomic particles and then sub-subatomic quarks and then the energy that (presumably) created all the matter in the universe. And that does not even deal with other dimensions of the universe besides energy and matter, such as the forces (which abstract from gravity, electromagnetism, the weak nuclear force, and the strong nuclear force) and time of the universe. The latter is perhaps the most interesting, giving existence an infinity of permutations as a movie gives its characters a plot through frames. The universe as it is known comprises all of these minutia and titans to form everyday existence. Everything from the planet we call Earth to the neighborhood labeled “home” to the bowling pins scribbled onto my desk are items abstracted from fundamental matter. Then, on top of the physical world, psychological, economic, and political models abstract away the details even further.

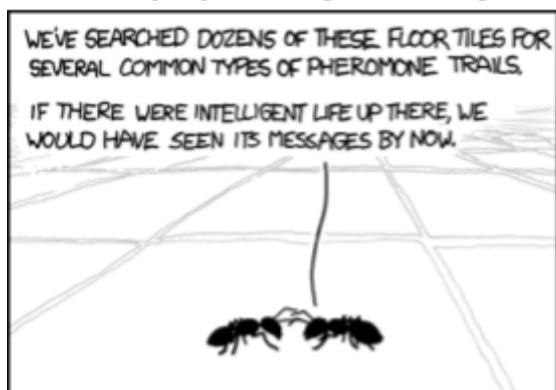
And we can still be satisfied calling the color red “red.” We humans can still believe that our emotions are more than the physiological changes drawn by a sexual urge created by a compulsion to survive. Love is driven by sex is driven by dopamine is driven by a positive mental response. We still can fool ourselves that we are special creations with a God that is of a manly-form and that any extraterrestrials are like humans but with elongated heads and photosynthetic-green skin. We separate “artificial” or “man-made” objects and effects from “natural” effects, as if humans were freak shows with supernatural beginnings. In his essay, “The American Scholar,” Ralph Waldo Emerson summarizes this view: “It is one of those fables ... that the gods, in the beginning, divided Man into men, that he might be more helpful to himself ... Man is thus metamorphosed into a thing, into many things” (Emerson 1) — unfortunately, this “thing” of Man is more perfect in concept than in its jealous, unsatisfied, violent reality.

We give ourselves the misconception that Earth is special because it is the only *known* planet to be viable, even though we know by intuition and fundamental mathematics that in the infinity of the universe there must also be an infinity of planets and in those infinity of planets there must be an infinity of planets in the habitable zone of their respective stars and in the infinity of habitable planets there must be other planets that harbor something we would deem “living.” (Here lies a variant of Murphy's Law.) But even then, that supposition is based on what we consider “life.” From these biased notions arises a “superficiality often consumes us, deters us from introspection and critical thinking, and keeps us ... distracted from the truth that lies under the surface” (Moshfegh). Perhaps the universe is living, and we fail to see it as bacteria in our gut fail to see the conscious brain only a meter above. Perhaps the origin of the universe, the Big Bang, is the end of our sight because it is the birth of its consciousness and we are only a figment of its imagination. Perhaps we are just insects, scuttling around on a two-dimensional floor and losing the depth of the universe in all its depth because we don't know what to look for.

For all we know, some uber-intelligent form, living or not, has dismissed earthly life as simple, stupid, animalistic. But this is all relative.

It probably isn't God as the Abrahamic religions believe it. That God is too brittle, too inflexible, too human-based. One biblical text asserts that "Dominion and fear *are* with [God], he maketh peace in his high places.

An insect's perspective on greater intelligence



THE WORLD'S FIRST ANT COLONY TO ACHIEVE SENTIENCE CALLS OFF THE SEARCH FOR US.

Source: "The Search." <https://xkcd.com/638/>

Is there any number of his armies? and upon whom doth not his light arise? How then can man be justified with God?" (Job 25:2-4). It seems counterintuitive, at least for me with my non-religious upbringing, that people should adhere to a punitive God. As Bruckner remarks in his essay, "The Art of Suffering," "We still need to distinguish [ordeal] from penitence ... One has to have very little love for humanity to think that it is by being shattered that a life progresses." (Bruckner 3).

Before I more or less subscribed to the clockwork theory, I believed at one point, in all seriousness, that our realm was just some science experiment. Not God, but some more-intelligent form — aliens, I suppose — had a third-grade laboratory assignment to create some form of life. Each being could be its own "God," as every scientist is the God of his simulation. But the one to create Earth and our universe would receive a fail grade, because the humans would keep fighting and end up destroying the Earth and never making it past its climate-based test.

Either the being was doing poorly in the class or felt

destructive in a third-grader way, not realizing the consequences to the life within. Only then would it be justified to deem existence a failure, and, in the words of Anne Dillard, regard the universe as "a monster that does not care if we live or die ... [and] is fixed and blind, a robot programmed to kill. We are free and seeing; we can only try to outwit it at every turn to save our skins" (Dillard 179).

But even in this conjecture, "third grade," "laboratory assignment," and even robotic Terminator-like monsters are human concepts that limit the scope of my imagination. And it's easy to blame people (or other beings) higher on the social (or existential) ladder. The universe can not and should not be considered as humans consider themselves, as we *homo sapiens* do not lie at the center of the universe. I guess it can be called a superiority complex. We have what philosopher Arthur Schopenhauer calls "B-perception" — will-filled, biased thoughts — but we need a more mindful, will-less outlook.

Occasionally, however, there is some sound connection between people and the universe. Nabokov argues that "the writer of fiction only follows Nature's lead" (Nabokov 3) — often there is no disconnect between good writing or art and what is perceived as the truth, because the best writing is simply a permutation of human knowledge; an alternative world with slight parametric tweaks on the known world. In the movie *A Fault in Our Stars*, the protagonist Hazel Lancaster states in her eulogy of her love Augustus Waters that "some infinities are bigger than other infinities ... I cannot tell you how grateful I am for our little infinity" (Green). While it may seem mathematically inaccurate to say that any quantity is greater than infinity, the concept of multiple infinities is actually a well-accepted idea in the mathematics world, and therefore Hazel touches upon the mathematical knowledge base to make the plot the more enticing and powerful.

As the adage goes, the more you know, the less you know. This is the purest knowledge — to understand the extent of one's existence and nothing further. To know how great, how infinite one's life is already but also how it is never the greatest. And it's much easier to understand better the extent of the universe with the power of science, which by nature attempts to qualify, quantify, and discover the purpose of our being.

As a result, it's no wonder so many people are scrambling to the STEM side nowadays. The modern discovery that technology — the practical application of the maths and sciences combine — can be a potential gateway to existential knowledge (as well as to personal entertainment, which lures the hedonists as well) attracts people more than the apparently fruitless acts of fantastical arts, voodoo, religion, or other ambiguous practices. If humans can harness the power of flying (which had previously been attributed only to birds and the *wingardium leviosas* of wizards) as they now can with planes and helicopters and hoverboards (like the ones from *Back to the Future*, not the modern ones that don't hover), what can't they do? Fermilab and CERN and the LHC are particle accelerators that reach ever closer to the defining fabric of the universe, recently touching upon the fundamental

Higgs Boson particle, and LIGO is an observatory that can even confirm the existence of once-conceptual gravitational waves.

Why even bother to leave anything to imagination, when we can realize it?

Of course, there are limits to this scientific method. A common opposing view is that human emotion is a much more powerful force than can be accounted for. By words, by mathematics. Surely that's what Jones argues in "Unspeakable Things": that emotions cannot truly captured in words, nor in any other form. And, surely, the hormonal changes and physical symptoms of feelings, whether they be so obvious as the signs of heartbreak, anxiety, embarrassment, cannot truly embody the sense of the emotion. Who can truly express Lyudmilla Ignatenko's pain as she recalls, "Often they die. In an instant. They just drop—someone will be walking, he falls down, goes to sleep, never wakes up. He was carrying flowers for his nurse and his heart stopped. They die, but no one's really asked us" (Alexievich 7)? They just die, they just fall, they drop like flies, they are no longer part of this world, they were once the ones she loved, they lose everything and she loses everything! That account is noticeably different than another description of the same situation: "Today, one of every five Belarusians lives on contaminated land. This amounts to 2.1 million people, of whom seven hundred thousand are children" (Alexievich 1). Human life only constitutes momentary specks on the band of time — "a long, curved band of color" (Dillard 142) that exists like "a woman's tweed scarf; the longer one spot [is studied], the more dots of color [are seen]. There was no end to the deepness and variety of the dots" (Dillard 142). But these same humans, just like every one of our ancestors or evolutionary predecessors, or even every atom and fundamental force and dimension, make up existence as it is now known, and no piece of it is less important than another.

Everything should coexist, has to coexist. And the fundamental beauty in the universe, besides its infinity, is exactly that it is the sum of its parts. Everything, with its infinity of defining aspects, able actions, and possible futures are just smaller infinities within a larger one. The universe is interdependent on all its parts — it has to be. Abstraction only works when the foundation is sound, just as any skyscraper cannot be built on a shifting base lest the engineers care to engineer another Leaning Tower of Pisa. Mathematics too, from complex statistical probabilities to the conceptual string and set theories, are all made up of arithmetic at its core. Taking out human emotion would wreck the universe. The heartless desires of industry, for example, currently dissolve the Earth's biospheric health with anthropogenic global climate change. As Mark Slouka puts it in his essay "Dehumanized:"

"The humanities, done right, are the crucible within which our evolving notions of what it means to be fully human are put to the test; they teach us, incrementally, endlessly, not what to do but how to be" (Slouka 6).

Of course, when humanities are "done right" is debatable amongst different fields of study. In general, however, the humanities are not there to tell human beings where we are in the universe, who *God* or *others* exist; they are to tell us who *we* are and what *we* should do.

Now then. I'm sure everyone gets it to some degree. The world is ruled by, predicated on, limited by a set of objective rules that no one can converse. Everything supernatural eventually gets explained with the use of science, and the worlds of Jesus and Harry Potter shrink by the day. Emotions are important but miniscule. People are infinite yet infinitesimal. Anything can be explained by either a logical paradox or a logical, almost-tautological description.

Zeno's paradoxes and chain escape puzzles are wonderfully ordinary inexplicables. Have you ever studied how a Rubik's cube (formerly known as the "Magic Cube" for its ingenious construction) works? How about its larger counterparts, the "Rubik's Revenge" 4x4x4 or the "Professor's Cube" 5x5x5? I can assure you that they are very different from the original Magic Cube, which might seem odd at first considering their similarity, but also seem very logical because of the much greater complexity of a larger cube unit. It is similar to the elementary school teachers asking their second-graders to estimate the answers of operations: 31 times 29 is somewhere around 30 times 30 is somewhere around 900, they would say. But is it above or below? At first glance there could be equal justifications for either side, but they never go *beyond* that estimate, that first glance.

That estimate is a good analogy for the majority of human progress. There's always a "good enough" point, which ranges from levels "slacker" to "perfectionist." Believe it or not, a perfectionist *has* to stop *somewhere*, even if he argues that *nothing is perfect* and he *has* to finish the job — or else he dies with the project. Mathematics is the language of perfection, and something that humans will never speak fluently. The current human view of mathematics is that of a baby: inconstant, shifting, never aware of the true forms behind the incoherent blurs. A baby always learns, and then it grows into that "good enough" stage in adolescence, when consolidation and pruning occur in the brain. That practical side, losing and hardening brain cells to optimize thought, is *science*.

Science is the language of imperfectability. If science teachers ever taught about significant figures, they are teaching the art of being “good enough.” Practical. But not perfect. What is necessary for life is never perfect, and scientists realize, experimentally, that there is always more to learn. That anything can happen, probabilistically. That matter can go right through matter on a microscopic level due to superposition, that one cannot both observe the position and velocity of a particle simultaneously due to the Heisenberg Uncertainty Principle, and that the speed of light is somewhat of a speed limit for matter strictly enforced by the universal policing forces.

“Science” is, simply stated, the science of knowing when to stop.

The second law of thermodynamics states that the amount of entropy, or chaos, of the universe is always positive or increasing. By this fundamental pillar of science, the universe simply becomes more and more disordered and hectic ever since its genesis; however, there is also always increasing order in the form of solar systems and planets and life. In his TED talk, “The history of our world in 18 minutes,” Ted Christian attempts to answer this apparent paradox:

“... The universe can create complexity, but with great difficulty. In pockets, there appear ... “Goldilocks conditions” — not too hot, not too cold, just right for the creation of complexity. And slightly more complex things appear. And where you have slightly more complex things, you can get slightly more complex things. And in this way, complexity builds stage by stage. Each stage is magical because it creates the impression of something utterly new appearing almost out of nowhere in the universe. We refer in big history to these moments as threshold moments. And at each threshold, the going gets tougher. The complex things get more fragile, more vulnerable; the Goldilocks conditions get more stringent, and it's more difficult to create complexity” (Christian).

Christian's philosophy personifies the universe, as if it were trying to find meaning or if the Goldilocks conditions were universal epiphanies. The moment when energy first fused to form matter. When life (as we know it) first began. When humans began the search for their origin, their sense of purpose. Who is to say that the universe is any different? The phenomenon that Christian describes brings up the notion of neuroplasticity, the fact that “the brain can be altered by experience in fundamental ways” (Begley 3), and a well-documented property of intelligent life. We may be those bacterium in the universe, trying to find the way out from a dark and dank gut, or we may be a neuron, and the Big Bang the mitosis that created the neuron. Perhaps finding the origin of the universe is equally difficult as trying to remember what it felt to first be conceived as a zygote: impossible.

And perhaps it is best to look not at where we began, but where we will end up. Just as children learn to move away from their mothers, assess their situation as part of the world, and then find their destinies.

What difference does it make if the clockwork theory or God or some scientific anomaly created the universe? From wherever its origins lie, the current state of the universe begs only one direction: forward in time. There's only looking back to see farther forward.

Do we *really* have to know that 29 times 31 equals 899 as a second-grader? As an engineer it makes more sense, but not as a toddler. The judging of emotions is another science: to what degree does Hazel's “smaller infinity” outweigh practical mathematics, and when does emotional tampering get in the way of logic?

Where does this fit in the scheme of the universe? Is it necessary? Is it *optimized*?

The only way to tell is what “you can call ... foresight, or innovation, but beyond that, what [is necessary for invention] is tremendous imagination” (Ouellette 1). Education cannot be geared at knowing *everything*, but some tangible goal by means of this “tremendous imagination.” Even Descartes wrote that “I only follow this road [of finding understanding] until I have met with something which is certain, or at least, if I can do nothing else, until I have learned for certain that there's nothing in the world that is certain. Archimedes ... demanded only that one point should be fixed and unmovable” (Simic 137). Even the great philosophers of old learned to focus their minds on finding *truth* at all, at only “one point,” instead of trying to find truth in everything or a holistic truth. As long as a will-less, D-perception is achieved, without with pride for the human race but without prejudice against all

others (as Oliver Goldsmith alludes to in his essay, “On National Prejudices”), the human limit should be truth. By mathematics. By science.

Because the universe is written in mathematics, but science is the language of the intelligent mind. That’s the challenge.

Electromagnetic radiation is surely a phenomenon that can be measured in numbers of great and tiny magnitudes, but the human ability to condense that feeling into the word “red” is an immeasurable feat. Humans don’t *need* to know what goes into red light, as the toddlers of this infinite universe. Only through trial and error were language, culture, social norms brought about. Only when the “good enough” threshold is achieved can humans move on.

This is the only unifying factor: the imperfection. The ideas of abstraction, optimization, the universe, multiple infinities, science, and human education and intuition all lie on the premise that there’s a lack of precision, that there’s a process from fundamental to complex. The fundamental forces dictate that chaos will always grow as complexity increases. One exemplar implementation would be “machine learning,” whose fundamental principle is to randomize the input parameters of a long-winded, complex equation and slightly tweak the parameters until they provide the desirable output. The equation with all of its terms are provided in Nature — it’s up to sub-universal objects and beings to adjust those coefficients, to optimize the equation and simplify and reduce, to be the lexicographers of the mathematical language that defines the universe.

Human beings act as pawns to the universal scheme of finding meaning of itself, for itself— what better than randomized living actions to increase the known permutations of the universe? There are human Dumpster divers, to whom “almost everything [they] have has already been cast out at least once” (Eighner 8), and to whom it “is outside work, often surprisingly pleasant” (8). Then there are human entrepreneurs such as Bill Gates, who said that “I choose a lazy person to do a hard job because a lazy person will find an easy way to do it.” And there are humans that find revelation in “the pleasures of reduction” (Simic 141). The miracle of life and evolution has created a great diversity of humans and human perspectives that cause such motivation to work to solve the universal puzzle of existence.

In “The American Scholar,” Emerson portrays the scholar as the “designated intellect. In the right state, he is Man Thinking” (Emerson 1). The scholar is to Man as Man is to the Universe: open-minded, persevering. Thus Man is the Universe Thinking — that is its goal, our purpose.

But there’s always an end. Time is, inevitably, limited in current knowledge, but existence is indefinite. Murphy’s Law is invariably true in the case of death, so that no amount of philanthropy or achievement can stop death. In a world of infinities, choosing one’s ends, circumscribing the human shape onto an infinite space, is more difficult than it might seem.

But no human is perfect. There is certain degree of mortality to every person no matter how strong their resolve; by plain force, such as by interrogation, it has been shown that “Human beings able to resist any amount of physical pressure do not exist” (102). Nor do human beings who have a perfect intelligence and can discover the meaning of the universe exist. And we don’t have to be perfect. Because when the next level of intelligent being arrives, which it undoubtedly will, we will be a little more perfect than the first humans were.

And they will be more perfect than us. And their posterity more. And more. And more.

The first step is to accept this fact and move on. How can we begin to prepare for them? What will we contribute as a step in the assembly-line of universal abstraction?

Machine learning: microcosm of universal learning



Source: “Machine Learning.” <https://xkcd.com/1838/>

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