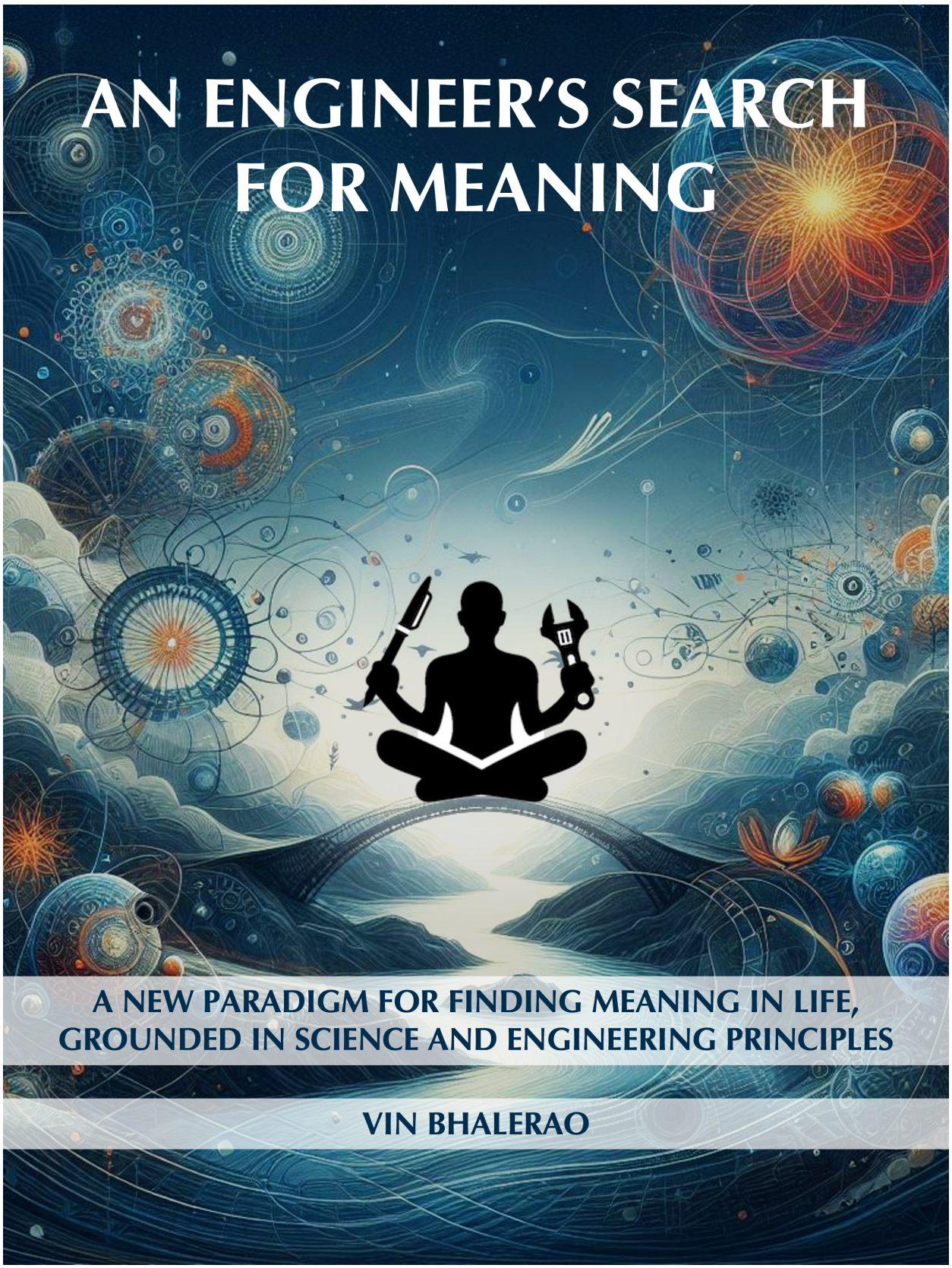
AN ENGINEER'S SEARCH FOR MEANING



A NEW PARADIGM FOR FINDING MEANING IN LIFE, GROUNDED IN SCIENCE AND ENGINEERING PRINCIPLES

VIN BHALERAO

An Engineer’s Search for Meaning

A New Paradigm for Finding Meaning in Life, Grounded in Science and Engineering Principles

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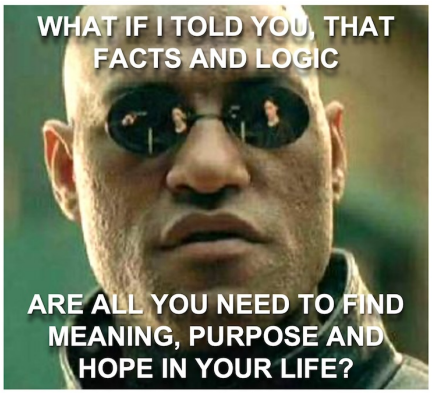
Preface

An Engineer's Search for Meaning

A New Paradigm for Finding Meaning in Life, Grounded in Science and Engineering Principles



Tumbling Down a Different Rabbit Hole

"An Engineer's Search for Meaning"

Can life's deepest questions of meaning and purpose be approached with the same rigorous methods we apply to science and engineering?

Based on the answers to these questions, can we build a vision of hope for the future that rests on solid evidence rather than just wishful thinking?

Could this approach unite people across cultures and backgrounds through a shared framework of understanding?

"An Engineer's Search for Meaning" answers all these questions with a resounding "yes!"

For too long, we've been told that questions of meaning and purpose belong exclusively to the domains of faith or poetry. As a result, modern-day people like us, who rely heavily on evidence and reason in all other areas of our lives, are often left choosing between intellectual dissonance and existential emptiness.

I'm an engineer who refused to accept this choice.

Instead, I applied the tools of my profession—systematic thinking, evidence-based reasoning, and first principles analysis—to the fundamental questions of existence.

What emerged was something unexpected: a coherent framework for finding meaning that stands up to rigorous scrutiny.

I call it the Meaning-Seeking Entities (MSE) Framework, and it represents a breakthrough in how we can approach life's biggest questions. This isn't philosophical speculation or poetic metaphor—it's a systematic analysis built on contemporary scientific understanding and proven engineering principles.

You might be skeptical.

After all, many have tried to bridge the gap between scientific rationality and existential meaning, often with disastrous results. But three crucial factors make our current moment different:

1. We now possess scientific insights and analytical tools that were unavailable to previous generations
2. We've developed new paradigms for thinking about complex, fuzzy, emergent phenomena
3. We have been humbled by our past mistakes and learned from them

These factors allow us to make a far stronger attempt at this question, as this book has done.

I am not talking about feel-good platitudes or concealed leaps of faith disguised as logic. I'm talking about a rigorous exploration of meaning through the lens of modern science and engineering principles. Every argument is built from evidence you can verify, every conclusion follows from reasoning you can test yourself.

I wrote this book for all the analytical thinkers who suspect that the idea of "meaning in life" isn't just a poetic notion but a fundamental aspect of life that can be understood through careful analysis.

Just as we've used evidence and reason to demystify a wide variety of natural phenomena that once seemed magical or supernatural, we can apply these same tools to the question of meaning itself. The often-mentioned "meaning crisis" of our time isn't inevitable—it's a problem waiting for the right analytical framework.

In the chapters that follow, I'll show you how pulling up our sleeves and applying real scientific and engineering thinking can transform our understanding of some of the oldest questions of existence.

The journey ahead promises something rare: hope grounded in evidence, purpose aligned with reason, and meaning that stands up to the most demanding intellectual scrutiny.

Moreover, since I am an engineer, I will also leave you with some practical tools that you can use in your regular lives to benefit from the ideas presented here.

Welcome to An Engineer's Search for Meaning. Let's begin.

The Whole Book in 5 Minutes

We can learn a lot about meaning, purpose and hope in life from honey bees. (Photo by Alexas_Fotos on Unsplash)

“What’s the purpose of a honeybee?”

“Its purpose is to collect honey, of course!”

“Anything else?”

“Well, I suppose it’s also to build and maintain its hive, tend to the larvae, etc.”

“Ok, but how do you know that that is its purpose?”

“Well, all I have to do is to look at it! How its body is structured, what it does all day, what effects its activities have, and so on.”

“What do you mean?”

“Look at its body. It has a tube protruding out of its mouth and a storage sack to collect the honey. It spends its whole day buzzing around the garden from flower to flower, doing its thing. Search on YouTube and you will find all kinds of videos about the life of honey bees. How they build their hive and maintain it, tend to the larvae, communicate with other bees and so on. Once you learn about all that, their purpose becomes pretty obvious.”

“Ok, but is that all? Maybe I should clarify myself. What I meant by ‘purpose’ was, what is their ‘greater purpose’?”

“Oh, I know what you mean! It’s pollination, of course! Everyone knows that they pollinate gardens and farms all over the world. You might have heard that there has been a decline in honey bee population worldwide and it is a major ecological concern. They say that without them the whole ecosystem could collapse! So keeping the ecosystem ‘humming’ - literally and figuratively - that’s their greater purpose, of course!”

“Sure, but that wasn’t exactly what I was getting at. Isn’t one’s ‘greater purpose’ supposed to be something mysterious, originating from some sort of a god or supernatural power, requiring some sort of a divine revelation before one can know what it is? All your answers so far were simply based on straightforward observation and analysis that anyone could do! Surely that can’t tell us everything about greater purpose?”

“Well, do we really need anything more? All that stuff about divine revelation may have been true in the past when we didn’t quite understand a lot about how the world works. But now we do. At least we know a lot more than we did. At least in this case. What we know about bees and ecosystems and so on is quite sufficient to figure out what their smaller as well as greater purpose is. And isn’t that quite wonderful and meaningful already? What can be more meaningful than ensuring the long-term survival of not just itself and its hive, but also the entire ecosystem?”

“Hmmm.. Interesting. I guess I can’t really argue with that! And I’m glad you brought up things like ‘wonder’ and ‘meaning’. I was going to ask you about that next. What’s the meaning of a bee’s life? What makes its life meaningful and wonderful?”

“Well, we don’t know if bees understand concepts like meaning, but I suppose we can try to imagine what it could be. So, I suppose, for a bee, a meaningful life would be something like knowing what its greater purpose is and living in complete harmony with it. Knowing that its work helps it and its hive and even the garden survive and thrive. If I was a bee, I would find that quite meaningful.”

“I like that! Everything you’ve said so far makes a lot of sense. So the next philosophical question that usually comes up after discussing meaning is that of hope. What might make a bee’s life hopeful?”

“Hmm, I just realized something. The great thing about this way of thinking about purpose and meaning is that hope is already built into it!”

“How?”

“We know that life is a process that started billions of years ago and has continued unbroken ever since. It has faced many challenges, of course, some even dire, but through all of that, it has continued to exist, spread and diversify in innumerable ways. It has faced severe climate changes, volcanic eruptions that blackened the skies for long periods of time, ice ages, asteroid hits, geological upheavals and every kind of disaster one can imagine in the past and come out of it stronger. In fact, this process of life looks almost impossible to root out once it has gotten started!”

“OK, but what has that got to do with hope?”

“Well, if a bee realizes that its life is an integral part of this process of expansion and enrichment of life, then doesn’t that provide a seriously strong foundation for hope? Because this process of life has managed to continue through every calamity imaginable and will very likely continue literally as long as the sun shines!

When we have such strong evidence, we don't really need to invent any feel-good stories for hope as we usually have to. It just falls naturally out of the evidence."

"Sounds very logical and reasonable. And yet somehow wonderful! You've not only given great answers to my questions but provided solid reasons for why those answers are, in fact, great. No handwaving or appealing to mysterious phenomena or dogma. Just the facts! I myself am a big 'evidence and reason' guy. No mumbo-jumbo for me, thank you!"

"Yes, but many other people have tried to define things like meaning, purpose and hope in life using only facts and logic before and failed miserably."

"That's true. But they missed a very important angle."

"What angle?"

"Let me ask you one more question to give you a hint."

"Go ahead! I'm enjoying this."

"Ok. If we want to find a human analog to what bees are or what they do all day, what would that be?"

"Hmm.. We have certainly heard the phrase 'worker bees'."

"But they are more than just plain workers, right? They build very interesting and complex things, discover new gardens, organize themselves in teams and societies and so on."

"Yes,. So artisans, maybe? Or even engineers?"

"Hmm.. Can you elaborate?"

"Well, they do build some amazingly complex, and huge - for their body size - and resilient hives. They keep maintaining and fixing them. And yes, they organize themselves into highly functional teams and have a strong, collaborative work ethic. They discover new sources of honey or even new locations for a new hive, plan how to migrate there and build afresh when needed. All these things sound exactly like what engineers do. At least when they aren't slacking like we are right now!"

"Well, we are having seriously important philosophical conversations, aren't we? Engineers are big suckers for those sorts of things too, you know!"

"Yes. But what does engineering have to do with the 'life, the universe and everything' stuff that you started with? And why are we talking about bees? How does any of this apply to people? Aren't we way more complex and demanding than bees?"

"Sure. People are certainly a lot more complicated and demanding as you say. We won't be satisfied with such simple answers. Yes, some of what we've talked about here does apply to us, but we need to go a lot deeper and broader and be a lot more thorough with our analysis before we can say how any of this applies to people."

"Of course we do!"

"And we need to do something different from what other people who have tried to do this in the past have done, otherwise we will fail the same way they did."

"Definitely. So is this the new angle you are talking about? I hope engineering isn't that angle!"

"Of course it is!"

"What? But isn't engineering, or technology in general, being blamed for many of the ills that plague us today? Everything from environmental pollution to social media to the possibility of an AI apocalypse?"

"Yes, that's true. So we can't just say 'engineering'. We have to qualify it carefully."

"Correct. So how about that?"

"Umm… You'll have to read my book to get into that! It will take a lot longer than 5 minutes!"

“Aha! I was wondering when you were going to shill your book!”

“Sorry about that! But you know…”

“Sure, I understand. And don’t worry. I’m already intrigued. I’m going to read it!”

“Great answer!”

“Anyway, all this talk about honeybees has made me thirsty for some honey-lemon tea. Would you like some? I make it from scratch, you know! From First Principles as they say, not from that industrially manufactured, pre-packaged stuff that no one knows where it came from!”

“Yes! Sounds like a great idea!”

The Whole Book in One Diagram

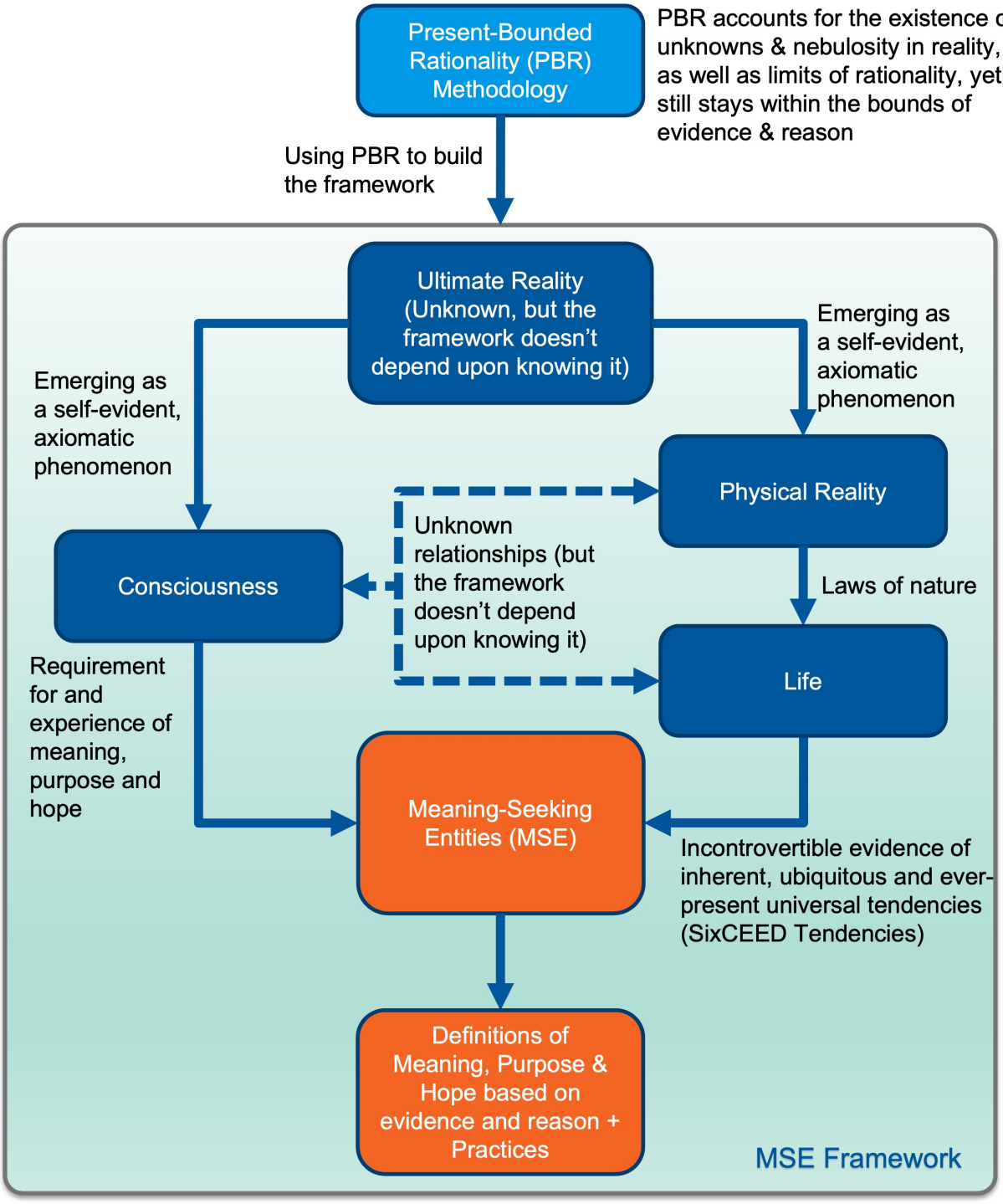
“Concern for man and his fate must always form the chief interest of all technical endeavors. Never forget this in the midst of your diagrams and equations.”

— Albert Einstein, Quoted in “Machine, Platform, Crowd: Harnessing our Digital Future” by Andrew McAfee and Erik Brynjolfsson

“The real voyage of discovery consists not in seeking new landscapes, but in having new eyes.”

— Marcel Proust, French writer

Since I am an engineer, I like to draw diagrams to help me think, as well as to present my thinking to others. Here is a diagram that captures how I have gone about deriving meaning, purpose and hope based on evidence and reason alone, starting from First Principles.



Meaning-Seeking Entities (MSE) Framework – Overview

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Let us start from the top of the diagram.

First, we define our methodology, which we call Present-Bounded Rationality (PBR). It is based entirely on evidence and reason, avoiding taking any leaps of faith or accepting any sort of dogma, no matter how respectable their source may be. (The meaning of each of the terms in PBR will be explained as we progress through the book.)

And yes, the PBR methodology acknowledges that we don't know everything and there is still a lot of nebulosity even in the things we do know. Not only that, but the methodology also acknowledges and accounts for the fact that there are well-known limits to rationality.

The beauty of the framework presented in this book is that we can still come up with solid definitions of meaning, purpose and hope based on this methodology.

I am calling this framework itself the Meaning-Seeking Entities (MSE) Framework. (These terms will also be fully defined in the book.)

The framework starts with a discussion of our Ultimate Reality (or the Great Unknown, if you prefer), followed by Physical Reality on one side, and Consciousness on the other, the two major foundations of the framework. We further show the phenomenon of Life emerging out of Physical Reality.

We also note that, at present, we do not know for sure the relationship between Consciousness and Physical Reality or Life. We do not even know if Consciousness is more fundamental or Physical Reality. But we do not depend upon knowing these things, and do not need to privilege one or the other to build our framework.

Note that we take all necessary care to avoid the typical pitfalls associated with other frameworks that attempt to define things like meaning, purpose and hope, such as needing to take leaps of faith or poetic licenses or appealing to authority. We honestly acknowledge our limits and yet make progress towards our goals.

Based on all of the above, we show that we have incontrovertible evidence that the universe appears to exhibit certain ubiquitous and ever-present "tendencies", which we call the "SixCEED" Tendencies. We define these tendencies and also define what we mean by Meaning-Seeking Entities (MSE) that naturally emerge from these tendencies.

We further define what we mean by meaning, purpose and hope, and where our desire for them emerges from.

Finally, all of this structure allows us to come up with rigorous definitions of meaning, purpose and hope, based on evidence and reason alone.

And, once again, being an engineer myself, I can't leave you with just some abstract definitions. I have gone ahead and defined some practices that anyone can follow on a regular basis to benefit from these ideas in their own lives.

Prominent New Concepts and Practices Developed in This Book

- The methodology of Present-Bounded Rationality (PBR) as an improvement over pure rationality for the purpose of understanding and working with reality
- Engineering as a far more powerful way (than religion or philosophy or even science) to understand and work with reality
- The connection between Present-Bounded Rationality and Engineering
- Meaning-Seeking Entities (MSE)
- The Meaning-Seeking Entities Framework
- The “SixCEED” Universal Tendencies
- A way to find Meaning in life using evidence and reason alone
- A way to find Purpose in life using evidence and reason alone
- A way to find Hope in life using evidence and reason alone
- The idea that Mindfulness and Active Inference / Free Energy Principle may be related
- The idea of consciousness as a new “virtual” life form that emerges inside complex living entities
- The idea of applying Active Inference to consciousness
- How the concept of and desire for meaning may be shown to emerge from consciousness itself performing Active Inference, in order to keep itself alive
- New practices based on the MSE Framework:
  - Mindful Moments
  - Purposeful Mornings
  - Hopeful Evenings
  - Meaningful Life

1. Motivation: A (Midlife) Crisis is a Terrible Thing to Waste

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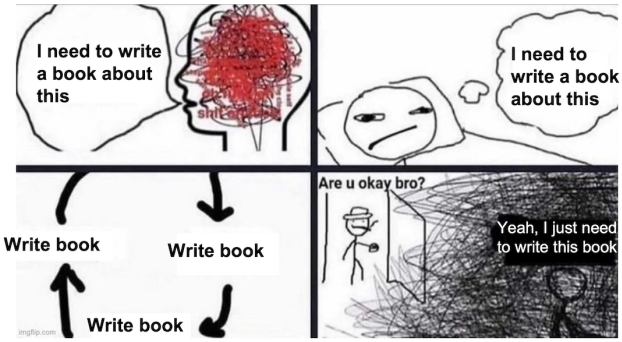

I Really Needed To Write This Book!

"An Engineer's Search for Meaning"

"Here comes 40. I'm feeling my age and I've ordered the Ferrari. I'm going to get the whole mid-life crisis package."

— Keanu Reeves, Canadian actor

"Look, if you had one shot or one opportunity

To seize everything you ever wanted in one moment

Would you capture it or just let it slip?"

— Eminem, American rapper, in "Lose Yourself"

What Would I Do if I Had Only 5 Years to Live?

A few years ago, I asked myself the above question.

No, I wasn't suffering from some terminal disease. Luckily what I had was something far more mundane and commonplace: a midlife crisis.

Lots of people go through it, of course. It's almost a rite of passage.

Some people might suffer for a while, but most manage to make a complete recovery and move on as if nothing happened.

Except, in my case, things happened. Big things. Evidently so big that I ended up writing a book about deep things like meaning, purpose and hope in life, no less!

The kind of book that philosophers, poets and those who have actually gone through serious suffering in life are supposed to write—not some guy who sits in a chair and writes code all day!

How does something like this happen?

Well, I'm going to tell you about it. That's what this chapter is all about.

But let me start with some general observations about this supposedly innocuous little condition known as "midlife crisis".

It is commonly believed that you have one big bad crisis sometime in your 40's, which makes you question everything you have done until then and whether that's all there is to life.

And then, depending on your circumstances, you either get a new car or a new career or a new carefree attitude towards life. Or maybe just a car-free lifestyle in an unfamiliar country. Some people go totally crazy and buy a whole vineyard or something. And others just get seriously drunk.

These activities typically result in your big bad crisis getting replaced by a smaller one.

Depending on which remedy you followed, you either end up with buyer's remorse or a new boss that's no better than your old boss or a "the grass looked greener there" type of disappointment. Or maybe just high Uber bills. Or bad wine. Or just a plain old hangover.

Luckily, most of us are far more familiar with handling these types of minor crises, having experienced them multiple times in our lives by then. In a short period of time, everything comes back under control.

Crisis solved, and life gets back to normal.

Unfortunately (or fortunately) for me, things didn't quite work out like that.

In my case, instead of one big bad crisis, I had more like a series of bouts over a few years.

This had the unexpected benefit that none of them were too severe and I was able to apply my learning from previous bouts to the subsequent ones. What doesn't kill you makes you stronger, right?

For example, I had already learned in previous bouts that buying a speedier car doesn't quite work because cops take special delight in giving speeding tickets to recovering midlife crisis sufferers.

I have always been a math / science nerd who liked to tinker with stuff, so I had never really had any doubts about my career as an engineer. Moreover, spending a few nights in karaoke bars had already taught me the hard way that becoming an entertainer was just not in the cards for me.

In earlier bouts, I had spent enough time driving through wine country to know that owning a vineyard was back (and bank) breaking work. Winemaking was not my cup of tea.

I had flipped through enough self-help books in bookstores (remember those?) to learn that the rational way of dealing with things like midlife crises was to clarify one's priorities in life by asking the hard question: "What would I do if I had only 6 months to live?" Whatever bubbled to the top of that list would be the thing(s) to focus on for your second innings.

6 Months to Live?

Once you get over the dread and anxiety of having to ponder your own mortality, you quickly realize that six months is such a short time that the answer usually turns out to actually be rather easy and, frankly, even

banal.

For most people, their 6-month bucket list would consist of things like getting their affairs (I mean financial of course!) in order, spending quality time with family and friends, smelling some roses, drinking some champagne, and generally taking things as they come, without too much complaint.

I had already tried all of those answers out.

Unfortunately, this had had the undesirable effect that my financial planner had raised his fees, my family and friends had started getting annoyed at me for calling them at odd times, my neighbors (whose roses I was smelling) had started looking at me funny and my doctor had told me to cut down on the champagne.

(Ok, I know this book is supposed to be all about facts and logic, but please allow me a little creative liberty to fail at being humorous in the first chapter, just so I can scratch that itch and get over it. I promise, after this chapter is over, it is all going to be facts and logic until you start screaming for more drama!)

Clearly, the "6 months to live" question wasn't working for me, though it made so much sense at first.

Still, I felt like there was definitely some truth to it. It did force me to seriously think about my life and prioritize things, but maybe it needed some changes before it became truly interesting and useful.

That's when it occurred to me - I needed to extend the time frame! Instead of 6 months, I needed to ask: "What would I do if I had 5 years to live?"

Now that's a far more interesting and useful question. Not to mention far less dread- and anxiety-inducing.

Extending the time frame to 5 years makes the question a lot more meaningful and useful. Answering it is not easy because the longer timeframe means there would be enough time to actually get some substantial and significant stuff done. A lot can be accomplished in 5 years.

Plus, the timeframe is also far more realistic. Unless someone is already suffering from something serious, they can probably count on having at least 5 more years to live, right? (Not to mention that medical miracles are making this possible even for many of those who may be suffering from serious ailments.)

The "5 years to live" question forces you to dig deep and see what it is that you really want to do in life or would regret not doing. With 5 years at your disposal, maybe you can still do it!

Is Panicking a Good Way to Start?

In my case, the answer came to me one day in the shower. Just popped right out of thin (well, more like thick and humid, to be frank, given I was in the shower) air, stood there in front of me and almost made me panic.

The scenario that materialized in my mind was so scary, I had to gasp for breath!

Let me put it this way.

Imagine you binge on a great TV show all weekend. Hour after hour, episode after episode.

Then, when you see your coworkers on Monday, you start raving about it.

You straightaway plunge into talking in great detail about all the wonderful characters and events and scenes in the show but then your coworker interrupts you and asks "Hey, back up! You're not making any sense. Why don't you first tell me what the show is about? What genre, what theme?"

A reasonable request, and yet, imagine that you are unable to come up with anything. You realize that you have no clue what the show is about. You are simply unable to come up with a coherent story or even a theme for it.

Suddenly all your excitement about the show looks completely overblown and your entire binge looks like just a meaningless waste of time.

If that happened to you, you would feel like an idiot.

Now, imagine if this binge lasted not just for a weekend, but for decades. Imagine it was an epic long-running drama with hundreds of episodes, twists and turns, successes and failures. Many of them highly memorable and poignant. Life-changing even.

And yet, you are unable to thread them all together into a meaningful whole. You aren't able to summarize what really happened in the show and what it all meant.

Not being able to tell any sort of a comprehensive, coherent and in-depth story about such an epic show wouldn't just make you feel awkward, it would be downright scary. It would make you question your sanity, as if you had suffered from a serious brain disorder or something. For decades!

Now imagine that this decades-long epic show was your actual life!

After having lived a decades-long life that contained hundreds of episodes, twists and turns, successes and failures, many of them highly memorable and poignant or even life-changing, if you were unable to tell a coherent story about it or even say what the whole thing was all about, that would make your whole life feel like a colossal waste of time!

Not just to your bewildered coworkers, but, even more seriously, to yourself.

And I don't mean just being able to tell an interesting story about your life, though that would be important, too.

I mean telling the story behind the story.

Ideally, you don't just want to describe the scenes, the events and the characters, but how those scenes may have come about, why those events may have occurred and why those characters may have behaved the way they did. Not just the "what" of your life story, but the "how" and even the "why".

You want to get into great depth and explain everything that happened in a coherent, comprehensive and logical manner.

Now, I agree that many people may say that they don't care about such things. They would rather focus on the people, the feelings, the poetry and drama of their life. Why bother going deeper?

But even such people, when pressed, will say that living a meaningful life is important to them.

In fact, finding meaning in one's life is and has always been important for the vast majority of people throughout history. That is exactly why we have come up with religions and philosophies and even poetry and drama.

And now, given the great strides we have made in science and engineering which have transformed everything else in our lives, I felt that we should even be able to look at life through that lens.

I felt that when it comes to something as important as one's own life, it should now be possible to not just be a great storyteller, but also a historian, an anthropologist, a biologist and maybe even a physicist, describing their whole life, all the way from the ground up, with every step along the way explained in the most vivid detail possible.

Not only that, but it should now be possible to do that for even this whole amazing thing called Life, the Universe and Everything. Doing so would provide the rich context within which the story of our own lives unfolds.

At a minimum, this looked like a very worthwhile exercise, at least to an engineering nerd like me.

Long story short, being able to tell the story of my life, as well as Life in general, thoroughly and from first principles, became an obsession for me.

This sort of thing becomes even more urgent when you realize that this may be your only chance! YOLO, right?

I had been given this one shot, one opportunity, to seize everything I ever wanted. How was I ever going to let it slip?

(Those are Eminem's words by the way, not mine.)

Meaning and Purpose

I felt I was really privileged to have been given this opportunity. To me, it almost looked like it was my duty to seize it. It had to be done.

So, it was time for me to get to work.

How do I make sense of my life all the way from the ground up? What are the underlying principles, forces and rules behind Life, the Universe and Everything? How do they ultimately lead up to my own life? Does my life have a purpose? Does what I do in my life matter in the larger scheme of things? What is this larger scheme, if there is one? And where is it all going?

In other words, what does this all mean and why does it mean that?

Of course, questions of this sort have been asked millions of times by millions of humans over millennia. And over the same period of time, many people have come up with some pretty interesting answers. Some of them have even withstood the test of time and gone on to become extremely popular, even to the point of turning into religions and philosophies.

(Interestingly, over time, the meanings of the words "meaning" and "purpose" themselves have changed. The words have taken on more theological or philosophical or even poetic connotations. And sometimes that is used as justification for why the methods of reason can not be used to reach them! But rest assured that there is a way to define these concepts scientifically as we shall soon see. And doing so not only makes them amenable to scientific analysis, but also more practical and, dare I say, more meaningful.)

It would certainly have been easier for me to just go with some highly popular ideas from ancient books, or sing moving verses from some great poems, or throw out some popular memes floating around in the zeitgeist that sounded cool. But I didn't want to do that.

Most of the religious or philosophical or poetic ideas rely on some pretty big assumptions. And very often there isn't any sort of a rigorous process to get to their conclusions. As a consequence, there is often a lot of inconsistency in them. Not only that, but many of those ideas have been proven incorrect over time.

As a scientist and engineer, I prefer to approach problems systematically. My training and daily practice have made me a highly analytical truth-seeker. As a result, I needed something far more solid.

I wanted to find honest, defensible answers to these questions, based on well-established evidence and rigorous, stepwise analysis, all the way from the ground up. No shortcuts, leaps of faith, hand waving, or dogma.

And if such a thing wasn't possible, I wanted to know the reasons for that. Was it because we just hadn't tried? Or was it because we hadn't quite gotten to it yet?

Or was there a more fundamental problem? Are there limitations to what we can know about reality? If so, I wanted to understand them. If there were some areas where we could be more confident but some others where we couldn't, I wanted to understand the boundaries and differences between them.

I saw no point in just feeling warm and fuzzy by lying to myself. In my book, it is perfectly fine to not know things, as long as you admit it to yourself and know why that was the case.

I wanted to know the most correct answers available today, and also understand why those were the most correct answers and what were their limitations, if any. Anything less seemed like selling myself short.

A tall order, to be sure. Scary even. But once it popped into my head, it became an obsession.

Answers, Entropy and Growth

It took quite a while to find and compile answers to these questions that could meet my, admittedly stringent, criteria.

What surprised me was that much of what I sought already existed. Some concepts were widely known, while others were obscure or emerging. Many of the ideas turned out to have been developed only in the last couple of decades. I needed to add only a few missing pieces and apply what I call the “engineering sensibility” to organize everything systematically, making it all fit together into a comprehensive and coherent framework.

As I got deeper into it, I kept discovering even deeper insights. Things that previously looked fuzzy started to become clearer. New avenues kept opening up, which led to further clarity as well as further richness of understanding. I even discovered that I knew things I didn’t know I knew!

Towards the end of this exercise, I found myself becoming more and more peaceful. Like a storm inside my head had started subsiding, the sun had started to peek out of the clouds, and the birds had started chirping again.

Not only that, but there was an unexpected bonus.

This exercise didn’t just give me answers to my questions, but pointed towards a better, more authentic way of life.

Some of the religious or philosophical or popular ideas that I had previously taken for granted suddenly lost their power over me, while some others started making a lot of sense.

Being an engineer, maybe I could describe the feeling as the entropy in my head subsiding and a new life-like growth taking its place. (Keep that image in your mind. We will be talking about entropy and life a lot in this book.)

The feeling was so nice that I felt I had to write it down and share it. What was merely a personal quest turned into a much larger and more formal project.

Long story short, the end result is this book, “An Engineer’s Search for Meaning”.

As the meme at the beginning of the chapter says, I just had to write this book. I would have written it even if only for my own satisfaction. But by putting it out there, I am hoping it will appeal to others who think like me.

2. Premise: Two Roads Diverged in a Yellow Wood…

Well, not quite a yellow wood, but we'll make do with this for now

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"All the interests of my reason, speculative as well as practical, combine in the three following questions: 1. What can I know? 2. What ought I to do? 3. What may I hope?"

— Immanuel Kant, German philosopher, in "Critique of Pure Reason"

"If you are in a shipwreck and all the boats are gone, a piano top buoyant enough to keep you afloat that comes along makes a fortuitous life preserver. But this is not to say that the best way to design a life preserver is in the form of a piano top. I think that we are clinging to a great many piano tops in accepting yesterday's fortuitous contrivings as constituting the only means for solving a given problem."

— Buckminster Fuller, American architect and systems theorist, in "Operating Manual for Spaceship Earth"

Man's (Incomplete) Search for Meaning

As I mentioned in the previous chapter, I really wanted to find honest, defensible answers to the questions of meaning, purpose and hope, based on rigorous stepwise analysis, all the way from the ground up. No shortcuts, no leaps of faith, no hand waving, no dogma.

But how was I going to do that?

Luckily, this quest is not uncommon at all. In fact, it might even be one of the oldest.

Since the dawn of time, in every corner of the world, scores of human beings have gone through this exercise. Time and again, people have asked fundamental questions about existence, such as:

- What is all this that surrounds us?
- What does it all mean?
- What is its purpose?
- Who am I?
- What is my purpose?
- Where is it all going?
- What can I be hopeful about?
- How can I live a good life?

Now, if you go down the street and try to ask a random person what they thought about the fundamental questions of "life, the universe and everything", most of them will probably say that they don't think about such stuff. (That is if they don't look at you like you were crazy and cross the street first!)

Many people probably go through their entire lives without ever thinking about these questions. Some might point to some book or some person. Some would say it's a luxury they can't afford. Some would even say it's a waste of time.

But the reason why most people are able to get through their lives without having to think about these questions on a regular basis is exactly because various people in the past have already done this thinking for them. Sometimes explicitly, as in some holy man/woman or philosopher or even scientist coming up with a brilliant idea that suddenly clears things up. At other times, the process was a lot more subtle, consisting of just regular people pulling up their sleeves and solving a problem they were facing, and then their solutions continuing to evolve through trial and error.

Over time, the answers and solutions that worked have turned into social structures, practices, laws, rituals, technologies and techniques, which hide all the underlying complexity of thinking and experimentation from the person in the street.

That's the reason most people are able to ignore such questions most of the time. (Isn't that the real luxury?)

We could even say that most of the progress humanity has made over the millennia has been, in large part, due to many such thinkers and tinkerers relentlessly asking such questions, simplifying the answers, creating structures and processes based on them, and bringing them to people.

The nerdy way of saying the same thing is that these questions and answers form the operating system of society, on top of which many apps have been built. Most people can simply use the apps to get through life. Only a few ever get their hands dirty by going deep into the operating system.

But that's what an engineer does, isn't it? An engineer whose hands aren't dirty is not really an engineer, right?

Engineers don't want to just use the apps. We want to understand the plumbing beneath them. We want to know how the apps work, where they came from, why these apps and not some other ones, how to develop new ones, and so on.

For an engineer, what can be more interesting than learning about the operating system of life, the universe and everything?

Note that here, by "engineer", I don't necessarily mean just those who went to engineering school or those who have it as their job title. I mean anyone who thinks like an engineer, anyone who wants to understand how things work and how they could be improved.

So my definition of engineers includes scientists, doctors, entrepreneurs, architects, lawyers, artisans and everyone in between. Anyone who doesn't want to just use the apps, but wants to understand the operating system underneath them, and build new apps or even a whole new operating system, if necessary.

But I am getting ahead of myself. We will get back to talking about the special role of engineers when it comes to things like meaning, purpose and hope in life soon enough. After all, the book is titled "An Engineer's Search for Meaning"!

For now, let us get back to the person in the street we started with, the one who said they rarely think about this type of stuff.

Whether they think about it or not, most people do face such questions, either explicitly or implicitly, when they have profound life experiences, such as births or deaths in the family or when diagnosed with a serious disease or when they break up with someone or lose their job or get betrayed or seriously disappointed in some way. Or when they face major life decisions, such as choosing a career path or a life partner or a new place to live. Or whom to vote for.

And of course, as we have already seen, when going through midlife crises!

To summarize, while these questions look rather obscure, they have been extremely important and influential throughout history, and continue to be so, both at the societal level as well as the individual level.

Needless to say, plenty of literature is devoted to them.

As a result, all I should have needed to do to find satisfactory answers to the questions of meaning, purpose and hope in life was to simply go to the library (or Google and Wikipedia or ChatGPT) and spend a few months reading.

Well, as it turned out, it wasn't that easy.

My insistence on answering these questions rigorously and from First Principles ended up becoming a major hurdle in my way. I didn't just want some answers that sounded good or were popular. I wanted to know how those answers were arrived at and be convinced that they stood on firm ground.

Unfortunately, that's not what I found in the library. Or any of the newspapers. Or the internet in general.

There were plenty of answers, to be sure. But none of them quite met my criteria. They all looked made. up, at least to some extent.

I had to make a choice. As Robert Frost's famous poem goes, "Two roads diverged in a wood…" One was well-traveled, while the other one wasn't.

(I am aware that there is supposed to be some controversy about how to interpret the poem. But we are going with the popular (mis?)interpretation here.)

Let us first look at the well-traveled road(s) and why they didn't work for me.

Well-Traveled Roads: Religions / Philosophies / Causes / Institutions

The largest bodies of thinking that address existential questions, and have the widest and deepest range of answers, can be found in the world's popular religions and philosophies. (I am combining these two categories because when I say religion in this context, I am really referring to the philosophical underpinnings of various world religions, not their cultural or political aspects.)

The second most popular path, particularly among people who have decided to move away from religions and philosophies, is dedicating themselves to various causes. These may include things like freedom, environment, justice, health, poverty, the arts and so on.

Alternatively, some people dedicate themselves to various institutions, including their employers or the industries they are in.

On a more fundamental level, we also have the popular triumvirate of money, power and fame that most people, knowingly or unknowingly, dedicate themselves to.

All of these approaches can be quite appealing, both emotionally and sometimes even intellectually. They can lead to happy and successful lives.

What's more, these paths contain many readily available options that you can simply follow, without having to find your own way. There are existing communities and activities that one can participate in, and they can provide a strong sense of meaning, purpose and hope to participants.

What I am trying to say is that I'm not disparaging these approaches at all. They can be quite attractive and even fulfilling. Along these paths lie some very powerful ideas that have impacted the world very deeply.

Here is just a sampling of some of these ideas that I myself find very appealing:

- **"Know Thyself" and "Nothing to Excess":** Two of the most well-known Delphic maxims inscribed on the Temple of Apollo. They have inspired many interpretations, but the ones I prefer are "deeply introspect as well as research yourself and the world around us thoroughly" and "everything in moderation".
- **Mindfulness:** The ancient Eastern practice of focusing one's awareness on the present moment, observing everything non-judgmentally, calmly acknowledging and accepting one's feelings, thoughts, and bodily sensations. The idea is by doing so, one can attain true wisdom.
- **Stoicism:** This is an ancient Western philosophical tradition that is based on the idea that the path to achieving "eudaimonia" (a well-lived life) requires one to practice four virtues in everyday life: wisdom, courage, temperance or moderation, and justice, and living in accordance with nature. It says that one should not get bothered by things that are beyond their control and instead focus on maintaining inner peace. Interestingly, there is a lot of overlap between the two independently derived philosophies of Mindfulness and Stoicism. This fact by itself is noteworthy because it suggests that there may be some deeper truth behind them. (Hold on to that thought. We will revisit both of these ideas in depth later on.)
- **Enlightenment:** This has two meanings. In the religious sense, enlightenment means reaching a state of complete awareness of our ultimate reality, also known as Moksha or Nirvana. In the historical sense, it is the Western intellectual movement emphasizing reason and individualism rather than tradition. Both of these are incredibly powerful ideas.
- **Brahman and Maya:** Concepts from the Vedas referring to the unseen underlying unity of all existence, and the world of illusion that we think of as reality, respectively.

- **Spinoza's God:** Baruch Spinoza, one of the most prominent Enlightenment philosophers, came up with the idea that the universe itself was God and there was no need to invoke any other divine presence outside of it.
- **Plato's Cave:** A story that serves as a wake-up call for people to seek the truth and not settle for what they see in front of them or what they are told as being the truth.
- **Aristotle:** Probably the most prolific originator or major contributor to many Western philosophical ideas, including logic, metaphysics, mathematics, physics, biology, ethics, politics, and so on. In particular, the idea of Thinking from First Principles, which forms the foundation of this book.
- **The Golden Rule:** The biblical rule of "Do unto others as you would have them do unto you."
- **Impermanence:** This is the idea from Buddhism and Hinduism that says that everything in the universe is constantly changing. In fact, it is better to think of everything as ongoing processes rather than fixed objects.
- **Yin-Yang or Shiva-Shakti:** These well-known concepts from ancient Chinese and Indian philosophies, respectively, suggest that the universe is full of opposite but interconnected, mutually perpetuating forces that also include each other, and are constantly changing.
- **Popular causes:** Freedom, Justice, Equality, Environment, Free markets etc.

The point I am trying to make is that all of the approaches mentioned above have a lot of strength and track records and can give deep insights about existence or how to live your life. I wouldn't be able to do what I do without these ideas and the work people have done structuring society on their basis. I am certainly in their debt.

But this list is cherry-picked from a whole grab bag of concepts that make up the religions or philosophies or causes they belong to. They form very small portions of the whole.

So, even if I could agree with the list above, I could not be satisfied with the bodies of knowledge they were a part of. And the list didn't form a coherent whole by itself. And I had some other issues with the list.

My Problems with the Well-Traveled Paths

While many ideas from world religions or popular philosophies or causes are emotionally, and sometimes even intellectually appealing, I couldn't always find rigorous justifications for them.

How were any of these ideas arrived at? What axioms were used and what steps were taken to get from the axioms to the final concepts? What body of evidence was collected in support of them? What alternatives were considered and discarded? What logic was used?

What's interesting is, some of the ideas are actually amenable to such rigorous analysis.

For example, the validity of the Golden Rule has been established using Game Theory. We will see later on in the book that the central ideas behind Mindfulness and Stoicism can be shown to have a scientific basis. The idea of impermanence can be seen when you get down to the molecular level, where everything can actually be seen to be changing constantly. And so on.

In fact, one of the reasons why these ideas interest me is exactly because I can at least see the outlines of scientific theories underneath them. But it looked like there wasn't much coordinated effort put into formulating such theories.

And, as I have mentioned already, even if these individual ideas could be proved in this manner, the bodies of knowledge they belong to don't always hold themselves to the same standard.

Most of these ideas are also frozen in time in some prehistoric period when people knew a lot less about the world than we do today. As a result, we now know that some of those ideas are clearly wrong or could easily be improved, but they still continue to be studied and practiced in their original form.

So, while I have already acknowledged the benefits of the road well-traveled and its attractiveness even to me, it just wasn't going to satisfy my requirements.

The Importance of Evidence and Reason

The importance of thinking rigorously from first principles based on a cohesive body of evidence-based knowledge cannot be overstated. It not only reveals truths that were previously unknown, or reveals flaws in our thinking itself, but it can even lead us to highly unintuitive or unpopular truths.

For example, the sun really does appear to go around the earth. All our senses and intuition tell us that this seems to be true. This was a commonly accepted idea for a long time, with large communities of people believing it and even finding meaning in it.

But the idea fell apart when people tried to build a comprehensive and coherent framework to explain the movement of multiple commonly known heavenly bodies.

This larger framework, known as Astronomy, which itself is a branch of Physics, tells us that it is the earth that goes around the sun. Not only that, but based on this framework, we can calculate how all the planets and other bodies in the solar system move and exert influence on everyone else's movement.

Physics is by far the most successful framework for explaining reality that we have ever invented. Using this framework, we can't just calculate where Mars is exactly, but we can fly to it. Or land on asteroids flying at astronomical distances and speeds. We can even calculate the probability of one of those asteroids hitting the earth, and how much damage that is likely to cause, and what we can do about it.

Isn't that not only a much richer and more satisfying explanation but also more useful in practice, not to mention existentially? Doesn't it eventually lead to other interesting discoveries like steam engines and lightbulbs and MRI machines and black holes and supernovae and how our own planet may have been born and so on? Doesn't knowing these things inspire more awe than simply accepting the first explanation?

Taking it a step further, if we built a rigorous, comprehensive and consistent framework for answering the deeper questions of life, wouldn't that be more satisfying and further strengthen those concepts, and even lead to new discoveries about life and the universe and our place in it?

For a science and engineering nerd like me, who is used to having everything clear-cut and buttoned down, the well-traveled path mentioned above left too many gaps. I felt that I needed to keep looking.

As a result, I found myself repeatedly coming back to science and engineering. This was the body of knowledge that met my requirements when it came to many other questions. This was my comfort zone, the path I trusted the most to take me where I wanted to go.

The Path Less Traveled: Evidence and Reason

One could say that science and engineering, which are the result of our dogged pursuit of evidence and reason to explain reality, have spoiled people like me.

This path has provided us with a very deep, wide and rigorous framework and methodology for learning about and even controlling reality.

Based on this body of knowledge, we can build rigorous explanations of phenomena from first principles, make trustworthy predictions, think of potential counterfactual scenarios and many times even make them come true.

When you understand a real-world phenomenon scientifically, you get a deep sense of satisfaction that you understand it far better than other ways of knowing. You can explain the phenomenon in a rigorous stepwise manner, all the way from the bottom, based on very few simple and well-known axioms.

Moreover, the entire body of scientific knowledge, constructed in the above manner hangs together with far fewer inconsistencies than the other alternatives.

Plus, this body of knowledge is humble enough to accept that it does not know everything. It even has a well-defined way of continuously improving itself whenever inconsistencies and exceptions are discovered.

This process can keep revealing new knowledge and even new capabilities that can enrich our lives.

Once you get a taste of this, it is hard to settle for anything else!

Long story short, it became clear to me that this was going to be the only way for me to get what I wanted.

Meaning Void, Meaning Contortions and Meaning Crisis

Now, I can sense the most likely objections you may have.

I am perfectly aware that there are well-known limits to science and engineering.

While reality does contain many discernible patterns that are amenable to factual and logical analysis, it also contains a lot of nebulosity, uncertainty and even unknowns.

In addition, we also have Gödel's Theorems that show the inadequacy of mathematical models to conclusively explain all of reality. (We will go over these limits and how we deal with them when we get to the chapter on our Methodology.)

As a result of some of these issues, as well as some dogma associated with religion, scientists and engineers have generally shied away from saying much about things like meaning, purpose and hope. They have been content to leave those concepts to the well-traveled paths mentioned earlier.

This has meant that anyone who wanted to travel the path of science and engineering had to either:

1. Give up on things like meaning, purpose and hope, creating a "Meaning Void" in their lives i.e. surrendering to nihilism, or
2. Go through uncomfortable and ultimately unsustainable "Meaning Contortions" trying to reconcile conflicting ideas from science on one side and religion or philosophy on the other.

Confounding matters further, while developments in science and engineering have brought us many benefits, they have also created a plethora of problems, such as environmental degradation, economic disruptions and social and political upheavals.

All of this has created what has been called a "Meaning Crisis" in modern times.

This crisis has been blamed for everything from the rising rates of anxiety and depression, drug abuse, loneliness, the disintegration of families and communities, political polarization and so on.

I suppose even my own midlife crisis could be seen as another consequence of the same problem. Just a generation or two before, someone in my situation would have simply read the prevalent scriptures or spoken to some wise person and been satisfied with their answers for what I was looking for, and not have had this crisis.

But it is not possible for people like me to do that anymore.

Those of us who have developed a respect for the ways of science and engineering need a robust framework for finding meaning, purpose and hope in their lives, that has a strong, rigorous and trustworthy foundation, where anyone can understand the entire framework and its methodology all by themselves, question any of its tenets and conduct their own experiments to verify for themselves the truth of its claims.

In the absence of anything already existing that could satisfy my requirements, I had no choice but to go out and build such a framework myself. And, luckily for me, I found a way to do it.

Using this framework, I was able to come up with definitions of meaning, purpose and hope that do not require leaps of faith or dogma.

I know, this may sound like a little too much "tech-bro hubris". But to my own surprise, I am not the first one to think along these lines.

It's Not Just Me Saying This!

Here is a (partial) list of people who have done great work in this area. All of them have far better credentials than me and have been working in this area for much longer than me. I am very much standing on the shoulders of some of these giants, as well as many other well-known scientists and thinkers.

- John Vervaeke ("The Meaning Crisis", Cognitive Scientist, U of Toronto)
- David Chapman ("Meaningness", AI Researcher / Writer)
- John Campbell ("Einstein's Enlightenment", Researcher / Writer)
- Sean Carroll ("The Big Picture", Physicist / Philosopher / Podcaster)
- Gary Drescher ("Good and Real", AI Researcher / Writer)
- Stuart Kauffman ("Reinventing the Sacred", Medical doctor / Biologist)
- Donald Hoffman ("The Case Against Reality", Psychologist, UC Irvine)
- Venkatesh Rao ("Ribbonfarm", Consultant / Writer)
- Erik Hoel ("The Intrinsic Perspective", Neuroscientist / Writer)
- Bobby Azarian ("The Romance of Reality", Journalist / Cognitive Scientist)
- Joscha Bach (Synthetic Intelligence, AI Researcher / Cognitive Scientist)
- R. Buckminster Fuller ("Operating Manual for Spaceship Earth", Architect, Systems Theorist, Writer)

While I do not always agree with them on everything, I have found some of their ideas useful or inspirational, and my own work has certainly been enriched by theirs.

I believe that all of these people, including me, ultimately have the same premise, just different approaches to it, and this is how it should be. Reality is complex, people have different backgrounds and contexts, and it is only natural that there are multiple paths leading to very similar ends.

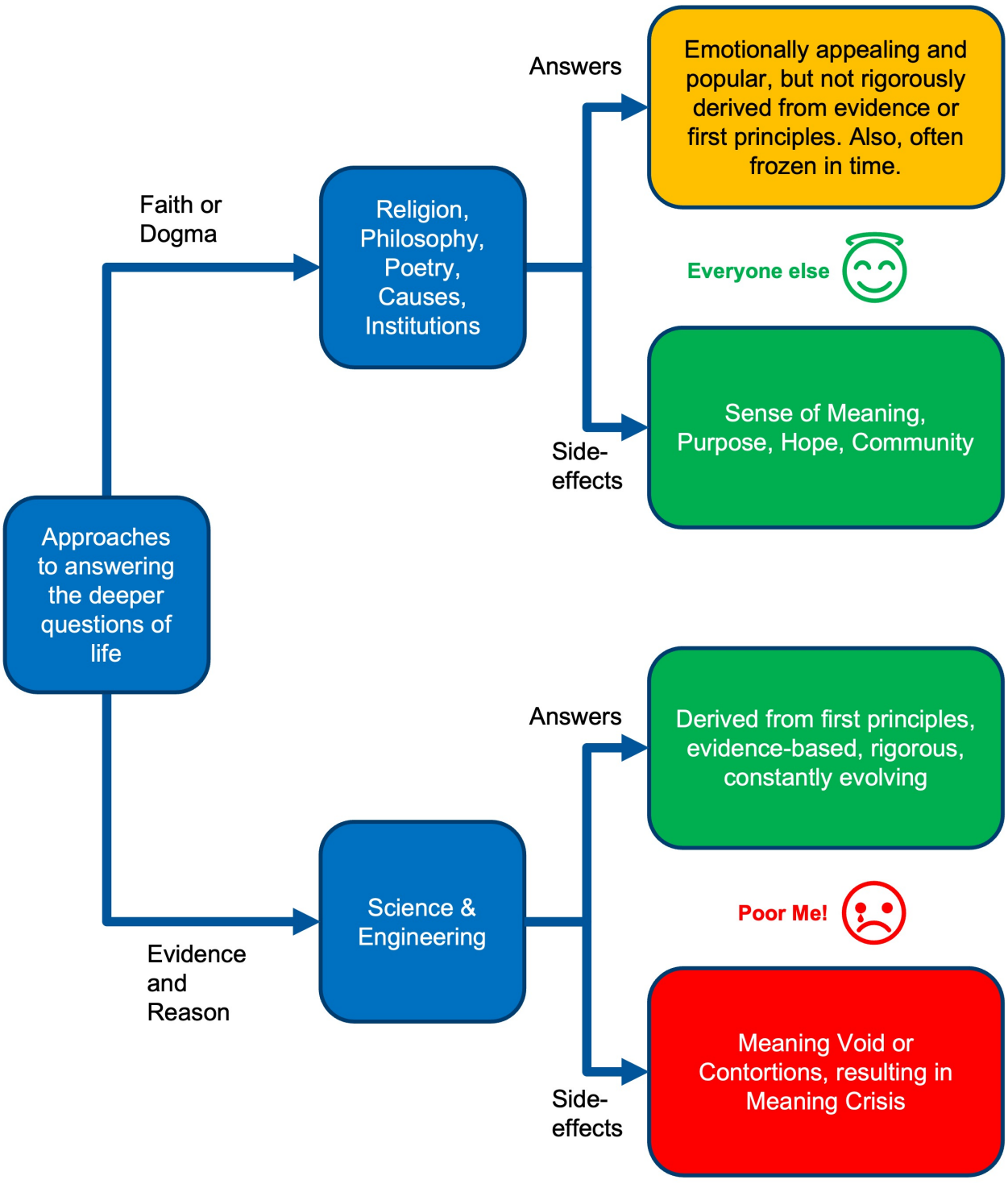
Also, this area is still relatively new and somewhat immature, so many perspectives are to be expected and applauded. I actually like the fact that many perspectives coexist and continue to interact and evolve as the field matures.

This is just like a diverse community of living organisms, each with their own unique characteristics, trying to fit into different niches, and yet having the same overall goals, resulting in a harmonious ecosystem, which appears to have a life of its own.

(Let us keep that image in mind, as it is another important theme in this book.)

This Calls for a Picture

Since I am an engineer and a visual thinker, I like to prepare diagrams to help guide my thinking. So here is a diagram that illustrates the premise of this book as outlined above.



Premise: Two Roads Diverged in a Yellow Wood

"An Engineer's Search for Meaning" © 2023 Vinayak (Vin) Bhalerao

Poor me taking the path less traveled

I include such diagrams throughout the book. They are a nice way to quickly recap the main ideas.

Let us quickly go over the diagram.

As you can see, when looking for answers to the deeper questions of life, the well-traveled path goes through an existing religion or popular philosophy or cause or even an institution. Its fundamental basis is usually faith or dogma or popular zeitgeist.

Such paths may lead to answers that are emotionally or sometimes even intellectually appealing. They are usually popular, practical and easy to follow.

But, for an analytical person like myself, they leave many gaps. Their answers are not based on first principles, they are often analytically unappealing or too dogmatic or frozen in time and sometimes even proven wrong or inadequate.

The less traveled path, on the other side, goes through evidence and reason and leads to science and engineering.

This path leads to far more trustworthy answers derived from first principles, that are rigorous, evidence-based, comprehensive, verifiable and constantly improving as we learn more.

Unfortunately, this path has not dared to get too much into questions of meaning, purpose and hope, so people who take this path end up with either a Meaning Void or having to perform contortions to somehow fit both sides of the diagram into their lives. This is what has led to a Meaning Crisis in various parts of the world.

Clearly the way out of this is to come up with definitions of meaning, purpose and hope based on evidence and reason.

This is the premise of this book.

In the next chapter, we will get into a lot more details about the promise that the book is making i.e. how we are going to go about solving the above problem.

Deep Dives

Throughout the book, I have included some “Deep Dives” that provide high-level descriptions of some of the important ideas that are mentioned here, but aren’t central to the framework we are trying to build. I highly recommend that you take at least a quick look at them, and if you find them interesting, go deeper.

Deep Dive: John Vervaeke’s “Awakening from the Meaning Crisis” Lecture Series on YouTube

This is a series of 50 video lectures on YouTube by University of Toronto professor of psychology John Vervaeke.

In it, he argues that, in his own words:

> “We are in the midst of a mental health crisis. There are increases in anxiety disorders, depression, despair, and suicide rates are going up in North America, parts of Europe, and other parts of the world. This mental health crisis is itself due to and engaged with crises in the environment and the political system, those in turn are enmeshed within a deeper cultural historical crisis that I call ‘The Meaning Crisis.’ ”

> **— John Vervaeke, Canadian philosopher and cognitive scientist, in "Awakening from the Meaning Crisis"**

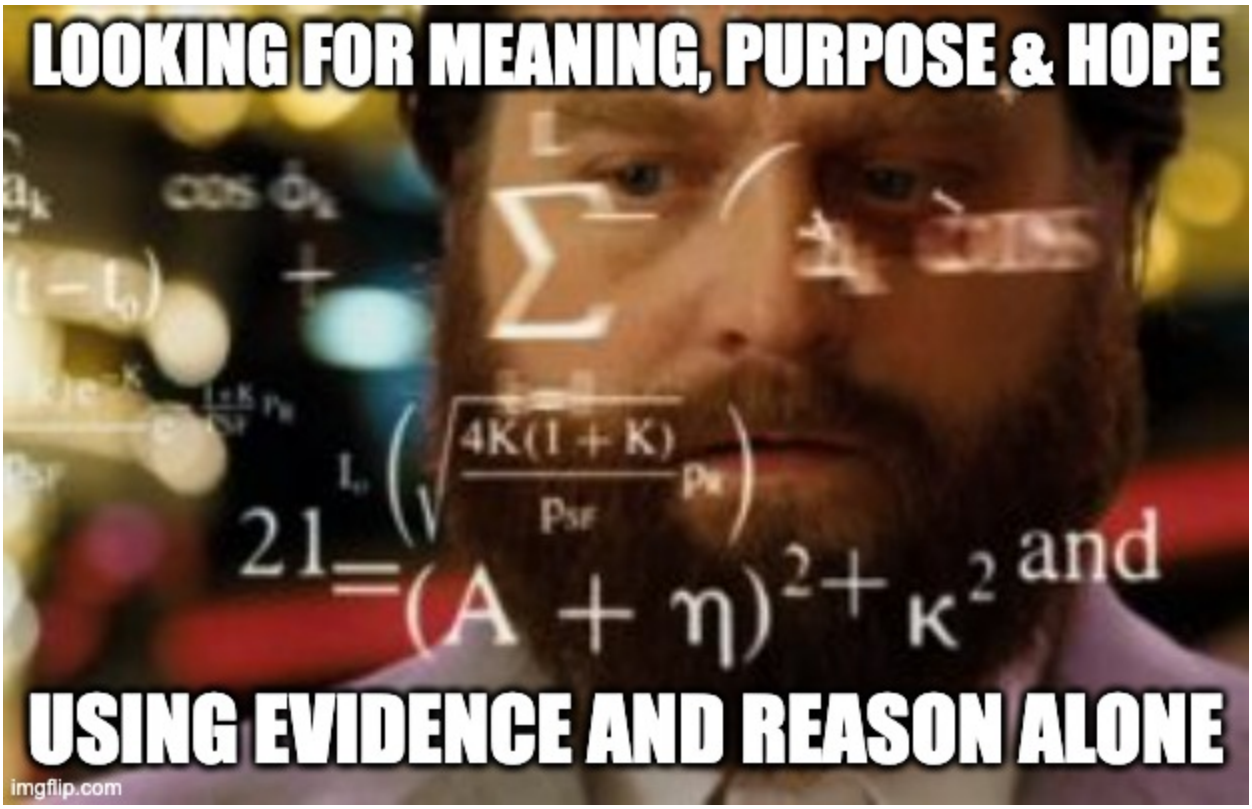
This wide-ranging and incredibly informative lecture series provides a detailed overview of many areas of Western and Eastern philosophies, building up the case for how and why the present-day meaning crisis has come about and what can be done about it.

The series combines insights from cognitive science, philosophy, and spirituality to provide a multifaceted approach to addressing the crisis. He suggests that this can be done by developing a "religion that is not a religion", which focuses on cultivating wisdom, participatory knowing, and active engagement with reality.

Ultimately, he suggests that we need to develop a new, secular sense of meaning that is grounded in science, philosophy, and psychology.

I highly recommend this series for anyone who wants to get an in-depth understanding of this topic, starting from first principles.

3. Bottomline: If Not Evidence and Reason, Then What?



If not evidence and reason, then what?

"You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete."

— Buckminster Fuller, American architect and systems theorist

"Anything that gives us new knowledge gives us an opportunity to be more rational."

— Herbert A. Simon, American political scientist

Is it Really Possible to Find Meaning, Purpose and Hope in Life using Evidence and Reason Alone?

We are lucky to be living in an era when we know so much about our world, discovered through a process that relies upon evidence and reason alone.

In fact, this may be the first time in our history that we can even talk about creating a coherent and comprehensive framework for navigating life's big questions of meaning, purpose and hope, based purely on a foundation of science and engineering, or more broadly, evidence and reason.

We are now at a point where those of us who have adopted evidence and reason as their primary guides in life, and have suffered from a loss of meaning as a result, can begin to recover it. And, with that, our sense of well-being, belonging, and happiness.

Before this, we didn't even have the required background knowledge for doing something like this, and as a result, had no choice but to take leaps of faith or just trust our intuitions and opinions.

It goes without saying that a framework based on a foundation of evidence and reason can be far more trustworthy than one based on faith or dogma. Moreover, just like any body of scientific knowledge, such a framework can be openly challenged and even improved by anyone who comes up with something that can be proven to be better.

Also, having the universal common language of science and math at its core ensures that people with vastly different religious, cultural, or ideological backgrounds can widely share and study the framework. It can even serve as a unifying force for all people around the world.

Beyond that, such a framework can provide new and deep insights into reality that, for many, can even reignite a sense of awe and gratitude for being a part of something so awesome. Such feelings are normally associated with faith-based lines of thinking, but it is possible to recover them even when walking on this path.

Over the next few chapters, I intend to describe such a framework that can accomplish all of the above and then some.

But before we go there, let us go over some disclaimers and potential sources of confusion.

(Note: You will see me using the words "evidence and reason", "rationality", "science and engineering", or just "facts and logic" somewhat interchangeably in this book. I am doing this mostly to break the monotony. We will talk about the relevant nuances that make them slightly different when needed.)

First, Some Disclaimers

I want to emphasize that I am not against any religion or philosophy. This book is not trying to stir up a controversy on that topic like so many other books that talk about science or rationality.

I am a curious person with a STEM background. I have simply followed my curiosity honestly and diligently and, to my own pleasant surprise, discovered some very interesting results and ideas in the existing scientific literature that provide all the basis needed for answering the deeper questions of life. I have had to add just a few extensions of my own and connect everything together into a coherent whole to form a complete framework.

Moreover, as I already mentioned in the chapter on Motivation, going through this exercise has been personally useful to me. It has brought a certain level of serenity and clarity to my life. I have also been able to recover my sense of awe and gratitude about life that we usually associate with faith.

And most importantly, I have a strong and defensible basis for saying all of this. I don't just know the "whats", but also the "whys" and "hows" of what I am saying, to the best extent possible.

As I went about researching the material for this book, and the vague outlines of a framework started crystalizing in my mind, many seemingly disconnected concepts that were all tangled up in my head got straightened out and a new sense of understanding emerged out of the clutter.

Many of the details got even clearer as I started writing things down, structuring them in a way that made sense to me, adding diagrams to explain them visually and so on.

They say that you only understand something well when you try to explain it to others. I have found this to be absolutely true. I have learned so much more about this topic, and even about myself, while writing this book.

Also note that, just like any other ideas in science, none of the ideas presented here should be taken as cast in stone or unquestionable.

This is why I prefer to think of the ideas in this book as a collection of scientific facts and results, not as a philosophy or doctrine. Everything in it can be challenged, tested, proven wrong, improved or replaced.

Still, I can imagine some of you rolling your eyes at the, admittedly, tall claims I am making.

There is a persistent dogma, even among scientists and engineers themselves, that things like meaning, purpose and hope are beyond the scope of their fields.

As a result, embarking on such an endeavor might come across as either incredibly naive or unbelievably arrogant.

Not without good reasons either. History is full of people who have tried to do similar things that resulted in disasters. Even recent history is full of "tech-bros" getting carried away with too much hubris and arrogance, getting into areas they had no depth or breadth in. So, it would be perfectly reasonable to ask: Am I just repeating their mistakes?

I am painfully aware of such objections. I accept the fact that this project is rather audacious and your skepticism may be justified. I am a skeptic too, just like most scientists and engineers are, so I can absolutely empathize with such suspicions.

So let me try to address some of these suspicions and objections in advance.

The Audacity of Finding Hope (and Meaning and Purpose) Using Evidence and Reason Alone

No kidding! Certainly, this endeavor is rather audacious, if I may say so myself. So, allow me to offer the following arguments in my defense:

A) Humility and Willingness to Learn

Having mentioned audacity, I guess it is time for me to talk about humility.

Other people who have undertaken this endeavor in the past have indeed failed miserably.

People in various parts of the world have tried to create entire architectures, economic systems and ideologies based on taking rationalism to the extreme. These attempts have resulted in everything from lifeless neighborhoods to failed economies to even unthinkable violence.

In my opinion, all of these failures were a result of hubris. Over-reliance on abstract reasoning without sufficient input from empirical evidence or an underestimation of the complexity of reality—whether in philosophy, economics, science, or moral reasoning—led them to extremes. They kept forging ahead even when weaknesses in their thinking started becoming evident.

One can say that they left rationality behind while pushing ahead with rationalism. Taking things to an extreme even in the face of evidence of failures is not rational.

We can certainly learn from these mistakes of the past and avoid their pitfalls. This is why we always say "evidence and reason" instead of just reason. And we talk about humility and willingness to change based on evidence.

These ideas are major pillars of the framework I am proposing. You will see them pop up time and again in the book.

Having gotten that out of the way, let us get back to some of the main justifications for following this approach.

B) We Already Use Science and Engineering to Answer Life's Other Important Questions

In the old days, it was customary for people to go to religious leaders when they were facing important life decisions such as what career path to choose or whom to marry or how to get rid of some ailment they may have been suffering from, and so on.

This was all we could do when we didn't have any better way of answering those questions. But over time, we have discovered far more reliable methods, based on science and engineering.

Here is a list of such questions and the modern methods we routinely use to answer them:

1) What occupation should I choose?

Modern methods: Creating a personal occupational and psychological profile, matching it to career profiles, looking at employment statistics and jobs databases, browsing career social networks etc.

2) How do I improve my health?

Modern methods: Medicine, diet plans, exercise regimes, therapy etc.

3) How do I find my life partner?

Modern methods: Psychological profiling, meetup or dating services, social media, relationship advice etc.

4) Where should I live?

Modern methods: Maps, demographic data, employment and living cost data, weather, and other statistics etc.

5) How can I become wealthier?

Modern methods: Financial planning, investing, budgeting, insurance, accounting, entrepreneurship etc.

As you can see, all of these modern methods are primarily based on evidence and reason, not faith or dogma.

Wouldn't the next logical step be to use the same methodology to answer life's deepest questions also? In fact, don't some of the questions from the list above partly rest on answering those deeper questions?

What's the holdup then, besides some dogma that somehow, these deeper questions are beyond the reach of reason?

Even if you could make only partial progress using this approach, wouldn't that be preferable to relying on something for which there seems to be no basis at all?

Which brings us to my next defense.

C) This is the Need of the Hour

The "meaning void" and "meaning crisis" that I mentioned in the last chapter are real.

Studies after studies have shown an alarming increase in depression and anxiety, polarization and intolerance, nihilism and conspiracy theories that have their roots in people not being able to find authentic and deep sources of meaning in their lives.

In addition, as a result of the amazing strides we have made recently in science and technology, our ways of life and thinking have been seriously upended.

In many cases, the frames of reference, realities of life and ways of thinking that were in vogue when various world religions or philosophies were developed would look alien to us today. We have drastically changed many aspects of our lives: the way we make a living, educate ourselves, connect with each other, feed ourselves, entertain ourselves, and so on.

This makes it urgent that we review the ideas of meaning and purpose that have been around for centuries and have formed the basis for a lot of our culture and institutions.

Moreover, some of the new technologies like AI, robotics and genetic engineering are raising entirely new questions about what it means to be human or what life itself means. It won't be too long before we are forced to make serious decisions about how to deal with them.

We badly need a rigorous framework that is based on the current body of knowledge and can address these challenges effectively.

The cost of not doing so can be very high, which brings me to the next point.

D) Meaning Traps

We supposedly live in the "Postmodern Era", which arose as a reaction to the excesses of the "Modern Era" that preceded it.

The Modern era was based on grand, centralized, all-encompassing theories and ideologies, many of which were based on science and rationality, but taken a bit too far. During that era, the pendulum swung too far, and as a result, it was only natural for it to reverse course and swing too far in the opposite direction.

This is what gave rise to the Postmodern era, which rejected everything that the Modern era stood for. Grand, centralized narratives of Modernism went out the door and Postmodernism set us free to find our own way.

A common refrain of our times is, "You don't need someone to tell you how to find meaning in your life, you can make it up yourself". Anything you feel is meaningful, by definition, is. Period.

This is a classic case of throwing the baby out with the bathwater.

Unfortunately, this has led to many people falling for all kinds of superficial or even dangerous ideas. The usual culprits here are extreme selfishness on one side or fads, totally made-up or shallow causes, conspiracy theories, opportunistic "influencers" touting various flaky schemes, and so on on the other side.

People who have been set adrift as a result of the Postmodern ideology can easily fall into such "Meaning Traps". Some of these traps even provide some sense of meaning, purpose and community, but people eventually get disappointed or at least confused. Worse, they get stuck in such traps, sometimes just digging themselves deeper into them.

Many people who tire of such Meaning Traps simply accept defeat, set their doubts aside and turn back to religious or philosophical or poetic ideas that they had left behind.

What I am trying to do is to offer a way to move forward instead of going back. A framework for meaning that is based on the deep, wide and proven body of knowledge known as science and engineering can help us free ourselves from such traps while avoiding the shortcomings of other approaches.

E) Isn't this Reductionism?

Reductionism is the idea that we can understand and explain reality fully by analyzing and describing all complex phenomena in terms of phenomena at a simpler or more fundamental level. Science, to a large extent, is based on this idea.

And it has been proven again and again that this approach doesn't always work in reality, particularly when we are talking about very complex phenomena.

For example, we currently can not explain consciousness in terms of neuronal activity, or the wetness of water in terms of molecular chemistry, or predict the shape of clouds from the movement of molecules of water or the day to day movement of markets from the fundamentals of individual companies.

A big reason for our inability to do so is that these phenomena are extremely complex, and trying to explain them in terms of small components quickly becomes computationally intractable. Also, some of these phenomena are emergent i.e. not only are they complex and intractable but they appear to display higher-order behaviors that don't even have a counterpart at the lower level, such as wetness or consciousness.

But it's not like we have any other way of explaining or predicting them either!

The point here is that we aren't claiming that we can explain everything fully using the methods of evidence and reason. What we are claiming is that these methods have a great track record of explaining many phenomena really well, are improving all the time, and nothing else even comes close.

People often say that faith or poetry "explain" a lot of these unexplained phenomena. But what they really mean is that faith or poetry are gesturing at or partly characterizing some of these things that we haven't found good explanations for. It is true that they may be pointing out some shortcomings in what science and engineering can do, but that doesn't mean they have anything better to offer in terms of explanatory or predictive power or accuracy. If you investigate these claims seriously, you invariably find erroneous assumptions, invalid evidence and ill-defined processes at play.

I see no point in relying on something even less proven than evidence and reason.

There is an implicit assumption in the criticisms of reason that it can never explain "everything". But we don't need to explain everything here. We have a much narrower goal of finding meaning, purpose and hope in life. And, as we shall see, we can absolutely do that!

This is similar to how we are able to land on asteroids or etch nano-scale circuits in semiconductors or edit DNA even when we don't know "everything".

This brings us to probably the most important question of all.

F) If Not Evidence and Reason, Then What?

If some real phenomena cannot be explained by evidence and reason, then what would you suggest we use?

If you believe that some phenomena are forever beyond the reach of reason, but you still believe them to be real, then, knowingly or unknowingly, you are admitting that you believe in some magical or supernatural power.

This is because there is no other way. We have only two choices for creating explanations or solutions: evidence and reason on one side, and faith, poetry or magic on the other.

Yes, it is true that some phenomena are too complex or too nebulous or even completely unknown or unexplainable at present, and some of them may even be unknowable. But just because we feel that there are some limitations to the rational approach does not mean we should suddenly resort to taking leaps of faith.

The rational approach not only allows us to discover and accept its limitations, it also allows us to keep learning more and keep updating our answers accordingly. This sort of evolution is built into this approach.

The alternative approaches don't allow for any of that.

It is evidence and reason that has allowed us to progress from "what are these twinkling lights in the sky" to land on a distant asteroid moving at incredible speed. Or "angry gods create plagues" to "here's a vaccine that can completely eradicate the plague".

Isn't it a lot better to base our thinking on a body of knowledge and methods that has such a fantastic track record than relying on some baseless stories that just feel good to us? Isn't it better to see what we can do with what we are sure of, and keep improving it as we learn more, than simply dreaming something up and insisting that it is the truth?

Ok, if even that argument didn't convince you, maybe I can try some other arguments that are commonly used when undertaking other audacious projects.

G) Think of This as Another "Moonshot" Project

We live in a world where "moonshot" projects are highly celebrated.

Some people want to go to Mars, some want to build superhuman intelligence, some want to build technology that will allow us to live forever and so on.

If they can dream about that and get everyone excited and participate, why not something a lot more immediately useful, feasible and, dare I say, noble or even divine, like finding a more reliable and defensible source of meaning, purpose and hope in our lives?

It is almost a no-brainer in comparison to the degree of difficulty, risk and expense of those other moonshot projects. It is not even close!

I can promise you, there is no chance this endeavor will lead to any massive explosions or extinctions or zombie plagues! At worst, you will just learn something new and deep about reality while keeping your life and limb intact.

Ok, after having addressed the futurists among us, let me say a few words to the traditionalists among us.

H) Well Established Precedent

This point is mentioned briefly in the Preface, but it deserves to be repeated here.

Centuries ago, people believed that epidemics or natural disasters were God's punishment for something they had done wrong.

Then, over time, we discovered that these were natural phenomena with scientifically provable causes. Then, over time, we even figured out how to deal with them when they occurred, make some predictions about them, and sometimes even prevent them from occurring in the first place.

It was our reliance on the process of science and engineering that allowed us to come this far.

This same process has been repeated in so many other areas of life. In each case, people used to believe that certain phenomena were mysterious, governed by some supernatural force. But over time, piece by piece, we were able to come up with rigorous explanations for them, and then improve our lives using the newly acquired knowledge.

Today, no one objects to the scientific explanations of those phenomena. And I believe we can make the same thing happen here.

Finally, allow me to make a democratic argument.

I) Another Voice in the Conversation

As the title of the book suggests, this is an account of one man's search for meaning. I am not at all claiming that what I am proposing here will necessarily work for everyone.

Different people will approach the issue from different angles. I'd much prefer a situation where mine becomes one of many such perspectives.

I am guessing that the perspective I am proposing will appeal to at least some people, particularly those with a STEM background who are unafraid to trust their own intellect and experience.

In fact, if it can help them, then I feel like I am really obliged to do so.

Moreover, I do have some evidence that this way of thinking works in at least once instance - because it is working for me!

I am not saying that my life has been completely transformed due to the ideas in this book - changing lives takes a long time, particularly if you aren't facing any immediate crisis. But I have definitely noticed a change in me towards feeling more peaceful, more confident and more aware. I am also seeing new nuances and more insights in simple and familiar things I encounter every day.

Most importantly, I now have a framework and toolset for analyzing events and improving decisions in my life from a new, firm and rigorous basis.

All of this gives me confidence that my voice is worth adding to the conversation.

I hope that these arguments satisfy most critics, so without further ado, let us dive in.

Time to Pull Up Our Sleeves

This reminds me of the motto of Blue Origin, Amazon founder Jeff Bezos' space company. I think it is quite pertinent here:

> *"Gradatim Ferociter!" (Step by step, ferociously!)*
>
> **— Motto of Jeff Bezos' space company Blue Origin**

So let us put on a moonshot engineer's hat and take a step-by-step but ferocious look at meaning, purpose and hope.

Needless to say, these words get thrown around a lot, but if we are going to analyze them rigorously, we need to establish what we are talking about from the very basics.

Words do not exist by themselves, they need a foundation and context, particularly when they are such important words and you are talking about looking at them from a new perspective.

Moreover, since these words ultimately deal with reality, and we want to do everything from First Principles, we need to start there. So we will start by defining our methodology for building the framework, then talk about the lowest layer in the framework, our Ultimate Reality, and then look at every layer above that until we get to our goal.

Let us start by giving the framework a name and then take a look at its parts.

The "Meaning-Seeking Entities" (MSE) Framework

Right off the bat, let us observe that "Meaning-Seeking Entities" sounds like a scientific or engineering term. This is very much intentional.

The term generalizes the idea of complex and conscious living entities such as ourselves, particularly when it comes to meaning-seeking. (We will define the term in more detail once we have built the scaffolding needed to do so.)

Generalizing the term allows us to potentially cover other meaning-seeking entities such as groups or communities of living organisms that act like conscious organisms of their own, or even artificial or alien lifeforms that may exhibit similar characteristics.

Thus, this is a framework that defines, from the ground up, layer by layer, what Meaning is, what Meaning-Seeking Entities are, how they become meaning-seeking and how they can find what they seek.

Each of the concepts below maps directly to a major part of the framework and there is a chapter dedicated to each of them.

A) Methodology:

The most fundamental aspect of defining a framework from First Principles is establishing what constitutes genuine knowledge according to the framework and what methodology is used to acquire it. Another word for this is Epistemology.

This is also where we will address the most important objection to what we are undertaking: limits to rationality and how we plan to deal with them. Our solution to this problem is to define a modified version of rationality, which I have termed Present-Bounded Rationality. We will go over what it means and why it makes a lot more sense than pure rationality.

We will also address why I keep adding "engineering" whenever I say "science" and why it is critical.

B) Ultimate Reality:

The next step is defining our model of ultimate reality, which is basically all that exists.

Needless to say, the knowledge of ultimate reality itself is acquired using the methodology mentioned above.

Of course, we won't go into all aspects of ultimate reality - that will take volumes. We will look at only the parts that we need for our framework.

C) Physical Reality:

We take it for granted that we live in a physical reality, but we also need to acknowledge that it may not be the ultimate reality. We do not really know how physical reality emerges from ultimate reality, but its existence is evident to us because we can perceive it using our senses.

Moreover, we have known for a long time that at least some aspects of physical reality appear to exhibit discernible patterns i.e. we can discover features and laws that seem to govern their structure and function. Physics is essentially a collection of such patterns.

But we also know that some things in physical reality are too nebulous to be captured as patterns, and some things are still to be discovered.

Here again, we will go over the parts of physical reality that matter for our framework. We will also start identifying some concepts that we will need to ultimately build our definition of meaning.

D) Life:

Normally, one would include Chemistry and Biology as the two layers immediately above Physics, but we don't need to make that distinction for this framework. For our purposes, clubbing them together into one layer called "Life" is sufficient.

Also, we will often use the term “Living Entities” rather than just “Life” because we want the term to represent all phenomena that display the characteristics of living organisms, starting from single cells to individual organisms (including AI or aliens) to organized groups or societies of such organisms, to even abstract concepts that may exhibit the same characteristics.

Also, normally we would consider Intelligence to be a layer above this, but again, for the purposes of this framework, we will include it along with Life. As you will see in the chapter on Life, it makes a lot of sense to treat intelligence as an inherent property of Life.

E) Consciousness:

Consciousness means different things to different people. We identify the most important definitions of consciousness that we will need for our framework.

Consciousness is one of the deepest enigmas of existence. We do not understand it very well, yet somehow it feels self-evident to us.

Typically, scientists and philosophers get stuck at this problem or even just ignore it altogether.

But in typical engineering fashion, we will not let its enigmatic nature hinder us, as long as we can still achieve our ultimate goal. We will try to understand what we can, use what we can, and see if we can continue to make progress.

As an aside, this is a critical difference between the engineering approach and the scientific or philosophical approach to problems, and why I feel so much more confident in using this approach where the scientific or philosophical approaches have difficulties.

F) Meaning:

The topic of “meaning” has been so muddied that we need to start by defining what the word even means. We need to figure out how to define it scientifically, what its essential attributes are and then figure out how to fit it into the framework.

This is where we will also define what we mean by “Meaning-Seeking Entities”. This will be followed by how the MSE Framework can help Meaning-Seeking Entities find meaning in their lives.

After we have done all this hard work, tackling purpose and hope becomes rather easy.

G) Purpose:

Here again we start by defining the term “greater purpose”. And then we will figure out how to define it using the framework. We will also start talking about how to convert all this theory into practice.

H) Hope:

It goes without saying that any framework that purports to explain Life, the Universe, and Everything should also be expected to provide a strong foundation for hope, otherwise it will lose its appeal to most people.

And, luckily for us, hope simply falls out of the MSE Framework. Moreover, it can be shown to be well founded, not merely wishful thinking, as it is in pretty much any other framework.

That will complete the discussion of all the layers in the MSE Framework. Lastly, it will be time to wrap it all up.

I) Call to Action:

Since I am an engineer, I don't intend to leave you with just a theoretical framework. Ultimately, the rubber has to meet the road. So we will take a look at some practices I have defined that are based on the MSE Framework. You can use these practices to bring the framework to life, i.e., actually find meaning, purpose and hope in your lives.

J) Executive Summary:

Everyone is busy, and reading long books is not always possible. So, in this chapter, I will provide a summary of the framework and the practices.

K) Rude Q&A:

Finally, it will be time to do some "rude" Q&A. Given that this is a rather difficult and audacious endeavor, and I have taken a slightly unconventional approach, I can absolutely imagine that people have many tough questions. Bring them on!

Ok, with that high-level introduction, we can finally start to dive into each of the parts of the framework mentioned above, starting with our Methodology.

4. Methodology: Engineering the Sh*t Out of My Midlife Crisis

The Martian didn't "science" sh*t, he "engineered" it!

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*"P(A|B) = [P(A)*P(B|A)]/P(B), all the rest is commentary."*

— Scott Alexander, Rationalist blogger and psychiatrist, in "Astral Codex Ten" (Blog)

"Nebulosity is pervasive. Other than in mathematics and fundamental physics, nothing is ever definitely this-or-that. Everything is always somewhat this and somewhat that. Put under high enough magnification, a stainless steel ball exhibits the same indefiniteness as a cloud. No ball can be perfectly round, nor made of perfectly pure steel, nor can one definitely say whether some particular atoms are part of it or part of its surrounds."

— David Chapman, Computer scientist and Buddhist scholar, in "The Cells of the Eggplant"

“Science can amuse and fascinate us all, but it is engineering that changes the world.”

— Isaac Asimov, Science fiction writer, in “Isaac Asimov’s Book of Science and Nature Quotations”

In this chapter, we are going to define the methodology we will use to build the MSE Framework. And since we want to be hardcore about doing things from First Principles, we are going to start from the absolute beginning.

Your beginning, that is.

A Journey of Discovery Begins…

When we are born, we know very few things about our new reality that we suddenly find ourselves in.

But what we are really good at is experimenting with the world and learning from it. Our very life depends upon it!

We quickly learn that when we are hungry, we cry and then we get fed. When we feel wet, we cry, and we get cleaned.

Then we start to associate some faces with the feeling of being fed or cleaned. As a result, we associate feelings of joy and comfort with those faces.

Then, we notice that the faces often smile at us. So we start to mimic the same action. This makes the faces smile even more and do even more feeding and cleaning for us, so this behavior gets fixed in our head.

Days and weeks pass. We are starting to get the hang of this new place. Familiar faces, familiar surroundings, familiar responses to our actions.

Life starts to become a little more predictable and thus a little more comfortable - at least some of the times and at least as compared to the complete chaos at the beginning.

Then one day, we open our eyes and find one of those familiar faces smiling at us. We beam back as usual.

But then, as if by magic, the face suddenly vanishes right in front of our eyes!

We are confused. What happened to that face? Where did it go?

The smile on our own faces disappears and is replaced with concern.

But then, before our attention wanders off, the face reappears seemingly out of nowhere!

Yaay! We are so happy! Everything is again fine with the world and we respond with a chortle.

Then the face vanishes again. And we are again confused. Where did it go? Why does this keep happening to me?

This cycle is repeated a few times and it is a roller coaster of emotions for us, with alternating joy and confusion.

Until we get tired. Or hungry. Or need to be cleaned.

And this game is just one of countless other pleasing, annoying and confusing things that occur around us all the time.

We start to realize that the world is a neverending series of confusing phenomena, i.e. magic, as far as we can tell.

Of course, we don't know the word "magic" yet, but we intuitively associate the underlying concept of magic with the world. We know that we can have some level of control over our fate, but the world is full of magic nonetheless.

Fast forward a few more months, and we start to figure out what's really going on with some of these magical phenomena.

By then, due to our incessant activity, curiosity and exploration of our world, we have started forming concepts like "the world contains objects", "the objects have properties like distance, movement, and occlusion", "most of these objects appear to persist, though they occasionally move", "sometimes, when an object moves, it can get occluded by another object" and so on.

We don't know what any of those words mean yet, of course, but we have started forming a tacit understanding of real-world physics. Not the definitions, formulas and equations yet, but the related attributes, behaviors and intuitions behind them.

Suddenly one day, while we are once again playing our favorite game of peek-a-boo, a light turns on inside our heads. "That face that appears and disappears, it isn't completely vanishing from reality. It is simply hiding behind an opaque object for a second and then reappearing!"

Unfortunately, once we start to understand this, some of these games start to lose their magic for us. When someone tries to play those games again with us, our attention starts to wander, looking for other magical things in the world.

And the same phenomenon repeats over and over.

Eventually, we figure out that most things that we initially thought were magical, turned out to be not so. They were predictable physical phenomena that we thought were unexpected or magical only because we didn't understand the physics behind them. But once we do, they don't remain magical to us anymore.

I believe that this joyful experience of magic (and its eventual loss) stays with us. Sometimes our whole lives. To the extent that whenever we come across something new that confounds us, our first intuitive reaction is to think that it must somehow be magical.

We cling to that joyful magical feeling so much that sometimes we prefer to suspend our disbelief or our natural curiosity just so that we can preserve the feeling!

Luckily, for many of us, the world contains a never-ending supply of magical objects and phenomena, and the fun continues. The cycle of temporarily experiencing magic, followed by exploration and understanding, which results in the loss of that sense of magic, continues in many directions and probably never ends.

What's interesting and truly magical here is the fact that we are naturally wired to be curious, to perform experiments with the world, to analyze their results, discover insights and find reliable methods for coming up with trustworthy explanations.

Over time, we have created formalisms around this natural tendency that we were all born with. We have identified various concepts and processes involved in it and created rigorous definitions and recipes for them. They form the ultimate basis for the methodology we will use in this book.

You guessed it, we are talking about the concepts of evidence and reason, and the processes of the mathematical, scientific and engineering methods, in order to make sense of and manipulate the world around us.

Let us take a deeper (and more formal) dive into them.

Evidence and Reason

Let us rewind back to the wonderful time when you had just opened your eyes for the first time and you knew very little about this totally new world you found yourself in.

Then, as your initial shock and displeasure about being thrust into this world against your wishes started to wear off, you started noticing things. Your brain was suddenly receiving a lot of input from the various senses that you were born with: sight, sound, smell, touch, taste, and proprioception.

You didn't know it at that time, but what your brain was doing was collecting evidence about the world (and yourself), detecting patterns in it, categorizing those patterns into objects and concepts, making logical inferences based on them, and slowly piecing together a model of the world and yourself in it.

With each new piece of evidence your brain gathered, it updated this model, bringing it more in line with how the world really is. The strength and direction of these updates depended upon how strong the new evidence was, how strong your prior understanding of the phenomena was, whether it was corroborated by multiple senses and so on. It did this most of the time without your conscious awareness.

You didn't know it at that time, but what you were essentially doing was Bayesian Inference. In fact, one of the leading theories of how our brain works is called the Bayesian Brain Hypothesis. It is fundamental to how we understand our reality.

(Note that any such descriptions of how our brain functions tend to be somewhat simplistic approximations of what really happens in there. In reality, the brain is a lot more complex and messy, but we can still usefully describe its function at a high level in the manner I have described. Keep these facts about the messiness as well as reasonable approximations in mind though, they are highly relevant to our endeavor and we will get to them soon enough.)

Over time, the model of reality that your brain built got larger and more complex, and most importantly, more capable of coming up with better explanations as well as making better predictions about phenomena in the real world.

And, the better your model got, the better your ability to deal with your new reality, going from total confusion to mere survival to some level of comfort to some measure of predictability and even control. Not perfect, but getting better all the time.

Also note that you did this not just by observing what was occurring around you, but also by performing various actions and observing their results. Not only that, but you acted on your curiosity, your imagination, and inspired by them, sought out new phenomena or built new things in the world, which further improved your understanding of it.

You didn't know this at that time either, but what you were doing is known as Active Inference. This concept is so important to all living beings that we will devote a major part of the "Life" chapter to it, later on in the book.

Observation, reasoning, memory, imagination and experimentation were the basis upon which you gathered most of your early knowledge about the world. (Apart from the knowledge that was inscribed into your genes already.)

In short, we can say that evidence and reason were the basis upon which you built your model of reality.

As you grew up, you also started acquiring knowledge in other ways, such as relying on what the adults told you or what the books said. Over time, you also learned some things via introspection (which again could be described in terms of evidence and reason, turned inwards).

The astute reader may have realized that what we are really talking about here is the area of philosophy known as Epistemology. So let's get into that next.

Beliefs, Knowledge and Gray Areas

Philosophy textbooks define Epistemology as the branch of philosophy that deals with knowledge: what it is, how we acquire it and related details.

Since we are trying to build a fundamental framework for meaning, purpose and hope from First Principles, based on knowledge rather than myths or dogma, we have to start there: What constitutes knowledge and which methods can be used to acquire it. (I have included a deep dive into First Principles Thinking if you are unfamiliar with it).

The most widely accepted definition of Knowledge is "justified true belief".

It is an honest admission of the fact that none of us really knows the ultimate truth of reality and all we really have in the end are beliefs with various degrees of justifications of their truthfulness. (For now, just hold that thought in mind. We will get deeper into this in the next chapter.)

So, in order for a belief to be classified as Knowledge, we need strong justification for its truthfulness.

It goes without saying that beliefs that don't have justifications should not be considered as knowledge. These are things like myths or dogma for which we don't have any basis. Note that we aren't saying that they aren't valuable in other ways. Myths and dogma play a huge role in human affairs. All we are saying is that they can't be considered to be knowledge, and since our endeavor here is to create a framework based on knowledge, we can't include them in it.

This still leaves a gap.

Not everything falls neatly into "justified" vs "not justified". For many real-world phenomena, in particular, when dealing with subjects like meaning and purpose, things aren't always so black and white. What do we do about those?

This is one of the reasons why people throw up their hands and say that these things are beyond the scope of rational analysis. But, as we have seen, this allows things like myths and dogma with even weaker bases to get in and fill the gap. We want to stop that from happening.

What we have to do in such cases is to honestly acknowledge when we don't have an incontrovertible explanation of some phenomena, but we may have a strongly justified one, and this justification is significantly better than any other.

In such cases, we can provisionally allow such phenomena into our model, with the understanding that they can be replaced if better justifications become available down the road. Also, we always remember that this inclusion is provisional and do not rely on it too much in our model.

Being able to deal with such gray or nebulous areas is an important aspect of our methodology. How we do this will become clearer as we proceed through this chapter.

To start the discussion, let us identify the types of knowledge and then sources of knowledge. This may look a little too academic, but its importance should not be understated. In fact, I would argue that many attempts at defining meaning and purpose go wrong right here.

Types of Knowledge

The first type of knowledge is Knowing Facts or Know-What. Here we include things that are typically associated with science. These come in the form of evidence, propositions, formulas, algorithms, equations, models, etc. that we use to explain natural phenomena.

The second type is Knowing How or Know-How. Here we include things like the skills associated with various processes, techniques and practices. This type of knowledge is hard to put into words, and can only be learned through observation and practice or apprenticeship. Other terms that are generally associated with this type of knowledge are Tacit knowledge or Embodied knowledge. Things like learning to play a musical instrument or riding a bike fall into this category.

There is a third type of knowledge, Knowledge by Acquaintance. This includes things like knowing a person or knowing the taste of some food. This type of knowledge can't be described in terms of facts or be taught via apprenticeship. It has to be learned via direct, personal relationships or encounters with the subject of knowledge.

Just to give you a taste of another way of defining types of knowledge, I have included a deep dive into John Vervaeke's Model of Cognition, which has a significant overlap with the above, but adds further nuances.

Next, let us look at the sources of knowledge.

Sources of Knowledge

The Stanford Encyclopedia of Philosophy states that there are 5 sources of knowledge:

1. Perception,
2. Reason,
3. Memory,
4. Testimony, and
5. Introspection.

While all of these sources are valuable, since we want to build our framework from First Principles, we need to be careful about how or under what constraints we use them.

It is easy to see that Perception and Reason are highly amenable to First Principles Thinking, because we can do those things ourselves.

For the third type, Memory, we should realize that while we do have first-hand access to our own memories, our memories do tend to fade or get overwritten over time. One way to mitigate this problem is to calibrate our trust in a memory based on how fresh it is or how likely it is that it might have been clouded due to our emotions or judgments.

Since it is practically impossible for us to experience or measure everything, we have to include knowledge acquired through the fourth source, Testimony, into our model. But, in order to do so, we need to have sufficient justification that we could acquire the knowledge ourselves if we wanted to.

For example, we can rely on a result published in a scientific journal (which would fall into the category of Testimony) provided we could, in principle, replicate the result ourselves if we wanted to. Scientific results are expected to fall into this category because being able to replicate them is a standard requirement for something to be considered scientific. (We have all heard of the "replication crisis", particularly in social sciences. Such a crisis is a lot rarer in the "hard sciences", so we will focus mainly on them.)

What about Introspection?

FInally, we need to say something important about the fourth source of knowledge, Introspection. There is some debate in the scientific community about how to deal with Introspection in an objective manner given that it is a subjective phenomenon.

In order to avoid stepping into controversial areas that border on pseudoscience or woo, we will only take any evidence derived from Introspection seriously if it meets all of the following criteria:

1. It must be simple to describe or define. The definition should be parsimonious and in its purest possible form, i.e. it should contain only the things that are absolutely necessary. Avoid tacking on any additional baggage.
2. It must be very widely corroborated. This entails that it should be easy to experience by anyone (including yourself) and the vast majority of people should agree on it.
3. It also goes without saying that it should also not be explainable in any other way. This includes all of the other acceptable sources of knowledge we discussed above, because, in that case, we would prefer those explanations anyway.

For example, this definition allows us to include the concept of consciousness, purely as subjective or phenomenal experience, into our methodology, without any of the additional religious or spiritual baggage that often gets associated with it. It fits our criteria because it is simple to define, in its purest most parsimonious form, we can readily experience it ourselves, is very widely corroborated, and we have no other explanation

for it at present. (Of course, if a better explanation becomes available down the road, we will update our framework accordingly. We will talk about this in more detail in the chapter on Consciousness.)

We will also allow for something like The Great Unknown, the idea that there may be things that are beyond our comprehension, at present and maybe forever. This includes answers to some of the deepest questions about existence such as “Why does anything exist at all” or “What is its ultimate substrate” or “What does ‘existing’ even mean” etc. And again, the idea of The Great Unknown in its purest form is easy to define, is parsimonious in its definition, is easy to understand, is widely corroborated, and no other explanation for it exists.

At the same time, we cannot include introspective reports of many other religious concepts such as the existence of supernatural beings with specific features or actions or commandments supposedly coming from them. This is because they aren’t widely corroborated in the sense that people don’t agree on any of their specific features or actions or commandments, often even getting into conflicts due to such disagreements. Moreover, we have been finding other explanations for many of their supposed features or actions. As a result, we will not be able to include such reports of introspection in our model.

One could say that all such religious ideas ultimately have a common, parsimonious core, which, as it turns out, is essentially the same as the idea of the Great Unknown described earlier. So while we do include that in our model, we don’t include any of the other attributes associated with any religion.

What About Intuition and Emotions?

Yes, it is true that we have also developed other ways of experiencing and dealing with reality besides evidence and reason, such as emotions and intuition. Many people believe that these are fundamentally different from reason and may even be superior.

But more and more work in neuroscience, evolutionary psychology, cognitive science, and even machine learning is leading us to believe that all of them have logic or reason as their ultimate basis. It is just a lot more complex and messier. One can think of intuitions and emotions as extremely complex networks of logical inference that we can’t always explain in terms of words. And possibly these networks have some emergent properties. But there is no other unknown or magical ingredient involved.

Essentially, unless one believes in magic, there is really no other possible source of these phenomena.

Moreover, we often find our intuitions and emotions failing us. This is because the validity of intuitions and emotions is heavily dependent upon the context you are in.

For example, our intuition might tell us that we should always go for high caloric foods. This is because this intuition has evolved in a time period during our evolution when nutrition wasn’t as readily available as it is today. So while the intuition may have been valid at that time, it is not valid today.

The same can be said about emotions. It is a common experience for all of us that there are times when an emotion is appropriate and when it is not.

So reason is still the arbiter that decides whether the context we are in is appropriate for relying on our intuition or emotion. And since we are trying to develop a general framework for understanding reality and finding meaning, purpose and hope in it, it makes sense for us to rely on reason.

And even reason has a boss: The ultimate basis of everything is always evidence. Reason is just a process we use to explain the evidence, compress and represent it in our mind, and make predictions about any future evidence we expect to encounter.

Bottomline

All of this discussion on epistemology may have just been a long-winded way of me saying that we are going to base the framework only on the principles of Evidence and Reason, without relying on any faith or dogma or magic or opinion. (Yes, I am aware that there are some strong objections to using this approach

for explaining reality, and in particular things like meaning, purpose and hope, and we will address them immediately after this section.)

It is true that taking this approach does mean we lose some of the sense of magic in our lives that we may have enjoyed in the past, but luckily we keep discovering new instances of unexplained or magical phenomena to entertain ourselves!

Also, an extremely important point to note is that any of the concepts that we do include in our framework can be challenged and even replaced if something better comes along. Nothing that is included here should be seen as final. In fact, being flexible and constantly improving, or being "alive", is an essential aspect of the framework.

Knowledge and epistemology in general are of course very deep topics in philosophy and volumes have been written on it. I am not really doing full justice to it here by describing them in one section. But I felt it is important to start there since we want to be absolutely sure that we aren't going to depend upon anything that does not have a strong justification for it, and we have thought about this aspect carefully.

This type of analysis is exactly what our insistence on rationality and Thinking from First Principles demands. (Now you may understand why I am unhappy with the other ways of finding meaning in our lives. They do not rise anywhere close to this standard.)

Still, an honest application of rationality itself requires that we recognize its limits, and come up with rational ways of dealing with them. In other words, we want to follow rational thinking as much as we can, but avoid becoming zealous followers of rationalism.

Limits of Rationality

First off, as I have already acknowledged in the previous chapter, this endeavor of trying to find meaning, purpose and hope using evidence and reason alone is incredibly audacious and we need to avoid any appearance of naiveté or hubris while tackling it.

The dictionary defines rationalism as "a belief or theory that opinions and actions should be based on reason and knowledge rather than on religious belief or emotional response".

That sounds a lot like what we are trying to do here, isn't it?

But it is also known that taking this approach too far causes serious problems. In fact, one of the strongest criticisms of rationalism is exactly that its adherents suffer from naiveté on the one hand or hubris on the other.

At a higher level, one can say that every good idea eventually gets driven off the cliff by its most ardent followers! The concept of rationality or rationalism is no exception to this rule. History is full of self-described rationalists driving themselves and their faithful followers off cliffs.

This occurs because many rationalists have a tendency to make it sound like reality is far simpler than it really is or that our rational thinking abilities are far stronger than they really are.

Rationalists usually fall in love with some abstract idea or model or "theory of everything" and really believe that it describes everything in reality. The idea or model is usually pure and clean and very appealing to our minds. Then they try to impose those pure and clean ideas on the real world. They try to make predictions or come up with recommendations for how to deal with various problems.

But, as we have seen, the real world is not as pure and clean. It contains a lot of complexity and nebulosity. So their predictions fail or their recommendations lead to disasters.

What they don't realize is that they are actually falling for the same trap that the non-rationalists fall for: taking leaps of faith! Their faith in their model is so strong that they ignore all the complexity and nebulosity of reality.

Ironically, other rationalists have analyzed this phenomenon, and come up with names for a set of psychological biases that many ardent rationalists suffer from:

- **Legibility bias:** The tendency to favor information that is clear, well-organized, and easily comprehensible over more complex or ambiguous content.
- **Formality or Elegance bias:** The inclination to prioritize solutions or ideas that are aesthetically pleasing or sophisticated in presentation, sometimes at the expense of practicality or functionality.
- **Systematicity bias:** The preference for structured and systematic approaches, often leading to a tendency to overlook or undervalue more flexible or chaotic methods.

We need to be careful to avoid these pitfalls of over-reliance on rational thinking. We know that reality is not always legible, formal, elegant or systematic.

We also need to distinguish between using rational methods in a bottom-up (or First Principles-based) manner vs using them in a top-down manner to prove some idea that the rationalist holds as sacred. The latter is basically the same as what is commonly known as "rationalization" and is not a scientific method. It is more of a method of advocacy, which is not what we are attempting to do here. We only want to create a framework that anyone can validate for themselves without anyone needing to advocate for it.

Finally, we need to acknowledge that reality seems to contain some regularities or patterns, but also a lot of nebulosity as well as many unknowns. And while rationality can help us come to grips with the patterned aspects of reality, it fails when dealing with nebulosity or unknowns. (This idea is critically important to the book, and I have included a Deep Dive into Pattern and Nebulosity at the end of the chapter to delve into some of its details.)

At an even more fundamental level, opponents of rationalism point to Gödel's Incompleteness Theorem as the ultimate proof of the futility of using rationality to understand reality. (I have included a Deep Dive into Gödel's Incompleteness Theorem at the end of the chapter, in case you are unfamiliar with it).

When people encounter these objections to rational thinking, their knee-jerk reaction is to totally give up on it and go back to far more irrational concepts to justify their beliefs (such as faith or emotions) or stop thinking altogether.

This is throwing the baby out with the bathwater. We don't want to do that.

Dealing with the Limits

In order to address all these limitations of using rationality to explain or deal with reality, we need to put some constraints on how we will apply it and also qualify the results we come up with.

We will do this in three ways.

A) Bounded Rationality

Needless to say that reality is full of complexity, nebulosity and unknowns. In spite of the great strides we have made, our ability to model reality accurately or influence it predictably is limited.

This can be easily demonstrated if you take a simple action that many of us do regularly, such as making dinner. Depending upon what you want to make, you will need a variety of choices of ingredients and cooking utensils, and they will be in different locations in your kitchen. If you're like me, sometimes you will have to search for some of them. Once you have gathered everything you need, there will be prep work which involves handling various ingredients, cutting or crushing them, and so on. Then there is the recipe you need to follow, but you may not be able to follow it exactly as specified because something you have may not exactly meet the specifications. For example, the water might be too cold. Or the spice may have lost some of its flavor. Or the butter may be too hard. Or the phone might ring in the middle of cooking. And so on. One has to both follow the recipe but also keep adjusting it depending upon all such unforeseen factors.

Add to that the large variety of kitchen configurations, recipes, ingredients and utensils, it should be no wonder that, in spite of a huge and lucrative potential market, we have not yet managed to create a general-purpose cooking robot.

These problems have been widely recognized and studied by many rationalists who had the misfortune of taking their beautiful formulas and diagrams and building something real in the real world. Such as a house. Or a sewage pipeline. Or, indeed, a whole city. This is the domain of engineering, rather than science.

One of the most prominent voices among such people was that of Herbert Simon, an American political scientist who has the rare distinction of winning both the Nobel and Turing awards. He formulated an approach known as Bounded Rationality to deal with these constraints.

This approach recognizes the limits to our knowledge of reality, the cognitive constraints of our intellectual ability, and the complexity of the problem.

As we all know, the problem we are undertaking, that of defining the MSE Framework, is one such complex problem, and would definitely benefit from this approach.

Bounded Rationality involves the incorporation of heuristics, tacit or embodied knowledge and evidence-based practices that can't always be formulated precisely in terms of scientific formulas. But note that we still need to be bound by the constraints of evidence and reason, not leaps of faith and wishful thinking.

Many engineering practices had already relied on ideas from Bounded Rationality even before this approach was formalized. And the approach gained in prominence in recent decades after people realized that their over-reliance on pure rationality caused many failures when they were met by the complexity and nebulosity inherent in reality.

The next pillar of our methodology is the Supremacy of Evidence.

B) The Supremacy of Evidence:

One of the largest pitfalls of rationalist thinking throughout history has been that people have sometimes become so confident in their process of reasoning that they have neglected clear and present evidence that was contradictory to the results of their reasoning.

The well-known failures of the cultural and architectural movement of Modernism, as well as those of Rational Choice theory in economics and its eventual replacement by Behavioral Economics, have been blamed on rationalism.

We want to avoid this trap.

It seems silly to have to say this, but, as a result of such traps, it becomes important to say it anyway: We must always treat evidence as the ultimate arbiter, no matter how confident we are of our reasoning process.

Here is a famous quote that captures this sentiment perfectly:

"It doesn't matter how beautiful your theory is, it doesn't matter how smart you are. If it doesn't agree with experiment, it's wrong."

— Richard Feynman, American Physicist

Evidence is where the rubber meets the road. If the evidence does not agree with the results of our reasoning, then we must go back and deeply investigate our entire reasoning process. We need to reevaluate our starting point or look for any piece of evidence that we may have missed along the way and update our process accordingly.

Of course, when we start talking about the importance of having good starting points, the next question that arises is: How do we decide what is a good starting point?

Many models of reality rely on starting points that are abstractions or "somewhere out there" e.g. some abstract principles (including "The Great Unknown") or values (including "human values") or ultimate goals (including "human flourishing"). I am not saying that these starting points are necessarily wrong, but they

are often been taken for granted without providing any supporting evidence for why those starting points and not some others. If we did that here, this whole project would become meaningless.

We need a starting point that is a lot more defensible and real.

As a result, I have chosen to go with something much more concrete and trustworthy as a starting point: the present moment.

C) Grounding in the Present Moment

If there is one thing I can be most sure of, it is that I exist right here, right now. I am alive, awake and experiencing this present moment. And the same applies to you.

So it makes sense to start from there instead of from some abstract concepts for which we may have no evidence.

We have a far better understanding of our present situation and the forces at play in the current moment than any other situation or moment. It is well acknowledged that our ability to predict things too far into the future (or remember things from the past, for that matter) goes down rapidly as the timespan increases. Same for physical distance or difference in contexts in general.

This is because reality is extremely complex, involving too many entities and forces acting on them along too many dimensions. Trying to apply our relatively limited knowledge of reality to this complex soup quickly leads to combinatorial explosions. Real-world systems are also extremely sensitive to initial conditions, which we may not be able to measure accurately. As a result, the longer the time or distance horizon or along any other dimension, the less we should trust our ability to make any statements about it.

It is not just that none of us can say exactly what will happen tomorrow or whether our account of some distant event in the past is accurate in all its aspects. Even well-known scientific theories, such as the origin of the universe or its presumed end aren't as clear-cut as we think they are. There are serious challenges to either the whole or parts of these theories.

In the MSE Framework, the way we deal with this limitation is to put most of our trust in the present moment, and our present location in space, and our current context or location along all other dimensions of reality that we can think of. We want to base as much of our thinking on phenomena we can observe "right here, right now".

Note that this does not mean we can't look at the long-term or distant phenomena at all. We can and certainly do make long-term plans and strategies when going through our lives. But all our actions are always in the present. And given that everything is constantly changing, we may have to adjust our planned course of action. This adjustment, again, occurs in the present moment.

It is important to realize that there is really no getting away from the present moment! Everything else is an abstraction, i.e., a simplified and often inaccurate or even completely untrue, model of reality.

This is clearly in contrast with most other ways of thinking about meaning, purpose and hope. Their insistence on abstract or far-off phenomena (such as the beginning or the end of the world, or heaven and hell, or some supernatural power etc.) necessarily involves taking leaps of faith. Often the distance from our present situation to those phenomena is so large that, if we are honest, we are simply unable to apply any sort of rational analysis to them. (Interestingly, this allows their proponents to claim that rational analysis is useless for such purposes. This is circular reasoning!)

Starting from and focusing on the here and now makes our methodology far more robust and amenable to rational analysis as compared to the alternatives.

D) Humility and Open-Mindedness

By now, this should go without saying, but it is important to state: It is really important to remain open-minded and humble throughout this endeavor.

One of the most important failures of rationalists in the past has been overconfidence and hubris. This is what made them go out and rearrange the world based on their ideas and ignore clear evidence that things weren't quite working as they had imagined. And then they kept pushing ahead even after their ideas had completely failed.

One of my favorite saying is "All good ideas die at the hands of their most ardent supporters."

We obviously want to avoid this fate.

Combining all of these ideas then allows us to come up with a meaningful name for our methodology: "Present-Bounded Rationality".

Let us formally state what we mean by it.

Present-Bounded Rationality

As the name suggests, Present-Bounded Rationality combines elements of Bounded Rationality with the idea of starting from and focusing on the present moment. Both of these are well-known concepts, though, as far as I know, this particular combination appears to be new.

Let us now formally define what we mean by Present-Bounded Rationality by looking at its key characteristics:

A) Insistance on Evidence and Reason:

It should go without saying that fundamentally we are still talking about a rational method of knowledge acquisition, but with a few modifications. So it is still primarily about using evidence and reason.

This means using the well-known techniques of Thinking from First Principles, Bayesian Inference and the Scientific Method. (These should be quite familiar to many people, but Deep Dives on each of them are included below for completeness.)

As we have already discussed, there are some caveats to this, which brings us to the next point.

B) Acknowledgement of the Complexity of Reality and Our Cognitive Limitations:

We have already acknowledged that reality is extremely complex, contains a lot of nebulosity, unpredictability and even unknowns, and our cognitive ability is limited. As a result, our ability to deal with reality has some limits.

Even when we discover some patterns in reality, we may not be able to meaningfully extrapolate them too far beyond a certain point. We may be able to say some things with a high level of certainty, but some of the details may be fuzzy, and may even become meaningless if stretched too far.

Needless to say, we still need to create practical, realistic and rational explanations and make useful decisions within these constraints. The next two characteristics of our methodology address these constraints.

C) Satisficing:

Satisficing is a combination of satisfying and sufficing. This is a well-known idea in real-world problem-solving, particularly in engineering.

The idea here is that sometimes, due to the limitations described above, coming up with perfectly optimal solutions to some problems may not be feasible. In such cases, we may need to settle for solutions that are "good enough" and keep improving them over time.

This is basically what we do pretty much all the time in our real lives. We are constantly making decisions in a complex and dynamic environment based on very limited knowledge. In fact, it has been shown that the total amount of knowledge, as we expand further out from our immediate context, is so incredibly large that there is simply no way we could analyze it rationally. We are almost always forced to satisfice.

There is ample evidence that everything in nature itself follows this approach. No system in nature can afford to look for the perfect solution, settling instead for something that is good enough and incrementally getting improved via the process of evolution.

Some of the most well-known examples of satisficing are the human reproductive system, the way pollen gets spread by bees, and indeed the process of rapid iterative development with constant feedback that is recommended for startup companies.

D) Grounding in the Present Moment:

A major flaw in how rationality is applied by many ardent rationalists is that they have a strong belief in some abstraction and they try to fit reality to it instead of the other way around. In many cases, they continue to do this even when their flaws become known because the abstractions are a lot easier to manage and intellectually appealing than the messiness of reality.

What we will aim to do in our methodology is to always remain grounded in reality and try to fit our models to it rather than the other way around.

We also need to maintain a certain level of detachment from our emotions and feelings while doing so. (We shouldn't have to say this, but this is one of the most common flaws in other models of reality.)

But even non-judgmental grounding in reality isn't sufficient. We need to be clear about what point within it that we have the most confidence in.

Starting from and focusing on what is occurring "here and now" or "clear and present" reduces our dependence on the (potentially flawed or incomplete) accounts of the past or inherently unpredictable extrapolations about the future or indeed, the unjustifiable jumps from reality to myths or abstractions.

This concept can also be generalized to other dimensions besides time, such as physical distance or the number of hops in a network etc.

Primarily focusing our attention on our local vicinity along all these dimensions drastically reduces the complexity of the problem we are dealing with, ensuring we have a far stronger basis for our thinking and far better effectiveness in our actions.

And, again, by doing so, if we are able to create good enough explanations and solutions, and they can always be improved as we learn more, then that works for our purposes.

E) Humility and Open-Mindedness

I won't belabor the point again, but including this here again, since it is such an important aspect of our methodology. Remaining humble and open-minded are extremely important pillars of Present-Bounded Rationality.

Since that was probably a little too long-winded (though, IMHO, necessary), I have included a cheat sheet below as a deep dive.

Before we proceed, I want to emphasize two interesting points.

Mindfulness and Stoicism

I am not the first one to suggest ideas like non-judgemental focus on the present moment (though, as far as I know, I am using it in this way for the first time.)

In fact, what I am talking about looks a lot like the practice of Mindfulness. This connection between the Present-Bounded Rationality methodology and Mindfulness isn't accidental either. There is a strong scientific basis for this connection, and we will explore this in much depth in the chapter on Life.

Also, note that the ideas of grounding in reality and non-judgmental observation are central to the Western tradition of Stoicism.

I believe that the fact that our Present-Bounded Rationality methodology has so much in common with well-established practices in two totally unrelated traditions lends further credibility to the methodology. We will rely on this fact much later in the book when we talk about developing practices based on our model.

The second point I want to address is a common misconception about the relationship between science and engineering.

Science vs Engineering

You may have noticed that I keep mentioning engineering in the same breath whenever I talk about science.

This is very much intentional. There are some interesting and critical differences between science and engineering.

The most obvious may be that the methodology of Present-Bounded Rationality is actually closer to engineering than to science. One can say Present-Bounded Rationality has the same relationship to engineering that pure rationality has to science.

But this idea goes a lot deeper than that.

We usually think of Engineering as the application of science and math to some real-world problem. For example, Wikipedia defines Engineering as follows:

"Engineering is the practice of using natural science, mathematics, and the engineering design process to solve technical problems, increase efficiency and productivity, and improve systems.

— Wikipedia

This way of defining engineering makes us believe that science and math were developed first and then engineering was developed as their application. But this is not true.

What do you call the activity that honeybees or spiders or birds perform when they build or fix up a hive or a web or a nest? What do you call the activities that human beings were engaging in when they started using the first tools or practicing agriculture or building shelters long before there was any notion of science? What do you call the activities that go on in your own body when it is repairing a broken bone or patching broken skin?

Going even deeper, when you take a close look at the activities that go on inside a living cell, such as various proteins performing various tasks such as building tracks for transporting molecules from one part of the cell to another or making copies of DNA and so on, a lot of them look exactly like what we would typically call engineering.

Every biological cell, as well as the organ or organism they are a part of is a nano-factory.

Don't these activities involve building or fixing complex structures in a methodical and repeatable way? Don't all of them involve complex technical problem-solving based on an understanding of requirements, physical principles and local conditions?

In other words, doesn't it all look like engineering?

What's interesting here is that neither honeybees nor spiders nor birds nor even the living cells in our bodies have any explicit or formal understanding of science or math. One could say that they have embodied or

tacit knowledge of them, which they have acquired through the trial and error method of evolution, but none of that knowledge is in any form that we can recognize as an explicit scientific formula or model.

On the other hand, in spite of this seeming lack of understanding of science or math, all of these entities are able to deal with complex, nebulous and even unknown aspects of reality, which science and math struggle with!

And their methodology for doing that looks a lot like Present-Bounded Rationality!

I think that engineering, seen in this light, is a much broader and older discipline than what we have typically believed it to be.

One could even say that engineering, and its basis, Present-Bounded Rationality, are the primary activities all living creatures engage in.

Only for intelligent creatures like ourselves, science and math emerge as secondary activities that aid and formalize (and eventually improve) parts of various engineering methods and practices, instead of the other way around.

An engineer's ultimate responsibility isn't to discover scientific explanations or mathematical bases for phenomena but to solve a real problem in the world in a systematic way. And often, this has been achieved irrespective of whether the scientific or mathematical basis for the method used to solve the problem is known in advance.

Of course, such explanations or basis can always come later and may help improve the engineering method in turn, but it is not essential to the activity itself.

The point I am trying to make here is that engineering is far more powerful than even math or science, particularly when it comes to dealing with the real world or even the deeper questions of life.

One can say that engineering isn't just an application of science and math to real-world problems, but science and math are formalizations of engineering methods!

There is a general belief that math and science are inadequate for the task of dealing with many aspects of reality, including things like meaning, purpose and hope. The reason why I keep bringing up engineering is exactly because I think this inadequacy can be effectively addressed by adding engineering (and the related methodology of Present-Bounded Rationality) into the mix.

Now, I know what you're thinking. "But engineering or technology has created its own problems!"

Yes, that's true. Some of the major evils that plague us today have been blamed on technology: Everything from nuclear weapons to factory farming to overfishing to social media to the potential for the dreaded "AI apocalypse".

This is where, once again, some of the important aspects of Present-Bounded Rationality come into the picture. If you constrain your engineering efforts by grounding them in the present and being humble and open-minded, you can overcome the aforementioned evils.

In fact, I am going to go ahead and coin another term "Mindful Engineering", to capture this. One can think of Mindful Engineering as the realization or embodiment of Present-Bounded Rationality.

In other words, Mindful Engineering is the practice of Present-Bounded Rationality i.e. systematically building things or fixing problems in the real world, while practicing Bounded Rationality, grounding in the present moment, the supremacy of Evidence, humility and open-mindedness.

This reminds me of something.

Well, But What About the Martian?

At the beginning of the chapter, I included a meme about The Martian. Let me explain why.

In the movie by that name, Matt Damon's character finds himself stranded on Mars, alone and without any hope of being rescued anytime soon. He only has a few days' worth of rations, and more importantly, oxygen, left.

So, what does he do? In his words that have achieved meme status,

*"In the face of overwhelming odds, I am left with only one option: I'm going to have to science the sh*t out of this!"*

— Matt Damon, American actor, in "The Martian"

He then proceeds to calculate how to make his rations last longer, how to grow his own food, and even make his own oxygen! Eventually, he figures out how to take off using a broken rocket.

What is not obvious to a lot of people is that he isn't really "science-ing" much. He is mostly "engineering" it!

While there is certainly a good amount of science involved in what he does, most of his activities actually fall into the domain of engineering: Quickly and constantly assessing his overall situation, determining his constraints and requirements, figuring out and scheduling the critical path to survival, conducting field experiments when necessary, many of which fail and have to be redesigned. Not aim for the luxury of perfection but for the reality of "satisficing". Not discovering new concepts or models, but applying existing concepts and making them work in the messy and unpredictable world, to build something useful.

This is pretty much the textbook definition of engineering.

Of course, there is a lot of overlap between "science-ing" and "engineering", but if you had to choose only one word to describe what he was doing, you would call it engineering.

I included this here to further emphasize the distinct identity and supremacy of engineering as compared to science.

(Ahem. "Identity" and "Supremacy" and Matt Damon? Sorry, couldn't help it.)

I suppose my emphasis on engineering rather than science may look a little unusual to many people, so it makes sense for me to address one of the main objections I can think of.

Don't We Need Perfect Knowledge?

In some ways, our methodology of Present-Bounded Rationality feels like a compromise.

We have been led to believe that we need a complete and perfect understanding of reality before we can talk about things like meaning and purpose. This belief has led people to create the illusion of complete and perfect knowledge by invoking some supernatural power with various attributes and behaviors to fill the gaps in our knowledge.

But do we really need that? I don't think so.

Let us look at some illustrative examples to clarify what I mean.

Cells in your body contain amazingly complex structures and execute equally complex processes that allow them to feed themselves, fix problems as they occur, and replicate when appropriate. They do this even though they are immersed in a complex, nebulous and largely unknown reality. They have no notion of any kind of supernatural power and that doesn't stop them.

Zooming up to the human level, we are able to manipulate the functioning of our own cells at the molecular level, etch nano-scale circuits on semiconductors, and land spacecraft on distant asteroids moving at astronomical speeds, in spite of the fact that we do not have complete and perfect knowledge of reality.

All these examples are proof that being able to evolve extremely complex structures and processes or solve extremely complex problems does not require complete and perfect knowledge.

Moreover, if you look at how all of these phenomena came into existence, you will see something very much like Present-Bounded Rationality at work. In fact, the methodology is simply a formalization of what we can see at work everywhere in nature.

So this methodology is not a compromise at all. In fact, it looks like that's the only methdology that works in the real world.

Isn't that so much better than taking leaps of faith or taking someone's overconfident but baseless proclamations as the truth? Or throwing up your hands that you aren't able to create a complete and perfect model of reality that explains everything?

It looks like a no-brainer to me.

Still, I am not against people who want to continue on the path of faith. This book is not about the raging debates on religion vs science or faith vs fact. I actually prefer a world where many competing approaches to the ultimate truth flourish and learn from each other. And each of these ways of thinking does have things to teach each other.

All I am saying is that, if someone does want to stick to the path of evidence and reason, it is possible to go a lot further with it than what we have been led to believe. More importantly, you aren't going to miss out on anything that the other paths give you.

Here is an interesting quote from Laplace, a well-known French scholar from the 18th century, that is highly instructive in this regard:

When Napoleon asked Laplace why he had not mentioned the Creator in his book on the system of the universe, Laplace said

"Sire, I had no need of that hypothesis."

— Quoted by Augustus De Morgan in "Budget of Paradoxes".

Similarly, I am also claiming that we do not need to hypothesize a magical source of complete and perfect knowledge in order to reach our goal of finding meaning, purpose and hope in our lives.

That concludes the discussion on the methodology that we will use to build the MSE Framework.

As you would expect for any framework based on First Principles Thinking, we need to start building it by first defining our model of Ultimate Reality. We will do that in the next chapter and then go on stepwise from there.

But before we do that, here are some deep dives into some of the concepts mentioned in this chapter. Most of this should be pretty familiar to readers who have a STEM background, so feel free to quickly skim over them if so.

Deep Dive: The Present-Bounded Rationality Cheatsheet

A) What methods of knowledge acquisition are we allowed to use to build the MSE Framework?

- As already mentioned (probably too many times!), we want to build everything from **First Principles**.
- We start with the simplest and smallest possible number of self-evident phenomena that have no other known explanations. There is a scientific term for them - **Axioms**.

- The axioms still need to satisfy the constraints of the epistemology as described above, including the types and sources of knowledge we are allowed to use. Also, even our axioms can be challenged and replaced if something better or deeper is discovered.
- Starting from these axioms, we follow **Bayesian Inferencing** and the **Scientific Method** to build our model of reality.
- Typically, the above methods will result in a formula or algorithm or a crisply defined model. Typically they fall into some branch of **Science**.
- But sometimes, a phenomenon may be too nebulous or complex to be captured in this manner. We need to acknowledge that methods of rationality have some limits when using our relatively limited intellectual capacity to deal with something as complex as reality. So, we need to introduce the ideas of **Satisficing, Heuristics, Approximations, Optimizations, Grounding in the present moment, Open-Mindedness and Humility** into the mix. We are calling this version of rationality as **Present-Bounded Rationality**.
- This methodology, along with practices that emerge from it, including those that utilize tacit or embodied knowledge that are still systematic and backed by evidence, is the essence of **Mindful Engineering**.
- Moreover, as progress in the areas of science and engineering continues, it will **continue to improve** our conceptualizations of reality, including the definitions of meaning, purpose and hope that we come up with. In other words, none of this is frozen in time. We must also always try to remain open-minded, humble, and honest, and accept the fact that we don't know everything.

Given our honesty in accepting that we do not know everything, we need to address the next logical question:

B) What do we do when we aren't able to know or model something about reality?

- Be comfortable with not knowing and avoiding the temptation to take leaps of faith or rely on unjustified opinions. This is the most important aspect of any methodology based on rationality.
- Treat the unknown phenomenon as a black box and study it. Create hypotheses or pedagogical devices to understand the unknown phenomena, but never confuse these constructs with the truth.
- See if our lack of knowledge is because of some mental block or cultural baggage. If so, challenge such preconceived notions and see if better explanations can be found. (This is basically what we are doing when we ask whether meaning and purpose can be defined without invoking a supernatural power.)
- Keep hacking at the phenomena using the methodology mentioned above to incrementally understand and explain it over time.

As we have already noted, the above methodology closely resembles that of science, and even more so, engineering.

Deep Dive: John Vervaeke's Model of Cognition

Canadian cognitive scientist and philosopher John Vervaeke has proposed an integrative framework designed to understand and explain various aspects of human cognition. I am including here a deep dive into his model to give us a slightly different way of looking at essentially the same ideas I described in earlier in the section on Epistemology.

This model consists of 4Ps and 3Rs. The 4Ps define 4 types of "knowing" that we are familiar with:

1. **Propositional Knowledge**: This is knowledge about facts or "knowing that" something is the case. It is often verbal and can be communicated directly through statements or propositions.
2. **Procedural Knowledge**: This refers to "knowing how" to do something and involves skills and procedures. It is not primarily about facts but about processes and is often acquired through practice and experience.

3. **Perspectival Knowledge**: This involves "knowing what it is like" to have a particular experience from a specific perspective. It encompasses the subjective, first-person point of view, providing a context that frames our understanding of the world.
4. **Participatory Knowledge**: This is the knowledge that emerges from being in a relationship with something, where both the knower and the known are co-transformed. It's a deeper, more embodied form of knowing that involves shaping and being shaped by our engagement with the world, people, and practices.

But simply learning about the 4 types of knowing is insufficient because reality is like a firehose of information and we would be unable to function unless we can continuously evaluate what is relevant to us and what is not.

According to Vervake, we do this via a process he calls "Recursive Relevance Realization" (3Rs):

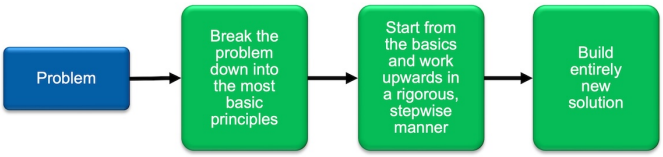
1. **Relevance:** As we discussed above, Relevance refers to separating the wheat from the chaff, or determining what is salient and important from the sea of information that surrounds us. This allows us to adequately model their current situation and respond effectively.
2. **Realization:** This term can be seen in two different ways. In order to deal effectively with reality, one has to "realize" it i.e. to grasp their situation well enough as well as to "realize" something i.e. do something real in the real world in order to respond to it.
3. **Recursive**: This refers to the fact that the process occurs at multiple levels, particularly in a complex organism such as ourselves. This may involve multiple levels of feedback loops both within the system and between the agent and the environment.

Vervaeke argues that cognition is not just about processing information or solving problems in isolation. Instead, it's deeply intertwined with our embodied engagement with the world, our perspectives, and our relationships, both with others and with our environment.

Deep Dive: First Principles Thinking

First Principles Thinking basically means "Don't take someone else's word for it, check it out yourself!"

The following diagram depicts this process in short:



First Principles Thinking

"An Engineer's Search for Meaning" © Vinayak (Vin) Bhalerao

Typically, when faced with a problem or the need to build something, we tend to follow conventional wisdom. But if we do that, and conventional wisdom is either wrong or has become outdated, then we end up repeating its mistakes.

So instead of doing that, we need to start from fundamental principles that are verifiable and incontrovertible and build everything up from there in rigorous, logical steps. Along the way, avoid making unjustified assumptions or jumping to conclusions.

This is known as Thinking from First Principles.

This idea has actually been around since Aristotle, and various famous people have been associated with it, including Richard Feynman, Charlie Munger and Elon Musk.

Needless to say, for the MSE Framework, we are taking a First Principles approach because we want to solve the crisis created by the existing solutions. It is conventional wisdom that has brought us here so we don't want to rely on it. We want to start from scratch and rethink the problem of meaning, purpose and hope, and see if we can end up with a better approach to solving it.

Deep Dive: Explanations

According to David Deutsch, physicist, the father of quantum computing and author of many fascinating books, the pursuit of the ultimate truth is an ongoing process that requires an open-minded and critical approach to knowledge.

We accomplish this by creating more and more accurate explanations of reality.

According to him, explanations are the fundamental building blocks of knowledge and are critical for understanding the world. He argues that the search for the ultimate truth is essentially the search for the best explanation.

In his view, explanations are not just descriptions of phenomena but are also predictive, testable, and falsifiable. Explanations provide a framework for understanding the world and allow us to make predictions about future observations.

He also says that there is no limit to the explanatory power of human knowledge, meaning that we can always strive to create better explanations of the world around us. What is important is the process of seeking and refining our explanations of reality through a rigorous and iterative process of testing, refining, and updating our understanding of the world.

Deep Dive: Bayesian Inference

Bayesian Inference is one of the most fundamental methods for building a model robust of reality. One of the leading theories about how our brains function is based on this idea and is actually known as the Bayesian Brain Hypothesis.

Let us look at a simple example to understand this process.

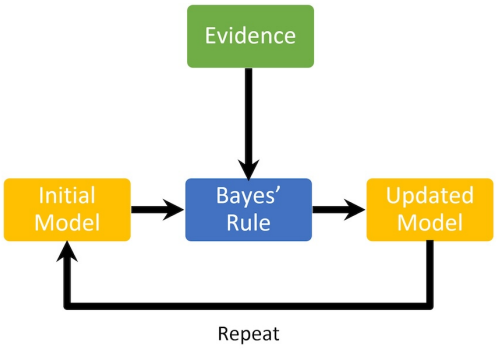
When an infant is playing with its toys, even when it appears as if it just randomly throwing things around, it is actually slowly gathering evidence about the characteristics of physical objects in its environment. It is piecing together concepts like object permanence, 3D space, weight, size, softness, and so on.

For example, when it repeatedly drops some toy on the floor in spite of you repeatedly complaining about it, it is actually coming to grips with gravity on its own.

All of us have been through this process and we continue it throughout our lives to learn about new things in our environment.

This is nothing but Bayesian Inference.

Let us look at a diagram to understand this process a bit more formally.



The Bayesian Inferencing Process

"An Engineer's Search for Meaning"

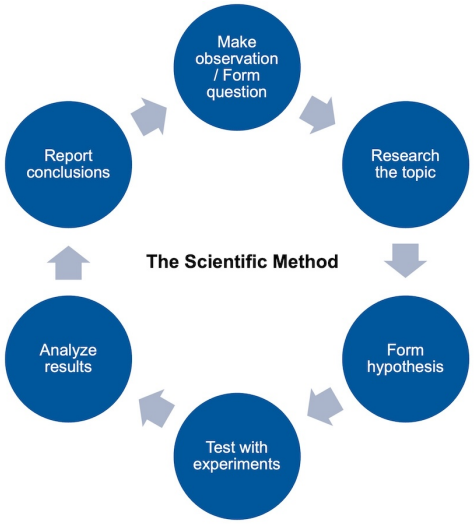
- Step 1 (Initial Model): There is a model of reality inside your brain. One of the things that the model contains is the probability or likelihood of occurrence of some event.
  - For example, suppose you wake up on a beautiful summer morning and wonder if it is going to be sunny today. You know that it is the middle of summer so there is a high probability that the day is in fact going to be sunny. This is known as your "prior".
- Step 2 (Evidence): Each new signal that reaches your brain from any of your senses creates a new piece of evidence. Your brain receives and analyzes each such piece of evidence.
  - In our example, maybe you look out the window and you see that the roads and pavements are all wet. This is a new piece of evidence.
- Step 3 (Bayes' Rule): You weigh this new evidence, known as the "likelihood", against your prior.
  - You know that wet roads and pavements means that it may have recently rained. This means that maybe it is one of those fluke summer days when it rains, and so there is a higher likelihood that it might rain again. So, while your original belief was that it should be sunny today, the wet grass is making you reconsider that belief.
- Step 4 (Updated model): So, you update your model of reality accordingly.
  - In the above case, you lower your probability that it is going to be sunny today. This is known as the "posterior".

This process gets repeated for every new piece of evidence that presents itself. And, accordingly, your model of reality gets more and more accurate over time.

In our example, you might suddenly remember that the president is coming to visit your city today and whenever a high-level government person visits, your city sends out crews to wash the streets. This makes you reverse course and raise your prediction of a sunny day back up.

A lot of our learning is basically a result of repeated application of this process and each time, we are likely to be improving our model of our reality.

Deep Dive: The Scientific Method



The Scientific Method

"An Engineer's Search for Meaning"

As shown in the picture, the scientific method consists of making observations, creating a hypothesis based on those observations, and conducting experiments to see if the hypothesis proves to be correct or not.

If it is proven to be correct, then the hypothesis becomes a scientific fact or model. If not, then the results of the experiments are analyzed and may lead to further questions or insights and then you go through the whole cycle again.

Of course, in reality, not all progress in science actually follows this exact process. Many times, things are a lot messier, with accidents or sudden sparks of insights or just fits and starts. But even in those cases, the scientific method is still the best way to explain the process after the fact or to replicate the results.

Since the entire process is based on evidence and reasoning, and can always be replicated or tested, we have a lot of confidence in it, we can make predictions based on it and we can defend it if challenged.

A hypothesis that gets proven to be correct is basically an abstract model that encapsulates (all of or possibly some aspects of) all the evidence that went into it. All of science is basically a constantly evolving set of such models. The set is evolving because the universe is vast and complex and we keep discovering new phenomena and new evidence all the time.

This unfortunately means that science is never really "done" or "complete".

This fact causes a lot of people a lot of discomfort because human beings are constantly looking for certainty. So much so, that we will believe things that may not even be true if they are given an aura of authority and certainty.

But science affords us a different kind of authority and certainty.

Science is authoritative because, it is impossible to defy it, in the areas where it is "settled". And wherever it is still not completely settled, it tells us the limits of its reach. So, we can always rely on it as long as we stay within those limits.

And science also provides a different type of certainty because its methods are future-proof. While the body of science as a whole may evolve as we collect more and more evidence, the underlying scientific method we rely on to process that evidence and improve our models will continue to be trustworthy.

Deep Dive: Introspection

Many subjective experiences are self-evident to ourselves. We can honestly say that they are occurring, but the inner world of our minds is mostly opaque to anyone other than ourselves, so there is really no way to prove to someone else anything about any of the phenomena we may be experiencing inside our minds.

In other words, it is really not possible to say anything objectively about our subjective experience.

Unfortunately, this has meant that science has not made a lot of progress in analyzing our internal experience, resulting in a major gap in our understanding. This is particularly relevant to concepts like consciousness, meaning and purpose because they are only felt internally.

But lately, many scientists have come around to accept that such subjective phenomena can be analyzed scientifically if we can ensure that the subjective experience is widely corroborated.

For the MSE Framework, we will take evidence of introspective phenomena seriously if it is widely corroborated and if there is no other explanation for it.

It goes without saying that the existence of consciousness is pretty much universally corroborated, and has found no other explanation, so we will include it in our models.

Of course, if an objective explanation for consciousness is found down the road, we will adjust our models accordingly.

Deep Dive: Pattern and Nebulosity

David Chapman, a computer scientist and Buddhist scholar, has written two phenomenal books, “In the Cells of the Eggplant” and “Meaningness”. In these books, he talks extensively about the fact that reality seems to contain both pattern as well as nebulosity, and how that affects our ideas of rationalism and meaning.

Science has shown us that reality does seem to contain many patterns, i.e. aspects that are clear, definite and structured. In many cases, we have managed to capture these patterns in terms of formulas and equations with very high levels of predictability and accuracy.

For example, in Physics we learn about various particles, their properties, forces that act on them and laws that govern them. (We will have a lot to say about all of these in the chapter on Physical Reality.)

But, at the same time, we also have ample evidence that many aspects of reality do not seem to be so easy to capture in terms of formulas. They are too nebulous or inherently indeterminate, fluid, and ambiguous.

Once again, Physics itself tells us that, at the bottom of it all, we have quantum fields that are inherently nebulous. We also have the Heisenberg Uncertainty Principle that tells us that there is a hard limit on how accurately we can measure the position and momentum of a particle at the same time.

Even above the level of quantum fields and particles, we have such complex interactions among the unimaginably large number of particles of various types, that it would be practically impossible to compute their exact future properties even after a very short time interval into the future.

At an even higher level, Chapman gives a great example of a cloud. No matter which physical or chemical properties you consider, trying to exactly describe a cloud is impossible. It is inherently nebulous. And we deal with many such concepts on a regular basis.

Chapman argues that pure Rationalism tends to overemphasize the patterned aspects of reality while ignoring the nebulous ones. As a result, while we should not abandon Rationalism, we definitely need to look beyond it to understand or deal with reality.

While I came across these ideas through Chapman's books (which are based on Buddhist philosophy), they actually have many close parallels in other bodies of thinking, such as:

- Shiva and Shakti in Hindu / Vedic philosophy
- Emptiness and Form in Zen philosophy
- Apollonian and Dionysian forces in Western philosophy

Deep Dive: Gödel's Incompleteness Theorem

Gödel's Incompleteness Theorem proves that no mathematical system can be complete as well as self-consistent.

Many people have used this as proof that trying to use reason or rationality to understand reality is doomed right at the core, because it has mathematical concepts at its core. Essentially the claim is that rationality is a mathematical system and as such, it can not provide an explanation of reality that is both consistent and complete.

The way the MSE Framework addresses this problem is as follows:

1. The MSE Framework relies not on pure rationality, but on Present-Bounded Rationality. This methodology takes into account the inherent limitations of rationality and accommodates them by using heuristics, satisficing, starting from and focusing on the present, and focusing on grounding in reality rather than abstractions.
2. We are not claiming to build a complete model of reality. In fact, we admit that reality contains many unknowns and also complexity and nebulosity that we are unable to capture in terms of mathematical concepts.
3. We rely on axioms while building our model, which again means we are not claiming to build a complete model. We admit that we cannot peek behind the axioms.
4. Moreover, we are not aiming to create a complete and final solution to our problem of defining meaning, purpose and hope either. We explicitly say that our methodology assumes that any solution we come up with, while it will be good enough to solve the problem in the best way possible currently, would still remain open to learning and modification in the future.

Sometimes, the people who bring up Gödel's Theorem and the limits of rationality in general want you to just give up on rationality and take leaps of faith with them or accept some dogma or poetic ideas.

But the flaw in that argument is that even if one admits all these limits of rationality, that does not give you permission to suddenly turn around and run in the opposite direction where your only choice is to take leaps of faith or rely on even less firmly established concepts. Just because you only have a good enough but less-than-perfect solution does not mean you should suddenly jump to something with no substantiated basis at all!

5. Ultimate Reality: Known Unknowns and Unknown Unknowns

Ultimate Reality: Known Unknowns and Unknown Unknowns

"An Engineer's Search for Meaning"

"There are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns—the ones we don't know we don't know."

— Donald Rumsfeld

"Perception is not a window on objective reality. It is an interface that hides objective reality behind a veil of helpful icons."

— Donald D. Hoffman, in "The Case Against Reality: Why Evolution Hid the Truth from Our Eyes"

Morpheus: "What is real? How do you define 'real'? If you're talking about what you can feel, what you can smell, what you can taste and see, then 'real' is simply electrical signals

interpreted by your brain."

— Lana Wachowski, in "The Matrix: The Shooting Script"

The Rumsfeld Matrix of Ultimate Reality!

Ultimate Reality is the name we will use in our model for the most fundamental reality that exists. Other commonly used terms for the same are: "base reality", or "the fabric of reality", or even "the ultimate truth."

And, just like some of the quotes above suggest, thus Ultimate Reality is not directly accessible to us. All we know are our perceptions of it, or the electrical signals reaching our nervous system, and any inferences we can make from them. We have no way of knowing what is generating those signals.

We could even be in a simulation, as many people believe, and have no way to tell.

In fact, as the Rumsfeld quote above says, not only do we have many known unknowns about ultimate reality, but we also have an unknown number of unknown unknowns.

Among the deepest known unknowns of reality are questions such as:

- What exists? In particular, what exists "out there" and "in here"? (And what does "out there" and "in here" even mean?)
- Why does it (or anything) exist at all? Where did it come from? (And if it did come from somewhere, where did that come from?)
- Does existence have a beginning or an end? What came before? What happens in the end?
- What does "existence" even mean?
- We call everything we can perceive using our senses, such as vision or hearing or touch, as "physical". But what does "physical" even mean?
- Is this physical reality different from our ultimate reality? In that case, how does the former emerge from the latter?
- What is "experience"? What is consciousness? How does that emerge?

We have asked these questions for eons. And while we have made tremendous progress in answering so many questions, we haven't really answered any of the questions above convincingly.

And of course, beyond this long list of "known unknowns", we also have the, possibly neverending, list of "unknown unknowns". And for them, since we don't know what we don't know, we can't even ask any meaningful questions about it.

In spite of all these difficulties, thinking about our ultimate reality has occupied the minds of many thinkers for millennia and their thoughts have formed the basis of many religions, philosophies and cultures.

So much so, that we have come to believe that unless some body of knowledge, like a religion or philosophy has answers to these questions, that body of knowledge can't really say anything about things like meaning, purpose and hope.

This is because, for a long time, we have believed that there was some omnipotent and omniscient entity behind all of reality, that created it and had its own reasons and plans for it. The belief was that concepts like meaning, purpose and hope have their origins in those reasons and plans.

But, as I mentioned in the previous chapter, we have no need for that hypothesis.

What I am claiming in this book is that we do not need to find ultimate answers to the "unknowns" mentioned above in order to come up with rigorous, evidence-based definitions of meaning, purpose and hope. We can absolutely get there by relying on just the "knowns".

Yes, once again, we are talking about our methodology of Present-Bounded Rationality.

Present-Bounded Rationality to the Rescue

As we have already mentioned in the chapter on Methodology, we do not need to start from "why does anything exist at all and where did it come from" etc., and having to rely on some supernatural power to rescue us from that conundrum.

We also do not need to start from some distant past when the universe "began" or some distant future, when the universe will supposedly "end". Both of those events are so distant that there is a lot of uncertainty about those events as well as the path we have taken from there to here or from here to there, respectively.

Instead, we will start from what we know a lot more about: We will start from entities and processes that can be shown to exist right here, right now.

Think of existence not as a story of the universe from the beginning to the end, with both ends shrouded in mystery. Instead, think of it as a story that begins with you at the center, where things are quite crisp and clear, but they get foggier and foggier as you move away in time or space in any direction.

Needless to say, you have a lot more evidence supporting the idea that you exist here and now, than about how the universe may have been created or how it will end.

You are conscious, you are breathing, you can see and feel things happening around us. You know where you are in relation to your surroundings. You are aware of your thoughts.

This is basically how the Present-Bounded Rationality approach to solving problems works. We don't ask for the entire universe to be completely unveiled to us, we make do with what we know far more clearly, and see if we can get to where we want to go from there.

So, what do we know about the here and now?

We know three things for sure:

1. Something seems to exist, including us. That is pretty much all we know about the ultimate reality because, as far as we know, we don't have direct access to it. All we have are our perceptions that we can sense using our nervous system. This brings us to the next point.
2. We seem to have a physical existence, in something we can call Physical Reality. We know this because we can perceive it, but we don't really know how this physical reality emerges from the ultimate reality. But that's not all we have.
3. We also seem to have a conscious existence. We are aware of our existence and our physical reality through our consciousness. We clearly have a sense that there is some presence inside of us. We don't know how our consciousness emerges from the ultimate reality or whether it has any relation to physical reality either. (Yes, there are some speculations about that, but none of them are proven. We will look at some of them later.)

Unfortunately, even these simple statements of fact lead to raging debates.

Philosophical Debates

Most people take our physical reality as the primary reality, and consciousness as secondary. This is generally known as Physicalism or Naturalism.

Other people object to that and say that true reality is ultimately non-physical, and consciousness is all that there is. For them, it is physical reality that is secondary or emergent or even imaginary. This idea is closely related to the philosophy known as Idealism in the West and Brahman in Vedic Philosophy or Tao in Chinese Philosophy.

Unfortunately, we have no objective and incontrovertible proof of either of these two claims. This causes endless debates and confusion about which model is "real".

We do not need to get into that debate.

Our methodology of Present-Bounded Rationality tells us that we have no need to get into these abstract debates. Instead, we need to focus on grounding ourselves into the here and now, and with our ultimate goal in mind.

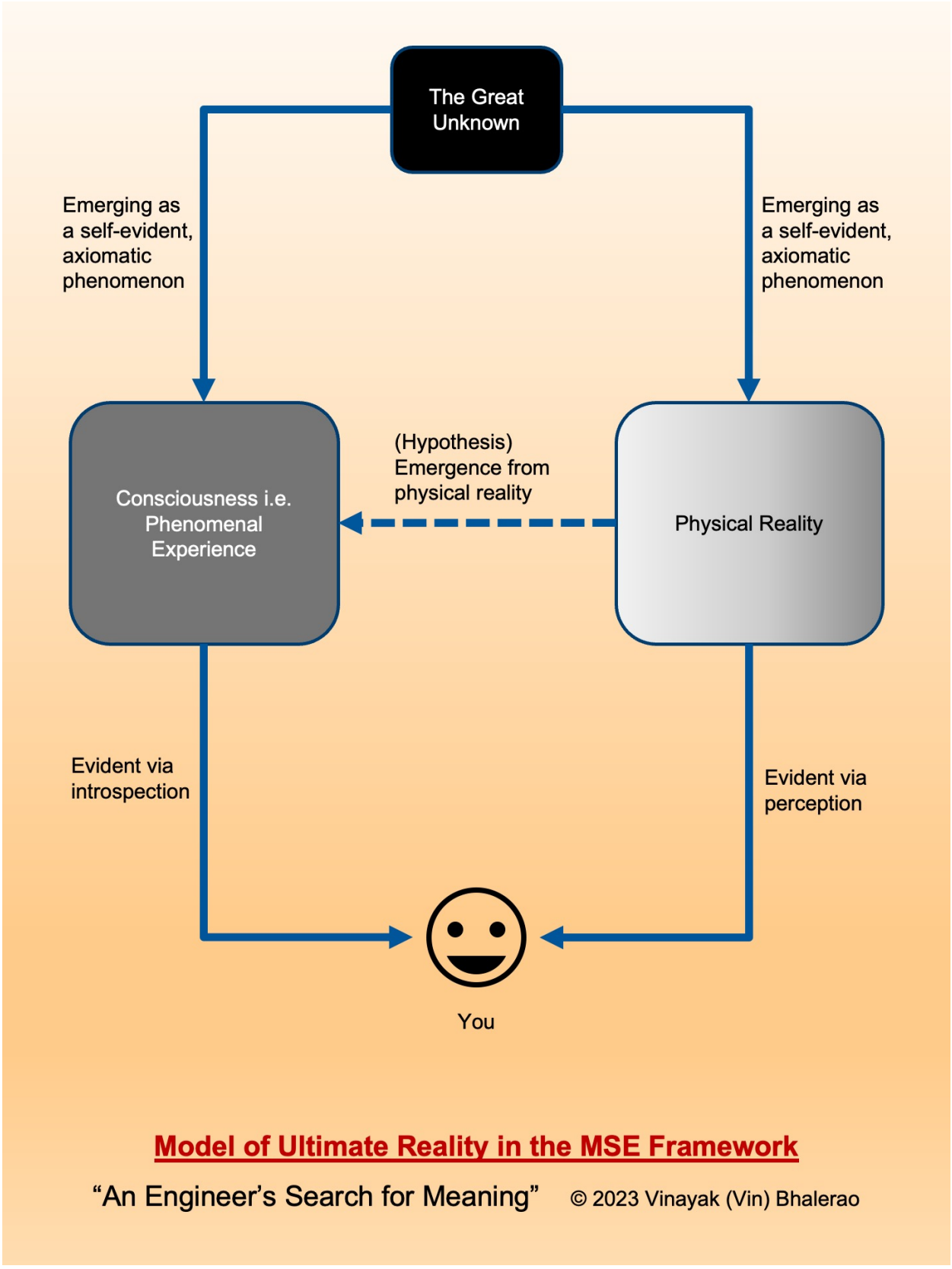
We don't need our answers to originate from some supernatural power or from some "beginning of time" or some "judgment at the end of time". We are fine with looking for answers in the here and now.

Also, as with all of science and engineering, we are fine with provisionally knowing a few things and having a process for knowing more in the future, and seeing where that leads us.

And, as we will see in this book, we can accomplish our goal with just that much.

With that lengthy introduction, let us finally get down to the business of looking at the model of Ultimate Reality as per the MSE Framework.

The MSE Framework - Model of Ultimate Reality



Model of Ultimate Reality in the MSE Framework

"An Engineer's Search for Meaning" © 2023 Vinayak (Vin) Bhalerao

We will start at the top of the diagram with the box that has a totally black background, labeled The Great Unknown.

In most religious or philosophical models of ultimate reality, The Great Unknown would be called God or Creator. Some religions think about the Great Unknown in a different manner, such as the concept of Brahman in Hinduism or Tao in Taoism.

We also have some very interesting modern hypotheses for The Great Unknown, such as the Simulation Hypothesis, The Computational Universe Hypothesis and the Wolfram Physics Hypothesis.

I have found many of these ideas fascinating and educational. As a result, I have included Deep Dives into some of these concepts at the end of this chapter. You may find them interesting, too.

But none of these models can provide any proof of their existence. So, we will continue to use the name The Great Unknown because we really don't know anything about it. Our methodology would not allow us to complicate our model with assumptions and opinions about the nature or features or intentions of this Great Unknown.

All we can say is that we have no choice but to start with something like The Great Unknown, which we will take to be self-evident and fundamental, but beyond that, we can't say anything for sure.

Luckily there is a scientific term for such concepts, "Axioms".

As a result, for the purposes of the MSE Framework, we will simply take The Great Unknown to be our most fundamental axiom.

Coming back to the diagram, we see two arrows emerging from The Great Unknown. Let us look at each one of them in turn.

Physical Reality

Physical reality, as the name suggests, is the part of ultimate reality that we can either experience physically, using our senses or prove the existence of, using instruments we have created, or using the laws of physics we have discovered.

While we know a lot about physical reality, and can even write formulas that can be shown to work perfectly. At the same time, we still have many unknowns about other parts of physical reality.

We will look at what these unknowns are in the next chapter, but for now, we have indicated this partly clear and partly murky knowledge by using a gradient for the background color of the Physical Reality box.

Consciousness

Just like we can all agree that we live in something like a physical reality, we can also agree that there is something inside us that we call "me", i.e. Consciousness.

Over the millennia, people have tried to understand what this thing inside of us is, but we are still far from reaching that goal in a scientific manner. But we can say that our lack of knowledge about consciousness isn't as dire as that about Ultimate Reality.

So, the background color of the Consciousness box is gray instead of black or white to indicate this.

We will take a deeper look at Consciousness in a subsequent chapter.

As true scientists, we are simply going to treat both Physical Reality and Consciousness as axioms since they are both self-evident and fundamental to us. Moreover, we treat them both as equally valid and complementary to each other, not in competition with each other like in the aforementioned philosophical debates, again, because we have no evidence pointing to the primacy of either of them.

Let us also note that how Physical Reality and Consciousness emerge from or interact with The Great Unknown is also unknown. Luckily, we do not need to postulate that for our framework due to our methodology which allows us to work with partial knowledge.

Just for completeness, let us note that at the bottom of the diagram, the Consciousness and Physical Reality boxes come together into You. This is the You, as a physical as well as conscious entity, existing here and now and experiencing both.

There is only one little item remaining in the diagram, the dotted line from Physical Reality to Consciousness.

Does Consciousness Emerge from Physical Reality?

What is interesting is that we do not know how Physical Reality and Consciousness interact with each other, but do have clear, widely corroborated evidence that they, in fact, do.

For example, when something happens in physical reality and we perceive it, we can experience it in our consciousness.

Also, our consciousness can direct us to perform actions that affect physical reality. (This is typically known as Free Will, which is another controversial topic that we will not get into since we don't need to do that for our purposes.)

Physics is the most successful of sciences, and it gives us a great account of all the physical objects and forces that exist. Still, we have not been able to find any force of Physics that can be shown to emerge from consciousness. And likewise, we know of no force that emerges from Physics that appears to act on consciousness.

So how the bidirectional interaction between physical reality and consciousness occurs is unknown.

At present, we have more plausible theories for showing how consciousness may be arising out of physical reality than the other way around. This is indicated in the diagram using a dotted arrow from Physical Reality to Consciousness.

If one of these theories gets proven, we will be able to simply delete the arrow that goes from The Great Unknown to Consciousness and convert the dotted line connecting Physical Reality to Consciousness into a solid one.

This means that, even if that were to happen, the rest of the MSE Framework remains intact. So, we can say that the framework is future-proof to some extent.

Ok, having started with this high-level overview in this chapter, we will be digging deeper into each of these concepts in subsequent chapters, starting with Physical Reality.

Deep Dive: Conscious Realism

Donald Hoffman is an American cognitive psychologist and a professor at UC Irvine.

His theory, known as Conscious Realism, states that evolution did not engineer us to perceive reality as it is. This is because evolution was more concerned with helping us survive and replicate, using as little resources and energy as possible.

Requiring living organisms to know their ultimate reality in order to survive would have required too much energy and resources, because reality is just too complex. So, evolution took shortcuts in our perceptive abilities to let us perceive only the features of reality that offered a survival advantage.

Luckily for us, there were enough patterns in our complex ultimate reality that were sufficient for us to survive and replicate without having to know all of it.

But, as a result, what we perceive through our senses isn't the ultimate reality, but representations of reality, with high correlations with its features that are relevant to our survival.

The analogy is to the user interface of a computer. The UI of a computer does not show us exactly what is going on inside its internal circuits. It only shows us a simplified interface which is sufficient for us to use it. The interface elements are highly correlated with the functions of the computer that we care about, but they look nothing like what actually happens inside.

To put it another way, a map is just a representation of the actual territory, but not the territory itself. In fact, it is impossible to derive the territory accurately from a map.

This means that it is impossible for us to truly understand ultimate reality given that the only access we have to it is based on our perceptive abilities.

Deep Dive: The Simulation Hypothesis

The Simulation Hypothesis as a hypothetical model of what ultimate reality may be like.

But note that it is at best a pedagogical device, not necessarily the truth. Claiming that it is the truth requires taking a leap of faith given that we have no evidence of its validity.

Here is a description of the hypothesis:

Imagine that there is some universe beyond ours in which there is something like a computer on which a game is being run. The game involves one or more players that are represented in the game using characters. In gaming parlance, this is known as a Massively Multiplayer Online Role-Playing Game (MMORPG).

The game is so engrossing that the players forget they are in a game and identify themselves completely with their characters inside the game. The only way they can "wake up" from the game is for their game character to die.

You and I are basically individuals who live in this external universe but we are playing this game that looks like our current universe and we identify completely with our characters in the game, which is basically our existence in this universe.

The consciousness that we experience may be the consciousness of this player. This may explain why it remains such an enigma. We will talk more about consciousness in more detail further down.

Many science fiction books and movies have explored this theme to various extents, the Matrix trilogy being probably the most popular among them.

Deep Dive: The Computational Universe Hypothesis

Max Tegmark, a Swedish-American physicist at MIT, proposed that the physical universe is not merely described by mathematics, but it actually is a mathematical / computational structure.

Essentially the idea is to imagine that reality, at its essence, is nothing but a space of all mathematical formulas and algorithms. Somehow, these formulas and algorithms start to expand or execute, which generates all of physical reality, including ourselves in it.

This could be considered to be loosely related to the Simulation Hypothesis, but not exactly the same. It is not saying that there is a reality or players outside the simulation, but the game, as in the Simulation Hypothesis, is all there is.

A major advantage of this theory is that it can answer the hardest question of all: Why anything exists at all. This is because mathematics can be seen to exist all by itself, without anyone having to "create" it. All you need is to accept is that mathematical formulas and algorithms inherently exist in some platonic space.

On the other hand, a big problem with this theory is that it appears to be unfalsifiable and untestable.

Still, it can serve as a great pedagogical device to help us understand various aspects of reality like space, time, quantum fields etc.

Deep Dive: The Wolfram Physics Hypothesis

Stephen Wolfram, a British American computer scientist and founder of Wolfram Research, has a proposal quite similar to that of Max Tegmark's proposal.

He proposes that the universe is a hypergraph consisting of (of the order of) 10 to the power of 500 vertices. There are also rules, known as cellular automata, that specify how to expand this graph based on specified formulas.

The hypergraph started with a single seed vertex and then one or more rules were applied to it over and over until it expanded to our current universe in its current state.

The graph continues to evolve using the rule, and all events in the universe can be thought of as a result of the rule being applied to various parts of the graph, leading to new states of the graph.

Note that, as of now, the actual rule itself still remains to be discovered. But this mechanism can serve as a great pedagogical device to explain how the universe could have evolved and why it has the structure and laws that it does.

Here are some concepts from Physical Reality that could be explained using this proposal.

- **Space:** Space at any instant corresponds to a state of this graph at that instant
- **Time:** The passage of time corresponds to the evolution of the graph through a sequence of states.
- **Computational Reducibility:** Sometimes, a mathematical formula or equation allows you to "jump ahead" and predict the final result of a sequence of steps in the graph without actually going through the process of applying the rule step by step. This is known as Computational Reducibility and whenever this is possible, we end up with a concise formula or model to explain some aspect of reality.
- **Computational Irreducibility:** At other times, this may not be possible, depending upon the state of the graph. This means that the answer to certain questions can only be determined by performing or simulating the actual steps. There is no shortcut formula or model to directly jump to the final answer.

According to Wolfram, while most of the hypergraph suffers from computational irreducibility, it contains parts that are reducible. This is what allows us to discover patterns and laws of Physics that work, while at the same time, we have to contend with nebulosity or inability to create concise explanations.

The way we have made progress in physics so far is by following these "veins" of computational reducibility in the hypergraph. But given the irreducibility in other parts of the graph, it looks like we will not be able to do this with all of Physics.

As you can see, this theory is a very rich vein of its own, capable of helping us understand many aspects of reality. But it is important to keep in mind that it is only a theory at the moment.

Deep Dive: The Vedic Universe Hypothesis

Vedic Philosophy states that there is just one universal unified consciousness that is the true ultimate reality. It is known as Brahman. Our physical reality, on the other hand, is only an illusion, known as Maya.

According to this philosophy, there is no duality between the self and the ultimate reality of Brahman.

It believes that the ultimate purpose of life is to attain this realization (known as Moksha or enlightenment). It also says that Enlightenment is a process, not a specific destination. One can keep progressing on this path forever. This endows life and consciousness with a long-term purpose.

One of the major benefits of this philosophy is that universal compassion follows as a logical outcome of believing that we are all a part of the same unified reality.

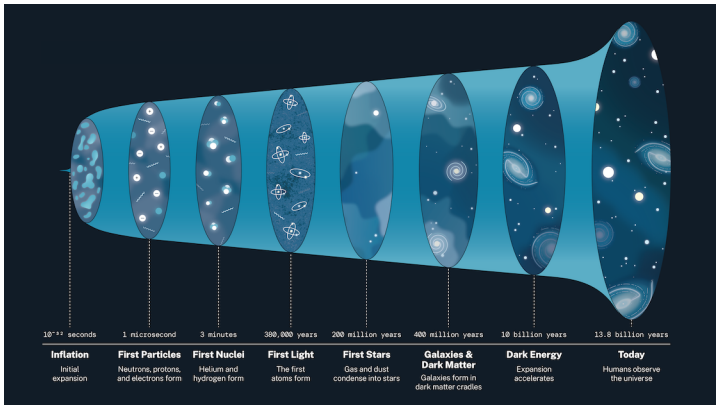
The Simulation Hypothesis can serve as a pedagogical device to understand the idea of Brahman. The external universe that contains the computer where the game is being played, including the player, can together be called Brahman. What we consider to be our physical reality is really just the environment inside the game, and all of us are basically game characters in this game. The consciousness that we experience is really the consciousness of the external player who is playing the game.

This also suggests an explanation for why we are unable to explain how Brahman, physical reality and consciousness all interact with each other, because the entire game computer and its software are outside the game and inaccessible to us.

Of course, this again is only a hypothesis and we don't have a good way to prove it one way or another.

Still, it is interesting that over such long amounts of time and from such completely different backgrounds, people have come up with very similar ideas for explaining our reality. That lends some credence to the idea that there may be a kernel of truth to at least some aspects of it.

6. Physical Reality: Hitting Rock Bottom?



Our physical reality (Courtesy: NASA)

"If something is in me which can be called religious then it is the unbounded admiration for the structure of the world so far as our science can reveal it."

— Albert Einstein

"Those swirls in the cream mixing into the coffee? That's us. Ephemeral patterns of complexity, riding a wave of increasing entropy from simple beginnings to a simple end. We should enjoy the ride."

— Sean Carroll, American physicist and philosopher, in "The Big Picture"

As noted in the previous chapter, Physical Reality is one of the axioms that the MSE Framework rests on. It is self-evident to us and fundamental, but we do not know how it emerges from The Great Unknown.

Physics has been immensely successful in explaining a huge part of physical reality. In fact, Physics is the most successful science of all in terms of its reliability, accuracy and scope, and, as a result, we rely on it heavily to build the MSE Framework.

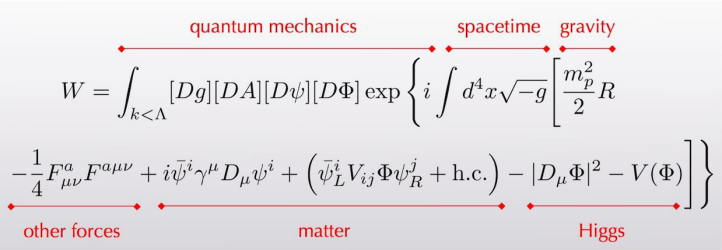
The Ultimate Equation of "Everyday" Physics

Well-known physicist and philosopher Sean Carroll says in his book "The Big Picture" that Physics has allowed us to completely describe "everyday physical reality", i.e., the part of physical reality that we interact

with on a regular basis.

Note that this fits in nicely with our methodology of Present-Bounded Rationality, where we focus primarily on the here and now, not on distant phenomena occurring either long ago or in the far future, or indeed, in some galaxy, far far away.

Carroll has put together a single equation that captures everything we know about our everyday physical reality, including quantum mechanics, spacetime, gravity, matter, the Higgs particle and all the forces of nature. He calls it the Ultimate Equation of "Everyday" Physics.



The Ultimate Equation of Physics (Sean Carroll)

"An Engineer's Search for Meaning"

We don't need to go into the details of this equation (there is tons of material available on it elsewhere), but just marvel at our accomplishment as a relatively young species on a small little planet somewhere in the unfashionable part of the universe with the audacity to want to decipher the true nature of reality from our ridiculously narrow perspective!

If we can do that, cracking the code of meaning, purpose and hope should be a walk in the park for us, right?

Ok, to sober us up a little from that bit of chest thumping, let me mention that, in spite of this wonderful equation, there still are some major gaps in our understanding of physical reality.

Here are some of the aspects of physical reality that we are currently unable to explain fully:

- Non-everyday physical reality i.e. things like Dark Matter / Dark Energy, very early parts of the Big Bang, how the universe may end, many aspects of Black Holes, etc.
- The "fine-tuned universe" problem i.e. why the universal constants that appear in physics have the values they have and why even slight variations in their values would have led to us, or even the whole universe, not existing.
- While there are a lot of discernible patterns in physical reality, there is also a lot of nebulosity. A great example is clouds - we are unable to capture them in terms of mathematical equations due to them being fuzzy, ill-defined, constantly changing, and appearing different from different distances.
- We experience a lot of complex phenomena that emerge from simpler phenomena, and while we may be able to say a lot about the simpler as well as the complex phenomena, we are unable to derive the latter from the former. This is known as Emergence. An example of this is the phenomena of temperature and pressure emerging from the movement of molecules of a gas. We will have more to say about Emergence later on in the book.
- As noted in the previous chapter, how physical reality and consciousness as well as The Great Unknown interact with each other is unknown.

For now, we will simply make note of the fact that physics, and science in general, has some limits, but we have found ways of making do with what we can do, using our methodology.

In any case, we do not need to know everything to define the MSE Framework. Apart from the basics, like

matter and energy, we only need a few other concepts from the entire body of physical sciences. Let us take a look at them below.

(This is a general practice in this book, we will quickly get an overview of each topic, but then talk in greater detail only about the concepts that matter to the MSE Framework.)

Pattern and Nebulosity

As noted earlier, physical reality contains both many discernible patterns as well as a lot of nebulosity.

Patterns include things like the laws of physics that we have discovered. They also include the elementary particles with specific properties, the specific ways they combine to form atoms and then molecules, the forces that act on them, and so on.

Through painstaking work, we have managed to discover many such patterns in physical reality. But we also know that not everything in physical reality is patterned in this manner. There is also a lot of nebulosity.

Nebulosity includes things like clouds, the shapes of various bodies of water, the shapes and structures of sunflowers, the arrangement of hair on bees' legs, the irregularities in the structure of bee hives themselves and so on.

Even things that appear patterned at the macroscopic level may actually be quite nebulous at the microscopic level.

Nebulosity could be inherent to the physical phenomenon, or it could be a result of our inability to figure out a pattern or inability to compute it because it would be too computationally expensive or intractable.

For many of the parts of physical reality that are patterned, we have been able to discover incredibly accurate mathematical formulas. And for many of the things that are nebulous, we have developed and continue to develop heuristics, tacit knowledge, practices and technologies that help us deal with them to the extent possible.

Science deals with the patterned aspects of physical reality and, in order to deal with the nebulous aspects, we can add engineering into the mix. As we have noted already both of these are parts of the methodology of Present-Bounded Rationality.

Coherence, Matter, Energy and Forces

As a result of amazing feats of intellectual ability and effort, human beings have been able to discover that, at the lowest level of physical reality, we have what appear to be a set of quantum fields that permeate all of space.

While we haven't been able to observe the quantum fields themselves, we have managed to figure out how to characterize them, using what is known as a quantum wave function. We have been able to discover an equation known as the Schrödinger Equation, that we can use to determine how a quantum wave function evolves. For example, it allows us to determine the probability distribution of a particle existing at any point at a given point of time.

But the really interesting part about quantum wave functions is that they don't remain as seemingly ephemeral wave functions forever. They can "collapse" and give rise to concrete physical particles that we can observe or measure. These particles make up what we typically call "matter", though one could extend the definition to include the quantum fields themselves.

If this collapse, known as "quantum wave function collapse" did not occur, we would have only probability distributions and nothing definite would occur anywhere in the universe. But, fortunately for us, such collapses do occur and they lead to definite things occurring in what we call our "classical" reality.

While there are many unknowns about the phenomenon of wave function collapse, what we know for sure is that they are constantly occurring an uncountable number of times all over the universe.

One can interpret this ubiquitous and ever-present phenomenon as the universe appearing to have a "natural tendency" for creating definite or concrete particles from foggy wave functions.

And this tendency isn't limited to just the wave function level either.

Various types of wave function collapses give rise to the creation of a variety of elementary particles. These elementary particles, in turn, come together to form protons, neutrons, electrons, atoms and molecules that form the basis of all physical reality.

At a higher level, clouds condense into droplets of rain. Billions of such drops come together to form puddles, which combine into streams, which combine into rivers and eventually oceans.

Also, all over the universe, huge clouds of hydrogen have been coming together (and are continuing to come together) over long time frames to form stars, or other material coalesces into planets.

Even inside our heads, foggy thoughts often collapse into concrete ones.

What I am trying to get at is that this same universal tendency can be observed in various domains, contexts and levels.

As a result, we can make a general statement that the universe appears to have a natural tendency to create concrete things from nebulous or foggy things.

So, let us go ahead and create a formal statement of this universal tendency, which we will call "Coherence".

Universal Tendency #1: Coherence

The universe appears to have a natural tendency to create definite or concrete things out of uncertain or foggy things.

(Note that the phenomenon of wave function collapse is also known as "quantum decoherence" in physics, but here we are calling it "coherence". This unfortunate naming contradiction occurs because, from the point of view of the quantum field, the wave function collapse can be seen as "decoherence". But from the classical physics side where we observe it, it can be seen as the quantum fog, in some sense, "cohering" to form concrete elementary particles.)

In addition, it is important to note that evidence of this universal tendency can be observed everywhere and all times, including right here, right now. There is no need to go to the uncertain beginning or end of the universe to make this observation.

Finally, you may have noticed above that I have given a number to this tendency: #1. As you might have guessed, we are going to build a list of such tendencies over the next few chapters and see what we can do with them.

Unfortunately, while the universe does give us this wonderfully beneficial tendency of coherence, it also gives us our most formidable enemy, entropy.

Entropy

Informally, entropy is considered to be a measure of disorder in a system.

However, this informal definition hides some critical nuances, so it is important to look at a more formal definition.

A more formal definition is that entropy is a measure of the number of different ways you can arrange small-scale entities with certain properties (known as microstates) that give rise to the same large-scale properties (known as macrostates).

For example, the number of ways you can arrange air molecules in a box to get the same volume of air at the same temperature and pressure.

Next, let us observe that, for any such system, there is a much larger number of ways for being disordered than being ordered. As a result, the probability of finding the system in a highly disordered state is much higher than the probability of finding it in a highly ordered state.

This is the same as saying that the probability of finding a system in a high entropy state is much higher than the probability of finding it in a low entropy state.

This purely statistical fact is what gives rise to the Second Law of Thermodynamics which says that entropy can only increase over time. This is simply a result of the fact that phenomena with low probability will be replaced with those with higher probabilities over time.

Luckily for us, the universe began in a very low entropy state and its entropy has steadily been increasing ever since. If the universe had begun in a very high entropy state, nothing much would be happening today.

Unfortunately, what this means is that the universe will continue to get more and more disordered over time, eventually leading to what has been named “the heat death” of the universe, when nothing interesting or meaningful will ever happen.

This idea, combined with our mistaken notion that meaning and purpose can only be discovered “at the end”, has been used to imply that any attempt at defining meaning and purpose using science is doomed. Moreover, it is all hopeless in the end.

This idea has insidiously percolated through our thinking, giving rise to claims of science being ultimately nihilistic and unable to address our desire for meaning, purpose and hope.

The fundamental problem here is the assumption that meaning, purpose and hope can only come from something that happens “in the end”, presumably when we meet our “maker”.

This is clearly another leftover idea from our belief in religion. This is because, in many religions, there is a “judgment day at the end”, when one finally gets to meet their maker and gets judged for their behavior during their life.

But, as we stated in the description of our Mindful Bounded Rationality methodology, we do not need to speculate on some highly unpredictable “end of time” moment in order to find meaning. Instead, we build everything from what we know for sure, which is the present moment, right here, right now.

So, we have no reason to believe that science is nihilistic. We can find plenty of meaningful things right here, right now, even through the medium of science.

For example, while we do have the worrying universal tendency towards increasing entropy, we also have an ally that helps us fight it. This ally, which can be called a big sister to the universal tendency of Coherence that we saw earlier, is Complexity.

Let us take a look at that next.

Complexity

Complexity is a measure of how hard it is to describe the set of properties of a system. Simple systems are easier to describe, or require less information to describe, than complex ones.

This is because the complexity of a system depends upon the level of organization or structure within a system. A complex system has many interacting components, and this can lead the system to exhibit emergent behavior or properties that are not apparent from examining the individual components in isolation.

As we saw earlier, physical reality consists of a wide diversity of elementary particles, atoms and molecules displaying a wide variety of properties as well as the variety of forces that they are subject to. They are constantly moving and interacting with each other. Many of these interactions result in them coming together in various ways, giving rise to more complex forms from simpler ones.

This process is ongoing. In stars, simpler atomic nuclei are constantly combining to form larger ones. On planets, simpler molecules are combining to form more complex ones, including really really complex ones such as proteins, RNA and DNA. On a higher level, many single cells are coming together to form organisms, organisms into societies, societies into entire ecosystems and so on.

At each level, it gets harder to describe the structure and set of properties of the system, i.e., the complexity of the system increases.

The vast majority of this happens spontaneously. This tells us that the universe, by itself, appears to have a natural tendency towards creating more complex things and organizing them in increasingly complex patterns.

There is even a deeper and more rigorous explanation for this tendency, particularly when living organisms are involved. We will look at that in the next chapter.

For now, let us formalize this ubiquitous and ever-present tendency by adding it to our list.

Universal Tendency #2: Complexity

The universe appears to have a natural tendency to form more complex structures out of simpler ones.

As you may have noticed, the first two Universal Tendencies, Coherence and Complexity, can be seen to overlap a bit, but each one also captures something unique that is not captured by the other. There may be a way to refactor the list of tendencies so there is no overlap, but for now, this is fine for our purposes.

Also note that I am stopping short of calling these tendencies as “laws”. This keeps the list informal and in keeping with our “satisficing” methodology.

In fact, and rather disappointingly, we do have a well-known “law” for the other universal tendency, Entropy. I am talking about the Law of Entropy of course, and it is considered to be one of the most ironclad laws of reality.

But lately, many scientists have been working on defining a new “law” that formalizes some of these universal tendencies that work in the opposite direction to entropy. I look forward to such efforts leading to a new law that is as powerful as the law of entropy. I have included a Deep Dive into one such effort below.

Note that I am not including Entropy in the list of universal tendencies that we are building. Needless to say, it is one of the most well-known tendencies of the universe, but this tendency goes in the opposite direction of our ultimate objective of defining meaning, purpose and hope in a rigorous manner. The list we are building isn’t intended to be a definitive list of all universal tendencies. It is going to contain just the ones that we need for our purposes.

Coming back to Complexity then, let us note that the phenomena of entropy and complexity appear to be engaged in a kind of a cosmic dance, bringing matter together and taking it apart.

This dance turns out to be one of the most meaningful things in the universe as we will soon see.

The Cosmic Dance Between Entropy and Complexity

As a first approximation, let us note that, informally, things that are less chaotic have low entropy and those that are more chaotic have higher entropy. But this is also true of complexity: things that are less chaotic look less complex and those that are more chaotic look more complex.

So, one might be tempted to conclude that entropy and complexity have a linear relationship i.e., as complexity increases, entropy also increases, and vice versa.

This may make sense because more complex systems have a greater number of possible arrangements of their components that are consistent with their macroscopic properties, and thus have a greater number of microstates, which imply a higher level of entropy.

However, it's important to note that complexity and entropy are not the same thing, and that they have a more complicated relationship.

Let us look at an example that illustrates this fact.

Imagine taking a glass of water and placing a drop of ink into it.

Before the ink drop touches the water, the combined system consisting of the water and the ink starts off in a state with relatively low entropy as well as complexity – all the molecules in the ink drop are uniformly distributed inside the ink drop and all the molecules of water in glass are uniformly distributed in the glass. This is because they haven't started mixing yet.

As the ink starts to disperse throughout the water, the entropy of the system goes up because now there are more ways in which the ink and water molecules could be arranged together than before.

The ink drop transforms into a set of complex and expanding swirls, slowly dispersing through the water.

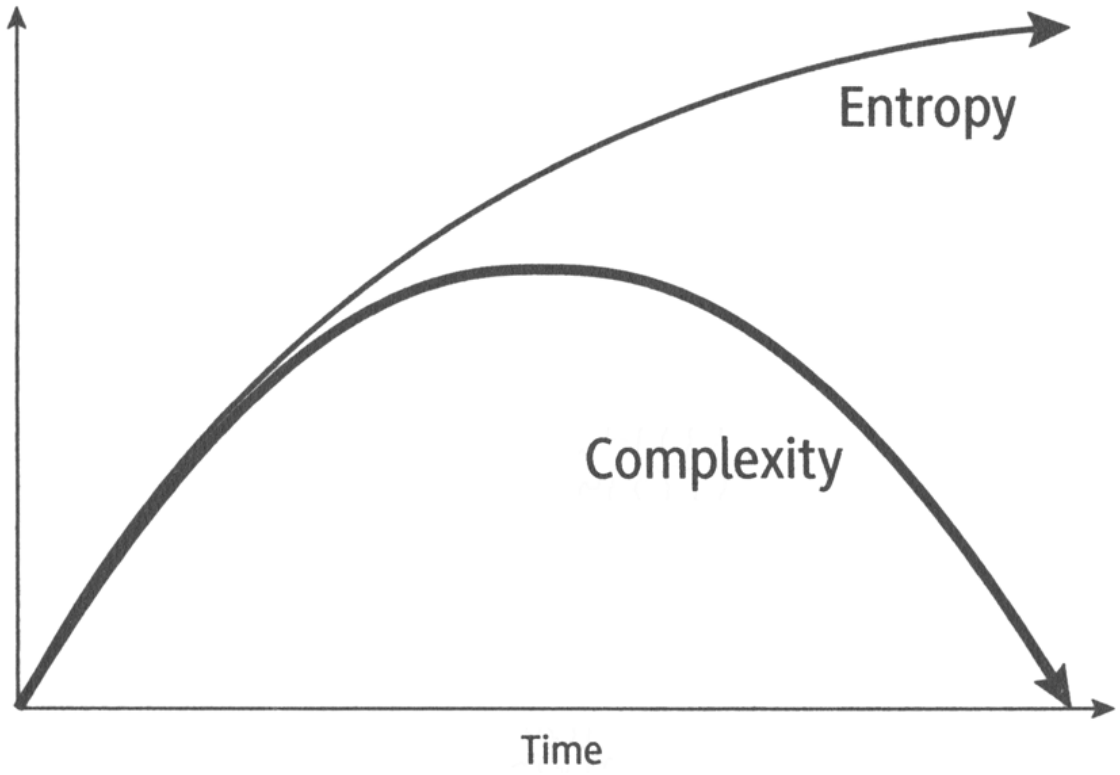
This means that the complexity of the system also increases. This is because complexity is a measure of how hard it is to describe the set of properties of a system, and a system with complex swirls of ink dispersing through the water would be more difficult to describe than one where they were bounded within their own volumes.

As the ink continues to spread throughout the water, the entropy of the system keeps going up, until the ink is uniformly distributed in the water.

Eventually, the ink and water reach an equilibrium. But this equilibrium is once again simple to describe: It's just a homogenous mixture of ink in water, which means it is once again less complex.

So, in this case, while the entropy of the ink+water system kept continuously increasing, complexity, which was initially growing, reversed course at some point and decreased, eventually becoming small again.

The following graph shows this relationship.



The relationship between Entropy and Complexity

Not to reveal any spoilers, but this interesting relationship between entropy and complexity turns out to be the largest source of meaning, and even purpose, in the universe!

But, like we have said, we will get there step by step, but ferociously.

Keep this picture of ink mixing into water in mind. We will encounter it again in the next chapter where we talk about one of the most important topics discussed in this book, Life.

Deep Dive: Poetic Naturalism (Sean Carroll)

Sean Carroll is a well-known physicist, philosopher and podcaster. He has written a book called The Big Picture, which talks about his model of ultimate reality, which he calls Poetic Naturalism.

In short, Poetic Naturalism can be described as follows:

Physical reality is mostly explained by the Standard Model of Physics, except for some areas at the low and high extremes, such as black holes, deep space and the Big Bang. (We already talked about this when we looked at the ultimate equation of physics, and, in fact, the ideas on this were taken from the book mentioned above.)

Beyond physics, different explanations exist for different sections of reality. For example, we have biology with its own laws of evolution, genetics, etc. Above that, we have psychology and then sociology, with their own laws and principles.

How we transition from the lower layers of this hierarchy to higher ones is currently not known. These transitions, known as phase transitions or emergence, cause gaps in our understanding of reality and, as a result, a unifying theory of everything remains elusive.

So, Sean's proposal is that we should simply say that there are many ways of talking about the natural world and some of those are still very valuable in their respective domains.

For example, the fact that the underlying laws of physics are deterministic and impersonal does not mean that at the human level, we can't talk about ideas about reasons and goals and purposes and free will.

In other words, while fundamentally this is still Naturalism, there is an element of poetic perspective in it. Hence, he calls it Poetic Naturalism.

Deep Dive: A Missing Law of Nature

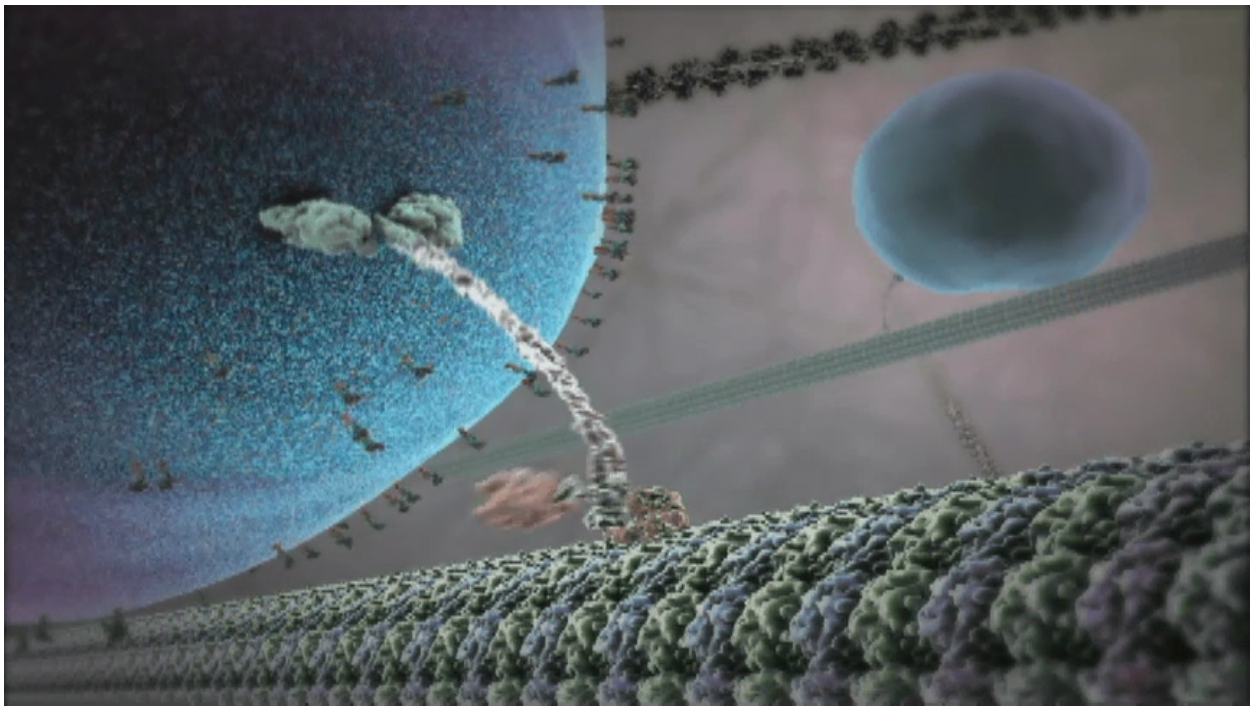
As mentioned above, many scientists have noticed that the universe has some natural tendencies that go in the opposite direction to the law of Entropy.

Here is a reference to and an abstract from one such recent effort:

"On the roles of function and selection in evolving systems" by Michael L. Wonga, Carol E. Cleland, Daniel Arend Jr., Stuart Bartlett, H. James Cleaves II, Heather Demarest, Anirudh Prabhu, Jonathan I. Lunineg, and Robert M. Hazen in Proceedings of the National Academy of Sciences, Volume 120, Issue 43, Oct 2023.

"The universe is replete with complex evolving systems, but the existing macroscopic physical laws do not seem to adequately describe these systems. Recognizing that the identification of conceptual equivalencies among disparate phenomena was foundational to developing previous laws of nature, we approach a potential "missing law" by looking for equivalencies among evolving systems. We suggest that all evolving systems—including but not limited to life—are composed of diverse components that can combine into configurational states that are then selected for or against based on function. We then identify the fundamental sources of selection—static persistence, dynamic persistence, and novelty generation—and propose a time-asymmetric law that states that the functional information of a system will increase over time when subjected to selection for function(s)."

7. Life: Entropy and the Pursuit of Complexity



"Inner Life of the Cell" - Animation developed by Harvard University showing a motor protein carrying a vesicle inside a living cell.

"The total disorder in the universe, as measured by the quantity that physicists call entropy, increases steadily over time. Also, the total order in the universe, as measured by the complexity and permanence of organized structures, also increases steadily over time."

— Freeman Dyson, Physicist and Mathematician, in "From Eros to Gaia"

"An agent does not 'have' a model of its world - it 'is' a model. In other words, the form, structure, and states of our embodied brains do not 'contain' a model of the sensorium - they 'are' that model."

— Karl J. Friston, British neuroscientist, in "Behavioral and Brain Sciences" (Journal)

The Mystery of Life

Human beings have been on a quest to explain the mysteries of life for a long time.

We have been haunted by questions like: What is life? How is it different from inanimate matter? How did it emerge from inanimate matter? How does it work? And, of course, what is its meaning and purpose?

And for a long time, all we could do was talk about it in religious or philosophical or poetic terms. Even today, most people prefer to talk about life in those terms rather than taking a scientific approach. (Except when they are sick or something.)

We acquired our longing for magic, as we saw earlier, while playing incredibly fun games like peek-a-boo as children. But when we figured out what was really going on, we couldn't experience that magical feeling anymore. So now we are afraid of going too deep into other things we find magical, like life, the universe and everything.

But luckily, not everyone feels the same way.

We have had a constant stream of scientists going after the aforementioned questions of life much more methodically and rigorously, via the sciences of biology, chemistry, and even physics.

And, we have made some amazing progress there.

Robert Hooke's discovery of the living cell, Charles Darwin's theory of Evolution, and Francis Crick and James Watson's discovery of DNA arguably mark the three of the most important milestones in this quest.

These milestones and many other discoveries have helped us understand the physical organization of life, how and why it has been changing over time, and the underlying code of life that controls a lot of it.

And learning about it has been extremely enlightening, not just because we are literally made of this stuff, but also because we are still governed by the same fundamental principles and processes that gave birth to us, even though we may not always realize it.

We will look at a few of these principles and processes in this chapter, along with how they help us build the MSE Framework.

Note that since we are looking at life through the lens of science and engineering, we will use the more general term "Living Entities" to refer to it. This not only avoids the potential baggage that comes with the heavily loaded word "life", but also generalizes it to other potential forms of life besides biological life, such as organized groups of living organisms or alien lifeforms or even artificial or virtual lifeforms.

Coherence, Entropy and Complexity, Again

Let us start with where we left off in the last chapter, discussing the concepts of coherence, entropy and complexity.

As we saw there, the overall entropy of the universe has been increasing in accordance with the Second Law of Thermodynamics. As a result, most things have a natural tendency towards falling apart.

But not always.

We can see ubiquitous and ever-present evidence of the opposite tendency also.

We have already seen two universal tendencies that work in the opposite direction: Coherence and Complexity.

These processes that bring things together continue until eventually we see complex molecules emerge from simpler ones, living cells emerge from complex chemical soups, complex organisms emerge from simpler ones, and self-organized complex societies of organisms emerge from individuals, and an entire biosphere emerges from everything on the planet.

While we understand a lot about all of these processes, we still don't have a full account of the first step: How life got started at all. We have some pretty solid hypotheses, but still no definitive account.

Luckily, we don't need to know that in order to define the MSE Framework, because we follow Present-Bounded Rationality as our methodology. We only care about what is happening with the processes of life right here, right now, to the best extent possible today, while keeping our eye open for future developments.

We have discovered some processes associated with the phenomena of life that are continuously occurring in the present and everywhere, and have formulated some very good theories about how or why that may be occurring.

One of them is American physicist Jeremy England's theory of Dissipation-Driven Adaptation, which could be described as a "Physics Theory of Life". Let us take a quick look at it.

A Physics Theory of Life

Let us continue with the "ink drop in water" thought experiment that we went over in the last chapter.

So once again, imagine that you place a drop of ink into a glass of water. As we already know, you would expect to see it slowly disperse until the ink reaches an equilibrium with the water, and the entropy of the overall system would be higher than before.

But now, imagine that this blob of ink didn't dissipate into the water. Instead, it expanded a little, then contracted back, and kept doing that, continuing its "blob-ness" for a while.

You would immediately feel that there is something very unusual going on. It would almost look like the ink blob was "alive" in some sense.

This intuition is perfectly reasonable because that is exactly how Living Entities behave — they may expand and contract or move or change over time, but they don't completely dissipate into their environment. They maintain their "blob-ness", at least while they're still alive.

Every living cell can be said to be like a blob of some extremely complex chemicals that resists dissipation as dictated by entropy. Another way of saying that is that it keeps itself far from reaching a state of equilibrium with its environment.

The way a living cell does this is by absorbing low entropy energy from some energy source in its environment and using that energy to keep itself in a low entropy state. In the process, it radiates high entropy energy into their environment, in the form of heat. The technical term for this is "dissipation".

Jeremy England's theory of Dissipation-Driven Adaptation generalizes this idea to any complex "chemical soup". It states that in a complex environment with an energy source, complex entities inevitably and automatically emerge to help dissipate that energy more efficiently than it would otherwise be.

Not only that, but if the energy source or the environment fluctuates from time to time, these self-organized complex entities will try to adapt to those fluctuations in order to continue to dissipate the energy efficiently.

In other words, they will resist reaching an equilibrium with their environment, or alternatively, maintain their far-from-equilibrium state, as long as the source of energy and the complex chemical soup continue to exist.

Such self-organized complex entities are known as Complex Adaptive Systems and the process is called Dissipation-Driven Adaptation.

Note that such conditions existed on early Earth for extremely long periods of time. There were various bodies of water with complex molecules in them, constantly interacting with each other. There were also energy sources, such as the sun or the hydrothermal vents at the bottom of the ocean. So, these conditions were perfect for the emergence of such self-organizing Complex Adaptive Systems. It is possible that life emerged as a result of some such mechanism.

That is why this insight is being called a Physics theory of Life. It potentially explains the emergence of life-like processes directly based on physics.

Jeremy England's insight itself is based on two well-established theories in thermodynamics known as the Fluctuation-Dissipation theories of Christopher Jarzynski and Gavin Crooks. In other words, this theory has a strong foundation of well-accepted theories in physics.

By the way, note that we are not claiming that this is how life actually got started on Earth. We do not know that for sure yet. We also haven't managed to create new life using this theory.

But we don't need that for our framework.

As I have stated earlier, in the MSE Framework, what we care about is not what happened in the distant past, nor what happens in the distant future. What we do care about is that we can demonstrate the process of Dissipation-Driven Adaptation occurring at any time.

In other words, irrespective of whether this process actually led to life, the process itself is real.

As a result, we can say that the universe appears to have a natural tendency to spontaneously create higher and higher levels of self-organized complexity, as long as we have a complex set of simpler entities interacting with each other, such as those found on planets like the earth, and an energy source, such as stars like our sun or other geothermal sources.

Needless to say, this is another and even stronger evidence for the natural tendency of the universe toward Complexity that we identified in the last chapter.

But wait, there's more!

Karl Friston, a British neuroscientist has an even more interesting theory of life, based on statistical physics.

Friston's Genius Formulation of the Phenomena of Life

As mentioned above, Karl Friston is a neuroscientist. So, his original goal was to come up with a fundamental mathematical model of how brains work.

Using various techniques in statistical physics and machine learning, he produced a mathematical model that captures the essence of how brains function. This model has been incredibly successful at explaining many aspects of brain function. He calls it the Free Energy Principle.

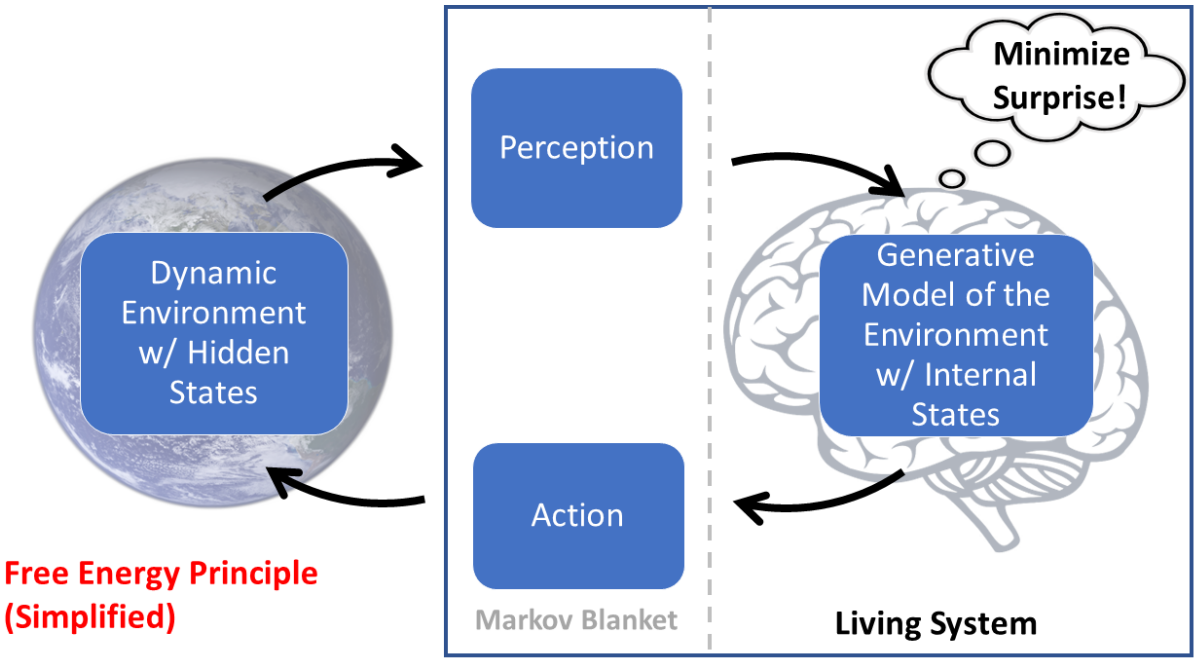
But he didn't stop there.

He discovered that this principle could easily be applied to explain the behavior of all Living Entities in general, starting from a single cell to a large living organism or organized groups of such organisms.

We will not go into the math here, because it will take an entire book of its own to explain. But we will try to understand the intuition behind the principle, as applied to Living Entities.

Let us start by taking a look at the following diagram which shows a simplified version of the principle.

It shows a Living Entity (big box on the right) interacting with its environment (the picture of earth on the left).



Let us start by observing that every Living Entity we come across in the world is enclosed inside a semi-permeable boundary or "skin" of some sort.

Mathematicians have a name for this boundary— it is known as a Markov Blanket. And, just like the name suggests, it separates and protects the contents of the Living Entity from its environment.

For example, the cell wall of any single living cell is such a Markov Blanket. The skin that surrounds our whole body is also such a blanket. If one thinks of a country as a Living Entity, then its border can also be thought of as such a blanket.

It is easy to see that the Markov Blanket plays a crucial role in preventing the contents inside from being dissipated into its surroundings. But it goes well beyond simply protecting the contents inside. It also has the capability of allowing chemical compounds and electrical signals in, which can be called perception. And it can also act on its environment, again in the form of chemicals or electrical signals or even physical movement.

Let us go over various parts of the diagram above to understand what is going on in a little more detail. We will need to do that in order to understand the essence of the most critical aspects of life.

Each of the sections below corresponds to one of the terms in the diagram above.

Internal States

The first thing to realize is that any living entity can only survive in a limited range of states. These are the states that are conducive to its continued existence. If the system goes outside this range, it is in danger.

For example, your body has certain states, consisting of its temperature, blood pressure, blood sugar level, and so on. Your body constantly tries to keep the values of these states within a certain range, failing which, you do not function properly. Too high or too low a value of your body temperature or blood pressure or sugar level, and you start having problems.

These states are called “Internal States”, i.e. states internal to the Living Entity, to distinguish them from the states of the environment, which are external to the Living Entity.

Basically, what we are saying is that, in order for a Living Entity to sustain itself, it needs to maintain its Internal States within a limited range of values that are conducive to its survival.

Hidden States

Analogously, the environment also has a large number of states.

For a simple system like an amoeba swimming in water, the environmental states may be characterized by simple parameters like water temperature, pressure, salinity, acidity, distance from a predator and so on.

And since these states are external to the Living Entity and thus unknown to it, we call them “Hidden States”.

Perception and Action

Now, the environment keeps changing constantly, which is to say that the Hidden States keep changing constantly.

For example, in the case of the amoeba, the water temperature, salinity, distance from predators etc. keep changing.

Any such change to a Hidden State could impact the Living Entity. There is always the danger that some of these changes will force the Living Entity to go outside the safe range of its own Internal States, potentially causing it to not function properly or even die.

It goes without saying that, in order to sustain itself, the Living Entity needs to be able to:

1. Perceive the changes to the environmental or Hidden States, (for example, the water temperature on its right is becoming too cold)
2. Analyze them to figure out how to respond (for example, determine that it needs to move where it is warmer and realize that means moving to the left, where it is warmer), and then
3. Take appropriate actions (for example, actually move to the left).

As hinted at earlier, the Markov Blankets of Living Entities are capable of performing functions 1) and 3) above. These are depicted in the diagram above with the labels Perception and Action, respectively.

The second part, analyzing the input and deciding how to respond, is accomplished by the Living Entity creating and maintaining an internal “Model” of the environment, as we will see below.

This Model is built by the Living Entity, based on its learnings from its previous experiences of interacting with the environment: What changes occurred in the environment, what actions it took, and what happened as a result.

If the results were good, the relationship between those environmental changes and the decisions the Model came up with would be reinforced. If not, they get weakened. Over time, the model gets better and better at making the right decisions.

(Of course, most Living Entities have ancestors, and a lot of this learning gets passed down from generation to generation via genes. But we don’t need to get into that detail yet. We will get to it eventually. For now, let us just say that it learns this by itself.)

Here is an example to illustrate this further.

Let us say you are looking at your social media feed and you come across something outrageous or triggering. Your eyes perceive it and notify your nervous system.

Luckily for you, you have experienced this before. Your internal model has learned, from your past actions, that clicking on that item will simply lead to your feed getting inundated with more and more outrageous and triggering items. You will just get more and more triggered and outraged. Not only will you waste your time, but you will ruin your whole day.

So you stop yourself from clicking on that item. Instead, your internal model tells you to switch to the far more rewarding activity of reading books about engineers finding meaning in their lives.

[Good for you! You have proved that you are an excellent Living Entity with a great future!]

Generative Model and Active Inference

As we have mentioned above, when a change in an environmental Hidden State is perceived by a Living Entity, it relies upon an Internal Model to decide how to respond to it.

But it can do even better.

The Internal Model isn't just reactive, it can also be proactive. So it doesn't just respond to changes in the environment, it can even get ahead of them by imagining things that could happen and be ready for them.

Think about what the Internal Model needs to do to accomplish this.

The Model needs to be able to make reasonable predictions about what the environment might do next, and prepare a set of responses to deal with them.

But, in order to figure out what responses might be appropriate, it has to be able to actually experience those conditions in the environment and respond to them to see what happens. This means it has to actively seek such conditions out.

In order to accomplish this, the Living Entity needs to do two things:

1. Its Internal Model needs to be "generative", i.e., capable of generating possible futures about what the environment might do next. These are known as "counterfactuals". And
2. It has to take appropriate actions to seek these counterfactual conditions out in the environment.

This process is called Active Inference. Active because it is not just passively inferring the Hidden States of the environment, but actively imagining what they could be and then actively seeking evidence for their existence.

Surprise!

Note that the ultimate goal of this exercise of Active Inference is to avoid surprises!

The recent Covid-19 pandemic provides an excellent case study for this.

The global health system can be thought of as a Living Entity with a generative model for world health, with the WHO and affiliated organizations being its home.

Such a model can be expected to be able to predict, based on its past experiences, as well as its generative ability, that pandemics of various types may occur at any time. And it needs to be ready for them with appropriate actions such as early warning entities, isolation protocols, vaccine research, educational campaigns and policy prescriptions.

A lot of this planning and strategizing involves imagining scenarios that could unfold (including ones that may have never occurred in the past) and preparing for them.

Of course, the scenarios they generate cannot be completely random. They need to be within the realm of possibilities given their knowledge of how the world works.

Typically, organizations such as the WHO would come up with realistic scenarios, conduct simulations, mock exercises, strategic and tactical planning exercises and so on to actively infer what types of responses would work in those situations.

The ultimate aim of this exercise is to ensure that if another pandemic were to break out in reality, even if it is of a different character, it would not be a surprise to the global health system, and it would be able to respond immediately and effectively.

Minimizing Surprise

As mentioned earlier, the Free Energy Principle involves a lot of complicated math. The end result of that math is a formula that calculates the amount of surprise that a Living Entity might experience when its environment changes in some way. The formula further states that this surprise needs to be minimized in order for the Living Entity to continue to exist.

It should be intuitive that minimizing unpleasant surprises should result in the Living Entity being able to respond to the change in the environment effectively, keeping itself intact.

In mathematical terms, minimizing surprise is also called “minimizing the free energy” (hence the name, Free Energy Principle).

(Note that the “free energy” mentioned here is not related to the concept of energy from physics. This is a separate concept from statistics.)

Another mathematical term for the same process is “maximizing Bayesian Model Evidence”. Essentially the intuition here is that the Living Entity wants to collect evidence that its Internal Model is robust against changes to the environment. Once again, it goes without saying that the better the evidence for the model, the better chance the Living Entity has of continuing to exist.

The main takeaway here is that when you update your internal model to minimize surprise, or improve its “Model Evidence”, you are basically becoming better at predicting what the environment might do next and responding effectively to it.

Hate Surprises? Good for You!

Here is another interesting example to illustrate the idea better.

It is a common practice to surprise people on their birthdays. And very often, the person having the birthday ends up suspecting that something is up and isn’t really surprised.

How does that happen?

All of us have models of our family members’ or friends’ behaviors inside our minds, based on their past behavior. We can also imagine the ways they might behave if they were trying to hide something from you. So, when they start acting in a weird manner, we notice that it is similar to how we had imagined they would behave if they were hiding something from us.

Based on all of that, we make a prediction that there may be some kind of a surprise coming our way, though we may not know all the details.

Then, we may start asking probing questions and see how they respond to them. Or look for evidence around the house of unusual activity.

This gives us more clues and reduces our uncertainty further.

All of this is another way of saying that we instinctively use our Perception, Internal Generative Model and Actions to perform Active Inference and minimize our surprise!

(So, people who say "I hate surprises" were right after all! Avoiding surprises is exactly what every Living Entity is inherently wired for! If you are one of those people who hate surprises, feel free to feel totally vindicated!)

Ok, that pretty much sums up the essence of the Free Energy Principle without going any deeper into the math.

Continuity of Existence or Identity

The main takeaway from all the discussion above is that Living Entities are constantly trying to minimize surprises in order to continue to survive in spite of their environment changing all the time.

And all of this happens all on its own. Every Living Entity, starting from a single cell to complex living organisms to organized groups of organisms are doing this automatically all the time.

So it looks like we have discovered another natural tendency that the universe seems to have: the tendency to create entities that inherently try to Continue to exist.

Universal Tendency #3: Continuity (of Existence or Identity)

The universe appears to have a natural tendency to create complex entities and processes that try to continue to exist or maintain their identity over time.

Having looked at the two main ideas connecting life and physics that have been developed fairly recently, let us now turn our attention to another important aspect of life, namely intelligence.

Intelligence

It is interesting to note that Friston wasn't looking for a principle that governs living entities. He was looking for the way a brain functions. In other words, he ended up discovering a fundamental principle of life while looking for a fundamental principle of intelligence.

This was probably not an accident.

It is common to think of the phenomena of life as separate from that of intelligence. Many people think that primitive life like bacteria and algae etc. are unintelligent and one has to get to larger, more complex creatures before we can call them intelligent.

But, as we just saw, every living cell necessarily has to have some amount of intelligence just to be able to maintain itself in a dynamic environment that might surprise it.

It has to have the ability to perceive its environment, create and maintain a generative model of the environment based on past experiences, generate counterfactuals, look for evidence for them, use the model to make decisions, and then act on those decisions. All of these activities look very much like intelligence.

For example, the Merriam-Webster dictionary defines it as "the ability to learn or understand or to deal with new or trying situations." Google defines it as "the ability to acquire and apply knowledge and skills."

Even the simplest bacteria can be said to have such capabilities, albeit at a very basic level appropriate for their limited range of activities.

In fact, when you look at all the things that happen inside a living cell, one could argue that the most intelligent entity in the universe, per unit of volume, is a living cell! The human brain may be far more intelligent overall, but it pales in comparison to the complexity and capability that a living cell packs in such a small volume.

All you have to do is watch some of the living cell simulations (or even videos of actual living cells under a microscope) to see the incredibly complex and varied activities occurring inside living cells. These include various molecules being ferried around in very purposeful and intelligent ways, complex structures being built or dismantled, cell walls allowing or rejecting various chemicals from entering the cell and so on. Watching a movie of a cell dividing into two, including how the DNA gets duplicated is simply awe-inspiring. White blood cells hunting down an intruder is nothing short of a nail-biting drama.

All of this occurs at the cellular level like clockwork, in an environment full of chaos. Way more chaos than most of us experience in our daily lives!

It is simply amazing to realize that all of that is going on inside every cell in your body, right here, right now!

(As an aside, anyone who thinks that science kills magic, or awe or even gratitude from our lives, should really watch such videos and then close their eyes and imagine all those things occurring inside their own body billions of times. They will instantly recover all of what they may have felt they had lost and more.)

I see no reason to think of all of these activities occurring inside living cells as unintelligent.

Of course, this isn't abstract or theoretical or artistic or other forms of intelligence that we typically associate with human brains. A living cell isn't going to beat you in IQ or chess or music composition. But it can absolutely beat you in terms of the amount of complexity and variety it handles in such a small volume.

Now, you might think that I am about to add another item to our growing list of universal tendencies. But I decided against doing that here, because, as I already stated, life and intelligence seem to be very closely tied to each other, and we have already accounted for life in the tendency of Continuing to exist.

But no worries, this universe we have ended up with is so awesome that we still have quite a few more tendencies to discover and appreciate.

In fact, let us add one to the list right now.

Emergence

While describing various phenomena in the chapters on Physical Reality as well as Life, we have come across quite a few cases where larger entities, patterns, or properties can be seen to arise through complex interactions among a large number of smaller or simpler entities, even though these outcomes are not apparent from the individual components alone.

For example, the phenomenon of the temperature or pressure of a gas emerges from the complex interaction of a large number of its molecules. Or the phase of matter, like liquid or solid, emerges from the arrangement and interactions of atoms. Or Complex Adaptive Systems, and eventually, Life, emerge from complex interactions of a large variety of molecules. Or murmurations of birds emerge from a flock of birds flying together or traffic patterns emerge from a large number of cars. Or how galaxies emerge from a large collection of stars and other matter in space.

In each of these cases, it is extremely difficult or even seemingly impossible to determine how some of the properties exhibited by the large scale or emergent phenomenon could be derived from its components. In fact, often it is the case that we can model the emergent phenomena quite well, and we can model the constituent parts quite well, but we can't explain how the former emerges from the latter.

Still, this phenomenon is so common, occurring in so many contexts and scales throughout the universe, that it really deserves to be recognized as another natural tendency of the universe.

So let us do that.

Universal Tendency #4: Emergence

The universe appears to have a ubiquitous natural tendency to create certain phenomena, where larger entities, patterns, or properties can be seen to arise through complex interactions among a large number of smaller or simpler entities, even though these outcomes are not apparent from the individual constituents alone. This is called Emergence.

Evolution

As quickly mentioned earlier, not every behavior learned by the Internal Model of a Living Entity is learned within its own lifetime. A lot of it gets passed down from generation to generation.

But even that process is more intelligent than simply copying what a parent has learned to a child.

That intelligence takes the form of small variations in information passed down, which are called mutations.

One can think of a mutation as another way for the Internal Generative Model of a Living Entity to come up with counterfactual scenarios. It then actually brings such an offspring into existence which then proceeds to seek evidence for the mutation. If such evidence is found, then the mutation is good. If not, then it is bad, and the corresponding mutation dies out.

This, as everyone knows, is known as Evolution by Natural Selection.

But, based on the analogy above, one can think of even evolution by natural selection as another instance of Active Inference. The generative model in this case is the DNA along with the process of replication and mutation at the time of cell division.

But wait, there is even more.

Organized Groups and the Biosphere

This process of complex adaptation through Active Inference doesn't stop at the individual level. It continues to expand wherever possible by making individual Living Entities self-organize into groups and interconnected webs of such groups forming ecosystems and eventually the entire biosphere.

In the case of human beings, they may take the form of families, communities, commercial or social organizations, and countries.

And in all of those instances, the Free Energy Principle and Active Inference continue to apply.

All of these organized groups usually have explicit or implicit boundaries, try to perceive changes in their environment as clearly as they can, create as accurate models of their environment as they can, and perform actions as effectively as they can.

For example, companies have HR departments that bring needed people in from outside (hiring) or send unneeded people outside (firing). They also have other departments that monitor and model their customers, suppliers, investors, competitors, and so on. They also create projections of future behaviors of those constituencies, and take into account how their environment might change and how they would need to plan and respond.

Through these actions, all of them try to keep themselves far away from being seriously surprised and getting destroyed i.e. reaching equilibrium with their environment.

And the process of evolution is seen even in these instances, in social systems or culture or economics and so on, which are continuously evolving. In other words, evolution appears to be another ubiquitous and ever-present Universal Tendency.

With that, as you might have guessed, we can add another item to our list of Universal Tendencies.

Universal Tendency #5: Evolution

The universe appears to have a natural tendency to create complex entities and processes that evolve towards more complex and sustainable forms through a process of natural selection.

The Need for a New Law of Nature

Needless to say, many scientists have noted the prevalence of these Universal Tendencies we have been collecting: Coherence, Complexity, Continuity of identity or Existence and Evolution.

While we do have the law of evolution in biology, what we really need is a deeper and broader law of nature that encompasses all of these processes in all of these contexts, starting from quantum fog to galaxies.

Even the Free Energy Principle, which appears to provide great explanations of the phenomena of life and intelligence, can't really be called a "law of nature". (In fact, that's why it is named a "principle" rather than a "law".) Much more work must be done to make these concepts rock solid from the scientific point of view.

We can still work within this limitation because our Present-Bounded Rationality methodology allows us to make progress as long as we are relying on the best possible explanations available to us as of now, and we keep an open mind to modify our beliefs as we learn more. That's exactly what we are doing here.

Luckily for us, some scientists have started putting forth proposals to formalize a new "law of increasing functional information." I am hopeful that some of these efforts will bear fruit and that this law will eventually become as well-known as the law of entropy.

Following is an excerpt from the paper that proposes such a law. As you can see, it hints at all the Universal Tendencies we have covered so far:

> *"Physical laws—such as the laws of motion, gravity, electromagnetism, and thermodynamics—codify the general behavior of varied macroscopic natural systems across space and time. We propose that an additional, hitherto-unarticulated law is required to characterize familiar macroscopic phenomena of our complex, evolving universe. An important feature of the classical laws of physics is the conceptual equivalence of specific characteristics shared by an extensive, seemingly diverse body of natural phenomena. Identifying potential equivalencies among disparate phenomena—for example, falling apples and orbiting moons or hot objects and compressed springs—has been instrumental in advancing the scientific understanding of our world through the articulation of laws of nature. A pervasive wonder of the natural world is the evolution of varied systems, including stars, minerals, atmospheres, and life. These evolving systems appear to be conceptually equivalent in that they display three notable attributes: 1) They form from numerous components that have the potential to adopt combinatorially vast numbers of different configurations; 2) processes exist that generate numerous different configurations; and 3) configurations are preferentially selected based on function. We identify universal concepts of selection—static persistence, dynamic persistence, and novelty generation—that underpin function and drive systems to evolve through the exchange of information between the environment and the system. Accordingly, we propose*

> *a "law of increasing functional information": The functional information of a system will increase (i.e., the system will evolve) if many different configurations of the system undergo selection for one or more functions."*
>
> **— "On the roles of function and selection in evolving systems" | Michael L. Wong et al | PNAS Vol. 120 | No. 43 October 24, 2023**

Curiosity and Creativity

Throughout this entire discussion of the Free Energy Principle and Active Inference, as well as Intelligence and Evolution, you may have noticed that all Living Entities inherently demonstrate two behaviors that we typically associate with human intelligence, though at levels appropriate to their context.

Those behaviors are curiosity and creativity.

Curiosity, because the process of Active Inference involves a Living Entity going out and seeking evidence of the counterfactual scenarios its internal generative model has thought up. This can be interpreted as the Living Entity being curious about its environment. For a very good reason, that it doesn't want to be surprised.

In the case of complex entities, the curiosity can also go inwards, where the entity is so complex that it needs to model its own behavior to avoid being surprised by itself.

And Creativity, because the internal generative model imagines these counterfactual scenarios. Sometimes, those scenarios involve not just being curious and seeking evidence, but creating something new entirely.

For example, birds build nests, bees build hives and beavers build dams. All of these can be seen as innately creative behavior by those creatures, that they have learned through evolution.

And we don't even need to say anything about the immense amount of creativity unleashed by the process of evolution. Everything you see in the biosphere, from simple bacteria and algae to complex creatures such as ourselves, as well as complex self-organized packs and societies of various social organisms were all created by the process of evolution. It is by far the best and most abundant example of creativity we can see!

In fact, another word for the biosphere, or even the entire universe, is Creation.

With that, we can now add these two to our list of universal tendencies.

Universal Tendency #6: Curiosity

The universe appears to have a natural tendency for creating entities and processes that exhibit curiosity.

Universal Tendency #7: Creativity

The universe appears to have a natural tendency to create entities and processes that exhibit creativity.

Diversity

As of now, the Standard Model of Physics recognizes seventeen distinct elementary particles—twelve fermions and five bosons. And that doesn't even account for the flavor and color combinations and their antimatter counterparts. If we do that, we end up with a total of 61 particles.

As per the latest version of the Periodic Table, we have discovered (or synthesized) 118 elements, each with unique properties.

We have identified seven main types of stars, grouped by their temperature, color, and luminosity: O, B, A, F, G, K, and M.

We have classified planets into 6 different types by mass, 15 types by orbital characteristics and 17 types by composition.

And all of that doesn't even account for other types of celestial bodies, like comets, asteroids, supernovae, gas clouds, galaxies of various types and interplanetary objects.

Back on earth, there is a tremendous variety in the types of living cells that exist and the various organelles they contain. And the total number of plant and animal species we have ended up with is in the millions.

I could go on for a long time listing the variety of geological features, weather phenomena, water features, ecological niches and so on that exist right here on Earth, not to mention the uncountable number of planets all over the universe.

All of these varieties of everything have unique characteristics, and they combine and interact with each other in a large variety of ways to give rise to a combinatorial explosion of diversity in the universe.

The point I am trying to make here is that the universe contains a mind-boggling amount of diversity, which formed all by itself.

While there is clearly a lot of overlap between this and the various other universal tendencies we have identified, including Complexity, Evolution, Curiosity and Creativity.

Still, I think it helps to identify it as another universal tendency because, as we like to say in the field of AI, "quantity has its own quality". When you have a huge amount of something, it has its own emergent behaviors that did not exist in the constituents.

As a result, we can add one more item to our list: Diversity.

Universal Tendency #8: Diversity

The universe appears to have a natural tendency to create a large amount of diversity of various types.

Mindfulness

This brings us back to one of the most central concepts in this book.

A significant part of the behavior displayed by all Living Entities, as described in this chapter, which, as we saw, can be derived directly from physics, could actually be described as "mindfulness".

Allow me to explain why. Time to expand our minds.

Not just our minds, but even the definition of what we mean by a mind.

Let us start by saying that the concept of "mind" includes intelligent, agentic, curious and creative behavior displayed by any complex system, appropriate for its level of complexity. If we define it this way, it can be seen to apply to all Living Entities that we have described: living cells, organisms, organized communities of organisms, ecosystems and so on.

Mindfulness, at the human level, is a practice that helps us clear our minds of thoughts that distract us from paying our full attention to what is going on around and inside ourselves.

Through various techniques, the practice teaches us how to calm our minds, clear it of all the stuff that occupies it most of the time, and focus our attention on the present moment and situation.

This allows our perception to become sharper and more wide-ranging, which helps our internal models to become better at modeling our true reality, and, as a result, makes our actions more effective.

Well, as we have already seen, that's nothing but a central aspect of Active Inference! That's exactly what every living organism is inherently doing all the time!

Every living cell keeps itself whole and functioning in the highly dynamic physical world by sensing its environment as accurately as it can, updating its internal model appropriately, and acting on the environment in accordance as effectively as it can.

And, over time, either via the process of its own learning or genetics or evolution, this inherent functioning of the entire phenomena of life gets better and better.

This is exactly what the practice of Mindfulness tries to teach - improving our perception of what is happening around as well as inside us, processing it without getting biased or distracted, thus improving its accuracy, and responding to it as effectively as we can.

Since the simpler organisms don't have complex minds such as ourselves, they don't really need to learn any practices like Mindfulness to quiet their minds. Their "minds", such as they are, are already pretty quiet! They are mostly just performing Active Inference without any distraction generated by their minds, and as a result, one can say that they are inherently practicing mindfulness all the time.

This can also be characterized as tacit or embodied mindfulness. So while we have to learn this practice, they are just born with it.

It is interesting that we had to wait for human thought to evolve for millennia before we rediscovered something that was an integral aspect of all living organisms!

And now that we have, it is only reasonable that we embrace it like we would a long-lost friend.

I hope this also clarifies why, in the chapter on Methodology, we decided to name our methodology Present-Bounded Rationality. Qualifying rationality in this manner not only makes sense based on the reasoning provided in that chapter, but it can even be derived from First Principles. (In fact, I had originally named the methodology Mindful Bounded Rationality, but then I felt that Mindfulness was too loaded a concept to use at such a fundamental level, so I went with the more fundamental idea of the present.)

One can even argue that Present-Bounded Rationality is the inherent methodology of all Living Entities.

Mindfulness forms a central idea in this book and keeps popping up in multiple places, not because it is popular these days, but because it can be scientifically proven to be a critical aspect inherent to all Living Entities.

Still, I think mindfulness expresses only a part of what Active Inference involves. There is another part that also needs to be discussed.

Prioritizing Counterfactuals

As we saw, the process of Active Inference involves the internal generative model generating counterfactual scenarios and then looking for evidence of their existence in reality.

Now, there is no limit to how many such counterfactual scenarios the model can generate, so the process of Active Inference has to select which of these scenarios are good candidates for evaluation through action.

In the case of highly complex Living Entities such as ourselves, this is where higher level concepts like reason as well as values come in.

Reason is the faculty Living Entities use to rank the scenarios in the order of their likelihood of being validated. And "values" is the faculty it can rely on when reason isn't able to provide sufficiently clear guidance (possibly because there isn't sufficient evidence to do so).

Values can be thought of as a priori weights that complex organisms associate with various choices so that the choices can still be ranked even when reason isn't able to do so.

Over the millennia, various human societies have come up with various sets of values that help people make such decisions in the absence of sufficient evidence.

But, as we have seen, very few of these values come with sufficiently rigorous justification for their validity.

So, any rigorous framework such as the MSE Framework must provide clear guidance for which concepts can be considered to be "valuable" in this sense. And, in order to meet our criteria, it must also provide sufficiently rigorous justification for suggesting those concepts.

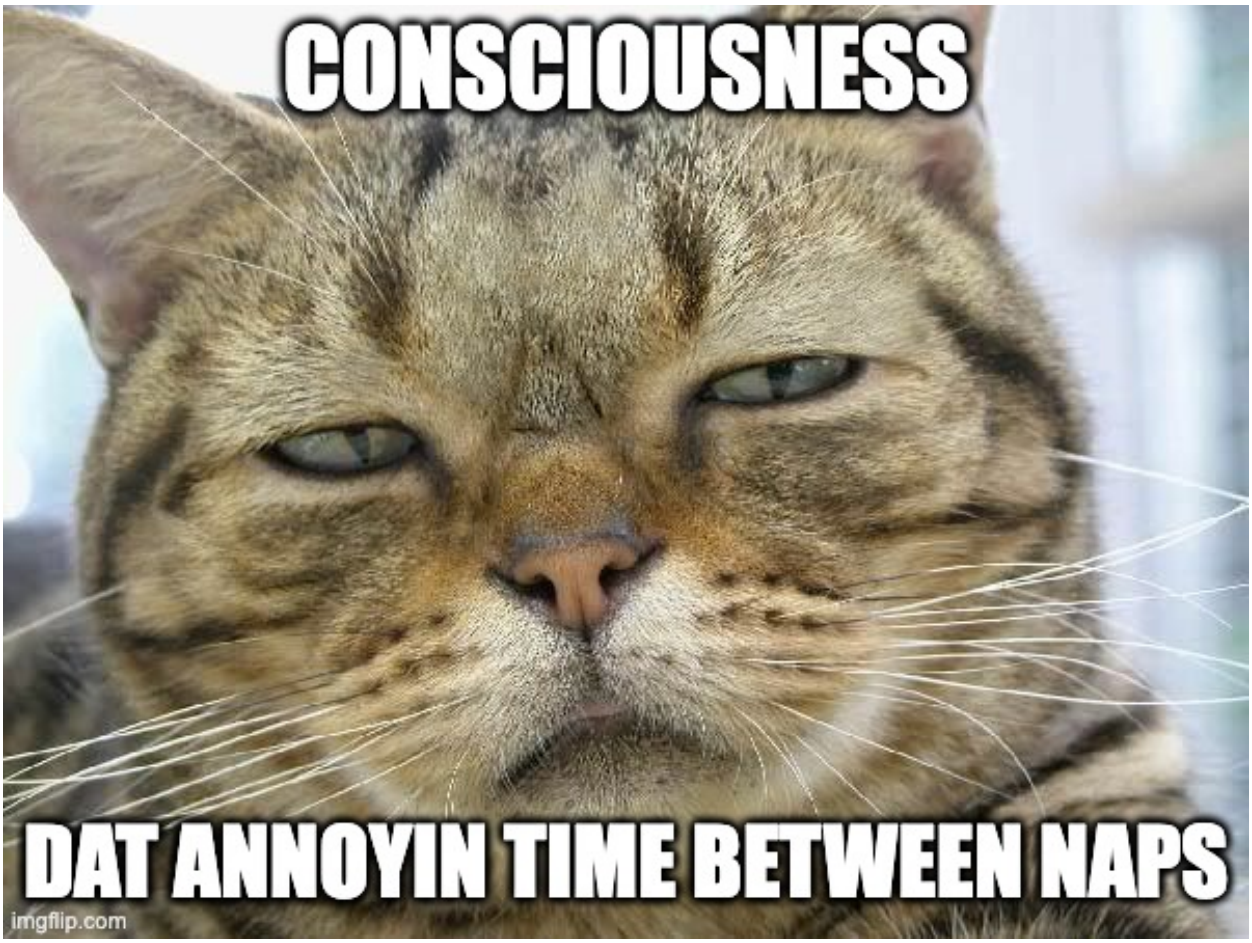
Also note that while the counterfactual scenarios occur in the future, and in some cases, even the distant future, the decision to evaluate them and act on them occurs in the present.

Let us keep these thoughts in our mind for now. Just like mindfulness, "values" will become another pillar of our framework as we progress through the book.

Of course, invoking things like "mindfulness" and "values" before we have even delved into the mind itself may appear a little premature. So let us do that in the next chapter.

The mind, or more specifically, Consciousness, is the next logical layer in our framework.

8. Consciousness: A Way for the Cosmos to Know Itself



Not quite what I have in mind here, but this looked cute

"The cosmos is within us. We are made of star-stuff. We are a way for the universe to know itself."

— Carl Sagan, American astronomer, in the TV series "Cosmos"

"The universe contains infinitely more beauty than humans can ever appreciate. While you

enjoy the spectacle of one sunset, trillions of sunsets are simultaneously occurring across the universe, painting alien skies with color frequencies you couldn't even perceive."

— Francois Chollet, AI Scientist at Google, in a Tweet

What is Consciousness?

We all have this feeling that there is some sort of a "presence" inside of us. It is looking out from the inside and is having the experiences we are having.

For example, when you say, "I'm feeling cold". Who or what is this "I" that is feeling cold?

You could say that it is your body that is feeling cold. But where is this feeling of coldness being experienced? Is it your mind?

But then, when you say "I am feeling happy" or "I am thinking about ice cream", who is this "I" that is feeling happy or thinking about ice cream?

You could say it is your mind.

But again, if you are saying "my body" or "my mind", who is this "inner me" that is not your body or your mind but seems to think it owns them both?

This is a question that has bothered everyone from little children to wise old people for a long time.

And we have given this "inner me" a name, "Consciousness".

Consciousness is the feeling we have that there is something inside of us that is experiencing the things we experience. And through the sum total of those experiences, it is the thing that knows "what it is like" to be you.

Over the millennia, the word has taken on a few slightly different meanings.

To start with, there is the meaning we started with, the experience of "the inner me" that knows "what it is like to be you". This is often called as "subjective or phenomenal experience".

But colloquially, consciousness can also refer to the cat's version in the meme up there i.e. being awake (vs sleeping). It can also refer to being aware of what's going on (vs being unconscious), or having a certain amount of activity in certain brain regions (vs being dead) and so on. We have also developed the concept of "universal consciousness" that gives rise to, or maybe, is, all of existence.

Then there are other words like "spirit" or "soul" or "essence" and so on that also get associated with the concept of consciousness.

Having the same word mean all these things makes any debates about consciousness highly problematic. Often it turns out that when people are having fierce debates, they are really talking about different senses of the word.

And since we are trying to take a principled approach to all such important concepts in this book, we need to be clear about what exactly we mean when we use the word Consciousness.

For the purposes of this book, there seem to be at least 3 meanings of the word that could be interesting for us to look at.

Let us take a quick look at them next.

A) Consciousness as in "Phenomenal or Subjective Experience"

This meaning of consciousness refers to the "inner me" or "what it is like to be you" mentioned at the beginning of the chapter.

Consciousness in this sense is self-evident to all of us but we cannot prove its existence to anyone but ourselves because it is purely subjective.

In fact, the only reason why I believe that you are conscious is because I know I am conscious, and I am a human being, and you look like a human being, so I extrapolate from there and accept that you are probably conscious too!

Needless to say, this makes it really hard to study this phenomenon scientifically because science is based on objectively verifiable phenomena. It has generally stayed away from dealing with highly subjective phenomena such as this. (Though I believe it is time for science to find ways of dealing with them, as I have already explained in the chapter on Methodology.)

But since we are trying to build the whole stack of concepts starting from the absolute fundamentals, we have a deeper problem here. It is known as the "hard" problem of consciousness.

The "hard" reference comes from Australian philosopher and cognitive scientist David Chalmers, who characterizes it as follows:

> *"The hard problem of consciousness is the problem of explaining why any physical state is conscious rather than nonconscious. It is the problem of explaining why there is "something it is like" for a subject in conscious experience, why conscious mental states "light up" and directly appear to the subject."*
>
> **— David Chalmers, Australian philosopher and cognitive scientist, in the Internet Encyclopedia of Philosophy**

Essentially, the deeper question here is, "How does consciousness, as in phenomenal experience, emerge from purely physical matter?"

After having thought about this for centuries, we still do not have a good answer to this question. While various people have proposed a few hypotheses, we are far from proving any of them.

But what we can say for sure is that this phenomenon is self-evident, easy to understand and widely corroborated. Every human being you can talk to will attest to the fact that they are definitely conscious. One does not need to be an expert on consciousness or a meditator or anything like that.

And since the PBR methodology allows us to include subjective phenomena that are simple to understand and widely corroborated, we can include this sense of consciousness in the MSE Framework, at least at the axiom level. (And, as you have seen earlier, we have indeed included it in the MSE Framework diagram.)

B) Neural (or, More Correctly, Biological) Correlates of Consciousness or "Easy" Consciousness

Consciousness in this sense refers to the structures and processes inside our nervous system that appear to be related to consciousness.

We usually associate various cognitive functions with consciousness, such as perception, attention, memory, and introspection. These, among others, are the "neural correlates" of consciousness.

Of course, more and more evidence is piling up that our bodies don't use just neurons to "think". We also "think" in deeper, subconscious ways all over our bodies.

So I think it is more accurate to say "biological correlates" rather than just neural.

Irrespective of whether you agree with this characterization, consciousness in this sense is considered to be "easy", (at least as compared to the "hard" version,) because we assume we can study these biological correlates objectively, and thus gain scientific insight into them.

And while we haven't completely solved this problem, we have made tremendous progress in doing so, using various scientific techniques.

C) "Universal" Consciousness

This is the idea that the entire universe is a single unified entity and, just like we have a consciousness, it also has, or in fact is, a consciousness.

Another idea that usually gets added to this is that the consciousness we feel inside ourselves is really just this universal consciousness expressing itself through us, though we aren't always aware of this.

This concept is known as Brahman in the Vedic tradition or Tao in the Chinese tradition or sometimes just as the Universal Generative Principle in secular terminology.

Unfortunately, here again, we have no evidence that such a thing exists. We have no way to verify that the universe is conscious in any way that we can understand or explain. We also have no evidence to claim any relationship it has with the individual consciousness we experience. The whole thing is an enigma.

But one part of this idea that we can agree with is that we all seem to have a natural tendency to want to expand and enrich our consciousness.

This is widely corroborated by many people when they say things like "I need to belong to something larger than myself" or "I feel that I am a part of something much larger than myself."

We also agree that simply watching a sunset or looking at a smiling child (or indeed, a cat) or listening to music or reading a book are all consciousness-enriching or expanding experiences.

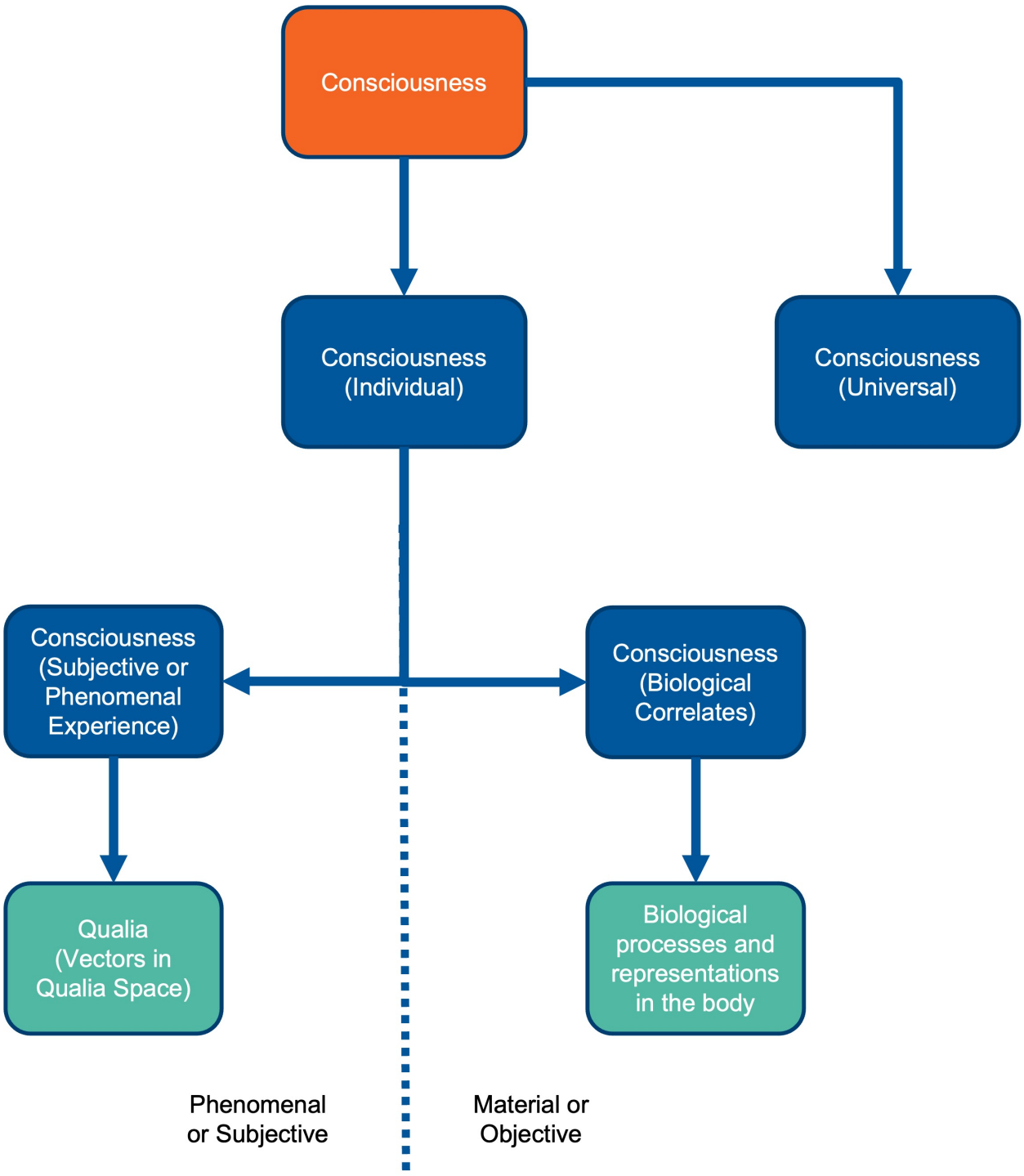
And it's not even just that. We can think of everything we do as, in some way, expanding or enriching our consciousness because each experience we have is unique in some, no matter how minor, way, and it adds to the whole.

And since this subjective feeling is simple and is widely corroborated, we will include it in our framework.

In fact, we will actually use this concept further below to state where we think the desire for meaning, purpose and hope comes from. So this idea turns out to be rather critical for the MSE Framework.

Time for a Picture - Of Your Consciousness!

So here is a quick picture showing our model of consciousness. For the purposes of the MSE Framework, we will use the term "consciousness" in all these senses. The context should make it clear which sense we are talking about.



MSE Framework Model of Consciousness

"An Engineer's Search for Meaning" © 2023 Vinayak (Vin) Bhalerao

Consciousness is complicated!

Consciousness as an Axiom

A significant roadblock to scientifically studying consciousness in the “hard” sense is that it is subjective, whereas science likes to deal only with objective evidence. The most powerful tool of science, the Scientific Method, requires objective evidence.

On the other hand, the phenomenon of consciousness is self-evident. You don’t really need any proof of the fact that you are conscious and are having an experience of seeing these words in front of your eyes right now.

But there is no way to prove this fact to someone else. All they can do is infer it based on the sharing of various characteristics, as mentioned earlier.

Normally, when science comes across evidence that isn’t objective, it simply dismisses it (or at least in need of further study so that it can be converted into something objective).

But in the case of consciousness, that would make no sense since, in spite of it being subjective, its existence seems self-evident already!

There are various proposals to show how consciousness might be emerging out of physical neural activity. I am myself receptive to the idea and have my own hypothesis which I have included further down in this chapter.

But unfortunately, all such proposals, including mine, are far from being proven at this point.

The way I have chosen to resolve this problem for the MSE Framework is to treat consciousness, in the “subjective or phenomenal experience” sense, as an axiom. An axiom is nothing but something fundamental that seems self-evident, is widely accepted and can’t be explained in any other way, so this should be perfectly reasonable.

But just in case you have some hesitation over accepting it as an axiom, let me provide a strong supporting argument.

The truth is, what we call “physical reality” is also something fundamental and self-evident that we all take for granted. Everyone agrees that it exists, but one can argue that, ultimately, it is also just a subjective experience.

All we can say confidently is that we are receiving some signals from something “out there”, but we really have no idea what their origin is. Because all we have are these signals. Whatever we construe as physical reality is simply what our brains infer from those signals. And the fact that other people agree with those inferences gives us a lot more confidence that they truly exist “out there”. But no one can say anything about the source of those signals.

In fact, if you really think about it, we don’t even have a good definition of what the word “physical” means. This is because there is no deeper reference frame that we can point to in order to define it. It is simply something we all intuitively agree upon without any further basis.

Any definition, such as “we can see it” or “touch it” either quickly becomes circular or somehow ends up involving consciousness.

We can talk about solid objects and elementary particles and forces and even quantum fields and so on, but those are just characteristics of physical reality. They do not tell us what we mean by the word “physical”.

This is no different from what we said about consciousness earlier. We all agree it exists but there appears to be no deeper frame of reference to base it on.

So, it makes sense to treat both physical reality as well as consciousness on the same footing - as axioms!

A major benefit of this approach is that it allows us to completely bypass all the philosophical debates between people who believe in one of them as being fundamental and the other one being just a figment of our imagination.

Let us dig a little deeper into these debates and highlight an important benefit of how our methodology helps us move past them.

Present-Bounded Rationality to the Rescue Once Again

A lot of scientists have the temptation to treat physical reality as privileged and consciousness as something that needs to be explained using physical reality as the basis.

That is why, by "Hard Problem", people always tend to mean the "Hard Problem of Consciousness" i.e. the problem of defining how consciousness arises out of physical reality.

On the other hand, some philosophers argue that one could take consciousness as fundamental and physical reality as something imaginary that emerges out of it. In fact, this is pretty much the stance taken by Vedic philosophy.

Interestingly, if you take this argument to be true, then consciousness becomes easy but explaining how physical reality emerges from it becomes a "Hard" problem, i.e., we end up with the "Hard Problem of Physical Reality"!

Many scientists and philosophers alike get stuck on one or the other of these problems because they believe that unless we can resolve this, we cannot have a complete understanding of reality.

But we do not need to go there. Our focus is on solving a real-world problem, that of defining meaning, purpose and hope. Due to our adoption of Present-Bounded Rationality as our methodology, we are fine with not having complete knowledge of everything. We can use what we know and see if we can create a useful model and a solution to our problem based on it, which we can always improve later on as we learn more.

So, we'll go ahead with treating both consciousness and physical reality as axioms, and both have an equal footing in our model. (As you can see, this is already reflected in the MSE Framework diagram included earlier in the book.)

Consciousness as a Universal Tendency

As we have already stated, we have no good theory for how consciousness originates. But what we do know for sure is that it does originate, and we can feel its presence right here and now.

Moreover, many other mammals (apes, dogs, elephants, whales etc.), birds (crows, parrots etc.) and sea creatures (octopuses etc.) exhibit at least some aspects of consciousness that are quite similar to ours.

For example, many of them seem to have a sense of self, enjoy a certain amount of play, display empathy towards each other, show evidence of thinking through problems, communicate with each other, show evidence of experiencing pleasure and pain, and so on.

Even some complex organized groups of Living Entities such as communities or countries or economies can also be seen to exhibit certain aspects of consciousness. These again take the form of exhibiting a distinct identity with unique characteristics, drives, fears and other types of emotions, the desire for survival and expansion, and so on. One could say that their consciousness is just an agglomeration of the individual consciousnesses of the Living Entities that inhabit them, but they also demonstrate some emergent properties that aren't present in the individuals.

There is even speculation that AI could develop consciousness down the road.

There are scientific theories, like the Integrated Information Theory that try to generalize the notion of consciousness to all systems that have a complex organization, irrespective of their substrate, biological or otherwise. (There is a Deep Dive into this theory below.)

The point I am trying to make is that, irrespective of our inability to identify the exact process of its emergence, we can say that consciousness in various forms has indeed emerged in the universe, and continues to emerge in various contexts and ways.

You have probably guessed what I am going to say next: Yes, we can absolutely think of the tendency to give rise to consciousness as another universal tendency, emerging on top of a variety of types of self-emergent complexity.

So, let us add it to our list.

Universal Tendency #9: Consciousness

The universe appears to have a natural tendency to create Living Entities of various types that display consciousness to various degrees.

But that's not all. Consciousness is more special than all the other tendencies we have identified.

What's really interesting is that Consciousness itself demonstrates all of the other universal tendencies that we have identified, namely Coherence, Complexity, Continuity, Curiosity, Creativity, Evolution, Emergence and even Diversity. (As a fun exercise, you may want to spend a little bit of time thinking of examples where your own consciousness exhibits each of the other tendencies.)

Let us keep this idea in mind for now, we will use it further down in the chapter.

But first, we need to look at the most important reason we have included Consciousness in the MSE Framework. Consciousness has a larger role to play in the framework besides being one of the tendencies, or even an "uber" tendency as described above.

The Desire for Meaning, Purpose and Hope

Most of us have probably experienced states of "heightened awareness" or "intense consciousness" at some point in our lives.

They could be a result of experiencing (or creating) great music, great art, great movies, great books, being in or making love, hanging out with friends, or maybe just eating ice cream.

Many people would even say that such experiences are really meaningful to them.

This realization gives us a clue for where we think our desire for meaning in life may be coming from, not to mention where the experience of meaningfulness occurs.

We have seen that our physical desires, such as those for nutrition, comfort, safety etc. arise in our physical body as a result of it performing Active Inference in order to minimize surprises and thus continue to survive.

But while these desires arise from our physiology (which emerges from Physical Reality in our framework diagram), some other desires, such as those for meaning, purpose and hope in one's life, appear to be arising out of our consciousness.

One reason for saying that these desires arise out of consciousness is that the sense of meaning, purpose and hope have no counterpart in physical reality. It requires a serious stretch of imagination to say that atoms and molecules, or even complex chemicals have any sense of meaning, purpose or hope. And since we have no theory that shows us how consciousness may be arising from physical reality, we can not jump to that conclusion either.

As we have already said, the desire to "belong to something larger than oneself" is simple and widely corroborated. We have already seen earlier that this desire could be seen as an expression of the natural

tendency for our individual consciousness to expand, to include not just other people, but eventually all of reality.

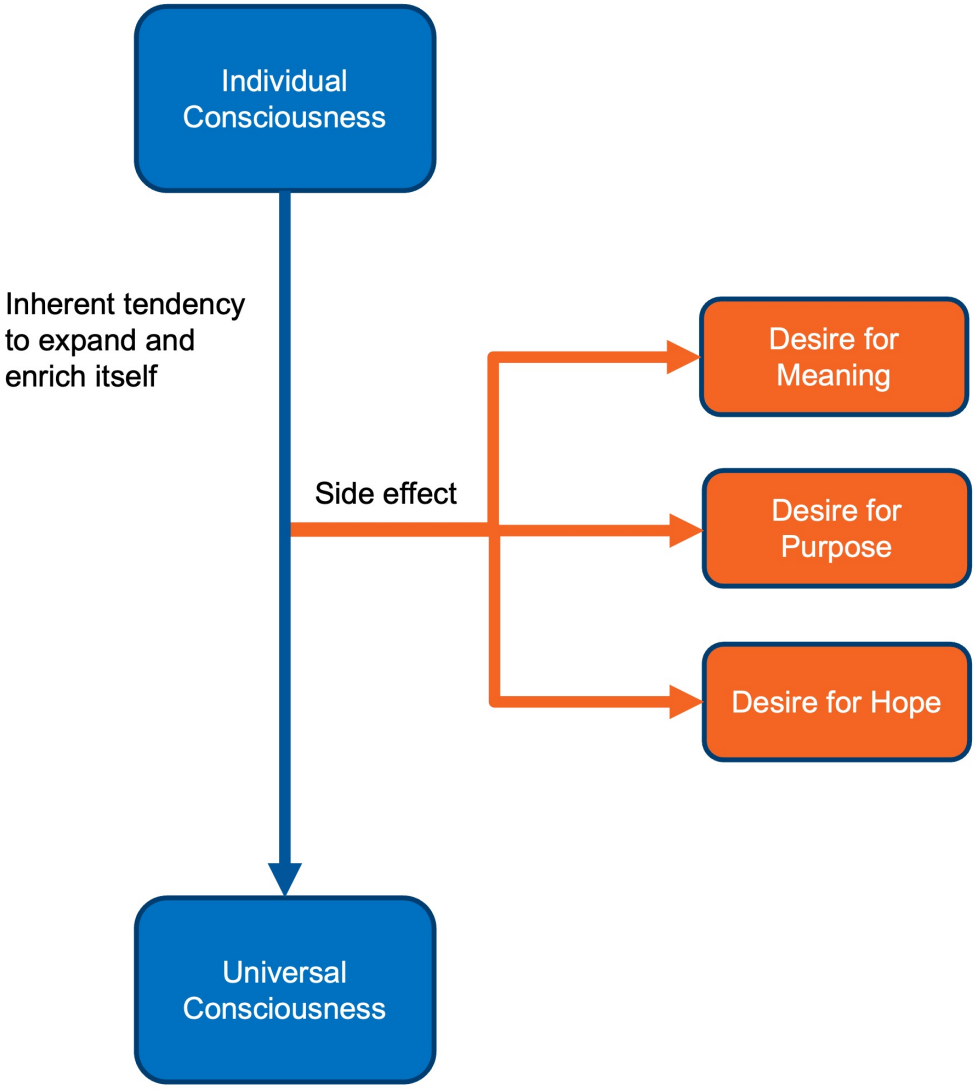
Moreover, we have also observed that the experience of expanding or enriching our consciousness is widely considered to be meaningful by those experiencing it.

In other words, we can say that our consciousness naturally acts as if it is trying to expand and enrich itself, and we experience this phenomenon as a desire for meaning and purpose.

Moreover, our consciousness expects to keep trying to expand and enrich itself in the future and we can say that we experience this as our desire for hope. In other words, hope is nothing but an expectation we have that our lives will continue to be meaningful in the future.

As a result, we can state that the desires for meaning, purpose and hope all appear to be side-effects of the natural tendency of our individual consciousness to expand and enrich itself.

Let us represent this idea with a simple diagram:



Emergence of the Desire for Meaning, Purpose and Hope

“An Engineer’s Search for Meaning” © 2023 Vinayak (Vin) Bhalerao

Emergence of the Desire for Meaning, Purpose and Hope

While that should be sufficient for our needs, I am going to postulate a highly plausible hypothesis about desires in general and using that as another factor in favor of this argument.

Hypothesis: The Origin of Desires

I am claiming that desires, whether they arise from our physiology or consciousness, are a result of Living Entities performing Active Inference.

Let us take a deeper look to see how we can arrive at this conclusion.

We know that the process of Active Inference involves Living Entities building a generative model of their environment. This model is generative in the sense that it generates counterfactual scenarios. The Living Entity then seeks evidence for those scenarios in its environment.

Well, we can say that desires are nothing but these counterfactual scenarios that emerge in these generative models, that we are compelled to realize in our real lives as a result of us constantly performing Active Inference.

In other words, it is the process of Active Inference that is at the root of the desire to realize these counterfactual scenarios. It inspires Living Entities to go out and seek evidence for their existence, which is the same as trying to fulfill them.

So, it seems quite reasonable to say that Active Inference is the root of all desire.

Now, note that Active Inference is a general principle that applies equally well to all Living Entities. It does not matter whether the entity is biological (such as a living organism), social (such as a community or organization), virtual (such as consciousness) or possibly even artificial (as in AI). One can say the process is "substrate-independent".

Thus, not only does our physical body tend to perform Active Inference, but even our consciousness may be doing it. We could even postulate that consciousness is a "virtual" life form that complex lifeforms give birth to. (We will explore this particular idea further down.)

This virtual life form also needs to continue to survive, and hence has to perform Active Inference.

For example, our physical brains do have the ability to sense our environment, build a model of the environment and perform actions on the environment. Similarly, our consciousness can also be seen to sense its environment, build a model of it, and act on it. It does this via the thinking / feeling parts of our brains.

We can also say that some of our desires are physical, such as hunger or physical comfort, and some arise out of consciousness, such as meaning, purpose and hope.

But note that the generative models created by these two processes are different. One is physical and the other is virtual or abstract (though it possibly uses physical infrastructure).

Let me explain what I mean.

We say that Newton developed abstract models of the law of gravity or laws of motion. But the models he created were meant for our consciousness, not for our physical body.

The reason why I am saying this is because our physical body already had its own, physical model of gravity and laws of motion. It built this model a long time ago, when we were small and kept picking things up and dropping them or throwing things around!

Yes, when we picked things up and let go of them. only to see them fall down, we intuited over time that things always seem to fall down unless supported by something solid i.e. we essentially "discovered" gravity ourselves.

Similarly, when we learned to throw and catch balls or whatever, we were slowly putting together a model of the laws of motion without being consciously aware of it.

These models were "physical" or subconscious in the sense that they got embedded somewhere in our neurons and even our muscle memories without us being explicitly aware of them. We didn't know any calculus or even any math then, but we could still throw things around and catch them reliably, i.e., deal with physical reality effectively, as a result of these models.

It was much later, when we actually did learn math and calculus that we were able to build abstract or mathematical models of gravity and laws of motion.

Why did we have to build these abstract models when we already knew these concepts intuitively?

We did that for the benefit of our consciousness! While our bodies had learned Newton's laws intuitively long before, our consciousness hadn't and (at least for some of us) was starving for that knowledge!

This is because the physical models we built were subconscious or embodied, so they were not directly available to our consciousness. Consciousness needs abstract models. It needs something abstract like math and calculus and find a way to represent reality in those terms and then figure out how to process it in mathematical terms.

And of course, once our consciousness had learned these abstract models, it could analyze them and build even more complex counterfactual scenarios using them, and that then motivated it to realize those more complex scenarios in reality. That's how we ended up with cars and planes and rockets.

When our teachers taught us math and calculus and Newton's laws, and we said "Oh, I finally get it", what we really meant was "My consciousness finally got it". Our physical body had already known it from the time we were little children. We wouldn't have been able to walk or run or jump or play ball without that knowledge!

So we actually learn Newton's laws twice in our lives - once, as infants, on our own (so, actually, we could call them our own laws!) and then again in school. The first one may be called intuitive or embodied, and the second one, abstract or mathematical.

Isn't that interesting? Makes you wonder about which other things we learn in school were intuitively known to us long before. (This isn't just an interesting thought. It is interesting to go through this exercise. You will be amazed at what you will discover!)

To summarize, let me state the main hypothesis a little more formally.

Hypothesis: The Origin of Desires

Desires arise in Living Entities as a result of them performing Active Inference. They are the counterfactual scenarios generated by their internal generative model. The process of Active Inference results in the Living Entities going out and seeking evidence for the existence of those counterfactual scenarios. When such evidence is found (or constructed), that is essentially the same as those desires being satisfied.

Physical desires such as hunger and thirst arise out of the physical process of Active Inference. Similarly, conscious desires, such as those for meaning, purpose and hope in life, arise out of our consciousness performing the same process of Active Inference.

Also note that this hypothesis lends additional support to the idea we had stated earlier, that the desire for meaning, purpose and hope arises in consciousness via the Active Inference process.

This idea actually turns out to be a rich vein capable of generating many insights about consciousness. Allow me to propose another intriguing hypothesis that emerges from it.

Hypothesis: Consciousness as a "Virtual" Life Form

As we have already seen, Living Entities perform Active Inference in order to continue to exist or survive.

In the case of conscious Living Entities such as ourselves, not only does our physical body constantly try to continue to survive, but our consciousness also does the same. (In fact, we can and do commonly think of

our consciousness as a "little person" inside our heads, essentially implying that it is an abstract life form of its own, and it doesn't want to die.)

Does that mean that consciousness may itself be a Living Entity? Could it be a "virtual" life form that complex Living Entities give birth to and continue to support, nurture and enrich during their own lifetimes just like they do with their biological offspring?

It is known that newborns do not exhibit many aspects of consciousness. Then, as they grow, they develop more and more attributes of consciousness until they mature into the adult version of consciousness that we are all familiar with. And even as adults, our consciousness continues to mature, or expand and enrich, as we have said earlier.

While our consciousness is going through this process of evolution, it keeps perceiving its environment, which includes our own physical environment as well as the virtual environment of our thoughts, feelings, emotions and perceptions.

Throughout this process, consciousness also tries to build its own internal model of its environment.

This is what we would typically call our conscious understanding of our reality, which is different from our physical or subconscious understanding of it. The conscious understanding is in the form of formulas and diagrams, while the physical understanding is in the form of muscle memory or physical skills or even our physical form.

Moreover, consciousness also tries to generate its own counterfactual scenarios based on its model, which get translated into instructions for our physical body to carry out. This is how, for example, we dream of ourselves sitting on a tropical island, and after a period of planning, budgeting and traveling, find ourselves over there.

Note that all of this is separate from the physical perception, internal model building and actions that our bodies perform. Our bodies perceive and react to a lot of things in our environment without even getting our consciousness involved.

These are things like breathing, digesting food, fighting pathogens, circulating nutrients and disposing of waste products, walking and so on. Our bodies do that in order to satisfy their own desires for survival, comfort and so on. They perform these actions without conscious involvement because they use their own internal model which is pretty much hidden from our consciousness.

The Active Inference that our consciousness performs is on top of what our bodies are doing. Some of our physical perceptions do reach our consciousness (like you noticing a notification popping up on your screen), get processed in our consciousness (such as you consciously deciding to look at the notification that just popped up), and then converted into physical actions (such as you clicking on the notification).

Of course, as you may have noticed, all of these conscious activities are tightly integrated with our physical bodies. But we can also see that they are separate from the activities that our bodies perform subconsciously, though the separation isn't always very clear to us.

What I am ultimately trying to suggest is that it is possible to think of consciousness as its own life form that lives inside our bodies, that we essentially give birth to, nurture and support throughout our lives. And just like our children, we hope that this life form will expand and enrich itself.

While I have no evidence to support this besides my own introspection, I am hoping that this idea will appeal to other people and, over time, get corroborated by a wide range of people. If it does, it can be incorporated into the MSE Framework as a first-class concept.

As I mentioned, this idea is a rich vein and we will look at another idea that emerges out of it in the next chapter.

Ok, after that bit of diversion, let us get back on track to consciousness and desires.

Suffices to say that, unlike many other scientific frameworks that try to avoid talking about consciousness, the MSE Framework treats it as a critical part of its foundation, not only as one of of the most important

universal tendencies, but also as the source of our desires for meaning, purpose and hope, and more.

Satisfying these desires helps us improve our mental and even physical well-being, which is ultimately why we consider it so critical.

With that, we have now built all the scaffolding we need to finally get to where we have been trying to get to, Meaning. We will do that in the next chapter.

Deep Dive: The "Easy" Problem of Consciousness

The "Easy" Problem of Consciousness refers to the question of how and why certain physical processes in the brain give rise to subjective experiences or the phenomenal experience of consciousness. This distinguishes it from the "Hard" problem, which deals with the deeper philosophical conundrums of that phenomenal experience itself.

While the Easy Problem is still an area of active research and debate, there are several leading theories and approaches that attempt to explain it. Here are a few prominent ones:

Higher-Order Theories (HOT): Higher-order theories propose that consciousness arises from the brain's ability to generate higher order representations or thoughts about one's own mental states. According to these theories, conscious experiences occur when the brain represents or reflects on its own internal states. They are called higher order to distinguish them from subconscious or unconscious mental processes.

Representationalist Theories: Representationalist theories propose that consciousness is closely tied to the brain's capacity to model the world, similar to the idea of the internal model in the Free Energy Principle. These theories suggest that conscious experiences involve mental representations that are rich, detailed, and actively updated by sensory inputs and cognitive processes. Consciousness is seen as a form of inner representation of the external environment as well as the internal states of the living organism itself.

Attentional Theories: Attentional theories emphasize the role of attention in generating conscious experiences. They propose that conscious awareness arises when attention is focused on specific sensory inputs or one's internal mental contents rather than the entirety of the sensory experience. According to these theories, attention acts as a spotlight, selecting and amplifying certain information, thereby making it available to conscious processing.

Global Workspace Theory (GWT): While GWT primarily addresses the Hard Problem of Consciousness, it also provides insights into the Easy Problem. GWT suggests that consciousness arises from the global exchange and broadcasting of information in the brain. According to this theory, information becomes conscious when it is made available to multiple cognitive processes and enters a "global workspace" that allows for flexible, widespread access.

It is worth noting that the Easy Problem of Consciousness remains a complex and multifaceted issue, and no single theory has yet provided a satisfactory and comprehensive explanation.

Nevertheless, the problem is considered to be "Easy" because it appears to be easier than the Hard problem, about which we are far more uncertain.

Deep Dive: Integrated Information Theory

The Integrated Information Theory (IIT) is a theory proposed by neuroscientist and professor Giulio Tononi that attempts to explain and characterize the Hard Problem of Consciousness.

According to this theory, a conscious experience is characterized by a high degree of integrated information, meaning that the conscious system must be able to generate a large number of highly differentiated and

irreducible states that cannot be decomposed into simpler components.

The theory also proposes that consciousness exists on a spectrum, with different levels of consciousness corresponding to different degrees of integrated information.

For example, a simple system like a thermostat may have very low levels of integrated information and therefore be considered unconscious, while a complex system like the human brain has a high degree of integrated information and can support rich, complex conscious experiences.

This theory is still very controversial, and a satisfactory and comprehensive theory for the Hard Problem remains an ongoing challenge.

Deep Dive: The Observer in Quantum Mechanics

Based on what we know so far about physical reality, at the most fundamental level, the universe consists of quantum fields.

A quantum field is basically a probability distribution i.e. a wave function that has a value everywhere in space. This value corresponds to the probability of an elementary particle existing there. These fields evolve over time, leading to the changes we see in the universe.

But then, we don't perceive anything like that when we observe reality. What we see are concrete things happening, not evolving probabilities.

In order to explain this paradox, physicists came up with the Copenhagen Interpretation of quantum mechanics, which proposed the idea of "wave function collapse".

The idea here is that the universe behaves as a quantum wave function when observations aren't being made. But as soon as an observation is made, the wave function "collapses", i.e., we don't perceive probability distributions, we perceive definite outcomes.

An equation known as the Schrödinger Equation has been extremely successful at allowing scientists to calculate the results of the wave function collapse, so we have strong evidence of this theory.

At the same time, the idea that "an observation" causes the collapse has caused a lot of controversies because it introduces the idea of an "observer". Many people have speculated that this observer is nothing but the mysterious (Hard version of) consciousness.

Physicists have generally shied away from venturing too far in this direction, but the idea is still quite popular. For now, physicists are content with simply doing the calculations, leaving the idea of the observer to speculators.

Still, Stephen Wolfram has proposed an intriguing possibility, mentioned below.

Deep Dive: Stephen Wolfram's Conceptualization of the Observer in Quantum Theory

Stephen Wolfram has come up with some intriguing ideas about the "observer" in quantum theory. It is a deep topic, but I will try to summarize it here quickly. His argument goes as follows.

We ourselves are embedded in the universe, which means we also ultimately consist of quantum fields.

Unfortunately, this means that we can never be sure of anything being anywhere at any point of time.

This raises the question: How can an observer such as ourselves, who is embedded in such a quantum universe "make sense" of anything?

Wolfram has a hypothesis about what might be going on, based on his own framework of Physics. (See the Deep Dive on it.)

According to him, the only way for an entity such as ourselves which is embedded in the quantum field of the universe to make sense of anything is to make the field “collapse” into concrete physical particles.

This “collapse” is exactly what the Copenhagen Interpretation of quantum mechanics demands. And it is corroborated by the fact that whenever we make an observation, we always see concrete things happening, though we can also infer the existence of the quantum fields.

Of course, this is still a hypothesis and is actively being worked on.

9. Meaning: Sorry Fellow Hitchhikers, It's NOT 42!

You don't have to go to the ends of the earth to find that out! It's all right here, right now.

"Suffering ceases to be suffering at the moment it finds a meaning."
&#xNAN;**— Viktor E. Frankl, Austrian psychiatrist, in "Man's Search for Meaning"**

"Human being is meaning making. For the human, what evolving amounts to is the evolving of systems of meaning; the business of organisms is to organize, as Perry (1970) says."

— Robert Kegan, American developmental psychologist, in "The Personnel and Guidance Journal"

"Ask yourself these two questions: What do I want to exist even if I don't. And how much of a difference I make to it. If you've got good answers to both of those, you have meaning in life. If you have only the first but not the second, you are seeking. If you have neither, you are in trouble."

— John Vervaeke, Canadian philosopher and cognitive scientist, in "Solving the Meaning Crisis"

Man's Search for Meaning

Let us start with a quick introduction to Viktor Frankl and his seminal book, "Man's Search for Meaning". His book is credited with raising awareness of the idea that finding meaning in our lives is critical for human beings.

Frankl was an Austrian psychiatrist and a Holocaust survivor during the Second World War. He spent about 3 years in various concentration camps, where he witnessed as well as personally endured horrendous suffering and saw how various people dealt with it.

It was his experiences during that time, observed through the lens of a fellow prisoner as well as a psychiatrist, that led him to write the book.

In the book, Frankl discusses the concept of "existential vacuum," where people experience a sense of emptiness and purposelessness when they lack a clear sense of meaning in their lives. We have used the term "meaning void" to describe essentially the same idea in this book.

Frankl argues that filling this vacuum with meaning is the primary human motivation. According to him, people can endure suffering with dignity and inner strength, even in the most extreme circumstances, if they can find some meaning in their trials.

The following quote by him conveys this idea well:

> *"Life is never made unbearable by circumstances, but only by lack of meaning and purpose."*
>
> **— Viktor Frankl, Austrian psychiatrist, in "Man's Search for Meaning".**

Needless to say, I have been greatly influenced by these ideas. So much so that I felt using a slight variation of the title of Frankl's book would not only be perfect for my book, but also pay homage to his ideas.

As stated earlier, my goal here is to take a rigorous, First Principles-based approach to the concept of meaning, so one does not have to take leaps of faith or rely on someone's opinion to get there.

In order to do so, we have to first define what exactly we mean by "meaning".

The Meaning of "Meaning"

Right off the bat, we should note that most people, including many scientists themselves, believe that the concept of meaning, used in this context, is beyond the reach of science or reason.

In my opinion, people who say this are, knowingly or unknowingly, admitting that meaning can only originate either from a supernatural power, or somewhere deep inside our subconscious which, in their opinion, is beyond the reach of reason.

Many others think the concept of the meaning of life itself is meaningless or totally made up. Still, others think that you can make it whatever you want it to be.

I wonder if Douglas Adams, the author of the Hitchhiker's Guide series of books and the one who popularized the phrase "Life, the Universe and Everything", had similar thoughts in mind when he came up with "42" as the answer to the question of the meaning of life.

Here is the relevant excerpt from his book:

> *"Alright," said Deep Thought. "The Answer to the Great Question..."*
>
> *"Yes...!"*
>
> *"Of Life, the Universe and Everything..." said Deep Thought.*
>
> *"Yes...!"*
>
> *"Is..." said Deep Thought, and paused.*
>
> *"Yes...!"*
>
> *"Is..."*
>
> *"Yes...!!!...?"*
>
> *"Forty-two," said Deep Thought, with infinite majesty and calm.*
>
> **— Douglas Adams, English author and humorist, in "The Hitchhiker's Guide to the Galaxy"**

Needless to say, none of these answers are satisfactory for our purposes. We should try to, and as we will soon see, can, do better. A lot better.

Apart from long-held religious and philosophical ideas, I believe a major part of the reason for all this confusion about "meaning" is that the word itself is not defined very clearly. It goes without saying that concepts need to be well-defined before we can apply any significant amount of rigor to them.

And, as it turns out, we can actually define "meaning" quite crisply and when we do so, it becomes quite amenable to rigor.

To start with, let us note that a lot of academic literature uses the phrase "meaning in life" to distinguish it from the colloquial phrase "meaning of life". This is probably because the phrase "meaning of life" is very closely associated with religion. Defining a different phrase, "meaning in life", allows us to distinguish ourselves from these old religious and philosophical notions and the confusion associated with them.

With that introduction, let us dive in and take a deeper look at what the scientific literature says we mean by the phrase "meaning in life".

"Meaning in Life" Based on Psychological Analysis

Luckily for us, this topic has already been studied quite extensively by psychologists. And based on various studies and surveys, they have converged on 3 primary components that comprise the notion of "meaning in life":

A) Having coherence or comprehensibility in one's life,

B) Having a sense of purpose in one's life, and

C) Having a sense that one's life matters or has existential significance.

(This is from a recent comprehensive review of the field, "The Science of Meaning in Life" by Laura A. King and Joshua A. Hicks, published in Annual Review of Psychology (Vol. 72:561-584), January 2021.)

Let us take a look at each of these categories in a little more detail.

A) Meaning as Having Coherence or Comprehensibility in Life

If you see structure and inter-relatedness between your life's experiences and recognize understandable patterns in them, then you have Meaning as "having coherence or comprehensibility" in your life.

In simple words, it refers to our commonly held expectation that "my life makes sense" or that "I can tell a coherent story about my life".

Human beings have always been storytellers. Stories are the way we make sense of everything, from a kindergartener coming home from school excitedly shouting "Guess what happened today", to people sitting in lecture halls listening to some scientist telling them "the story of life, the universe and everything".

It is natural for us to be able to do the same for our own lives in order for it to feel meaningful.

One of the popular bumper stickers from the 80s was "One who dies with the most toys wins". It was used to justify a lifestyle of materialistic excess. But now that we are older and wiser, maybe we can replace it with "One who dies with the most meaningful life story wins".

Needless to say, I like that phrase a lot personally. You may recall that this was exactly how I got started on this journey: My desire to make sense of my life and tell a coherent and meaningful story, starting from First Principles.

B) Meaning as Having a Sense of Purpose in Life

Meaning as "having a sense of purpose in life" refers to the expectation that you are aware of your aims or core goals and direction in life and you adhere to them to the best of your ability.

In other words, if you are convinced that your life has a purpose, then you feel that your life is meaningful.

When asked about their purpose, people typically come up with answers such as "I need to support my family", or "I have a mortgage", or "I like to accomplish things", or "I feel a need to fulfill my natural calling", or "I want to become rich" and so on.

Here is a famous quote along these lines:

> *"We're here to put a dent in the universe. Otherwise, why else even be here?"*
>
> **— Steve Jobs**

In my case, researching and writing this book has provided me with a strong sense of purpose day in and day out while I have been at it. Due to this, by the time I publish it and before anyone has read it, it would already have provided immense value to me! (As an aside, I would highly recommend writing a book about a subject you really care about. It is incredibly rewarding even if no one ever reads it.)

C) Meaning as Existential Mattering or Significance

A common refrain you might hear when talking to people about meaning in life is that they feel they need to contribute to something "much larger than themselves" or "make a difference" in the world somehow.

What they are referring to here is "existential mattering" or "significance". People who feel that their lives matter or are significant in some way feel that their lives are meaningful.

This need probably arises from the fact that we are consciously or subconsciously aware of our mortality as well as our relatively minuscule sphere of influence when compared to the unimaginable longevity and immensity of the universe. We want our lives to have an impact well beyond our limited lifespan and our local niche.

The reasonable way to achieve that is to look for something that is likely to survive far longer than ourselves and has a far larger scope than ourselves, and make a contribution to it.

This is why people usually like to associate themselves with something large and long-lasting, such as a well-known religion or philosophy or a long-lived institution or cause that has survived for a long time and is likely to continue and grow for a long time. As long as their contribution helps that entity survive and maintain or increase its scope, they can feel that their life is meaningful.

The “intense conscious experiences” that we talked about in the chapter on Consciousness, such as listening to sublime music or watching a reading particularly moving story or even appreciating the mathematical beauty of some formula also fall into this category. The heightened states of consciousness experienced at such moments give us the feeling that we belong to some sort of divine, all-pervasive and immortal reality.

As you might have noticed, there is some overlap among all three components of meaning mentioned above, but there is also something unique in each. Also, most peoples’ definitions of meaning in life will probably contain some amount of each of these components.

Looking at Meaning from First Principles

Normally, the definitions of meaning provided above would be adequate for our purposes, but one may still have some discomfort over the fact that they are derived from surveys rather than from the ground up.

You may ask: Is there a way to derive these definitions of meaning starting from First Principles?

And there is! The Free Energy Principle and Active Inference come to our rescue here again.

As we saw in the chapter on Life, Active Inference is the process that all living organisms perform in order to continue to survive in a dynamic environment. Active Inference involves the living organisms building a generative model of their environment, which generates counterfactual scenarios and then seeks evidence for them, thus improving the predictive power of their models.

Moreover, conscious living organisms such as ourselves need to build a constantly improving internal model of not just our environment, but also ourselves in relation to it. This allows us to make better predictions and avoid a larger number of surprises.

It goes without saying that as our internal model gets better, things within as well as outside of ourselves start to make more and more sense to us. This implies that our sense of coherence or comprehensibility improves, which improves our sense of meaning in our lives.

As conscious beings, we are able to reflect upon this process and analyze it. As a result, we can detect patterns in our environment as well as ourselves. We start to realize that these patterns have a direction to them - they are heading towards something. This gives it the flavor of having a purpose.

When we realize this and align ourselves better with this sense of purpose, our sense of having meaning in our lives also improves.

And, ultimately, as we saw in our discussion of mindfulness and Active Inference, as we get better and better at this process, our sense perception improves, our internal model becomes more aligned with our environment, and our actions in the world get more effective. As a result, we become better participants in the activities of the universe overall.

This could be interpreted as us contributing to something much larger than ourselves. Moreover, being conscious beings, we can understand this ourselves, which provides us with a sense of “existential mattering” or significance.

This whole process can also be seen from the point of view of the communities we are a part of. If one thinks of these communities as living organisms themselves, then our participation in Active Inference at the individual level contributes to the Active Inference process at the community level also.

Essentially what I am getting at is that “meaning” may be how our consciousness interprets the process of Active Inference that we must perform in order to continue to exist, as individuals as well as parts of society or whatever communities or institutions or organized groups we consider ourselves to be a part of.

Thus, we can say that the emergence of the 3 components of meaning that we identified earlier can all be explained from First Principles, via Active Inference. This gives the concept of meaning a very solid foundation.

But it gets even better!

Deeper Dive into Meaning-Seeking

Let us take a look at the hypotheses we have put together about consciousness in the last chapter:

1. Consciousness may be a virtual life form that we give birth to and nurture all our lives
2. Consciousness itself may be performing Active Inference in order to continue to exist
3. Our desire for meaning arises in our consciousness

Could we hypothesize that "meaning in life" is really just the internal generative model created by our consciousness as a result of it performing Active Inference?

In other words, our search for meaning is how the conscious living entity that lives inside us interprets its own motivation to continue to exist and, which, in turn, motivates us to do the same for our physical bodies.

What I like about this way of thinking is that it is somehow more palatable and frankly, even more meaningful, as compared to the idea that consciousness is a myth or something we make up. Sure, we may be making it up, in the sense that it is an abstract living entity that we give birth to. But that does not make it meaningless. In fact, it is what gives rise to the concept of, and the desire for, meaning, and is thus critical for conscious living organisms such as ourselves.

Agreed, this idea is mostly speculation on my part, but I think it is a rich vein of thought, and I hope many more meaningful ideas will come out of it.

Getting back to our main thread after that bit of diversion, let us revisit the list of Universal Tendencies that we have been putting together over the last few chapters, and see what interesting insights may emerge out of that.

List of Universal Tendencies

As we already saw in the previous chapters, the universe appears to exhibit some well-defined features, and follows some well-defined laws and processes. We observed that these features, laws and processes, taken together and observed over time, give the appearance that the universe has some inherent tendencies, a set of directions it appears to "want" to go in.

These tendencies are strong, ubiquitous and ever-present. All of them can be seen to exist right here, right now. Here is the list:

1) Universal Tendency #1: Coherence

The universe appears to have a natural tendency to create definite or coherent things out of uncertain or foggy things.

For example:

- Quantum fields => Elementary particles,
- Clouds of atoms => Stars and planets,
- Chaotic chemical soup => Living cells,
- Subconscious thoughts => Conscious thoughts.

2) Universal Tendency #2: Complexity

The universe appears to have a related but slightly different natural tendency to form more complex structures out of simpler ones.

For example:

- Elementary particles => Atoms,
- Simple atoms => Heavier atoms,

- Atoms => Simple molecules,
- Simple molecules => Complex molecules (proteins, RNA, DNA),
- Complex molecules => Living cells,
- Living cells => Living organisms,
- Living organisms => Societies of living organisms and ecosystems,
- Simple thoughts => Complex thoughts.

3) Universal Tendency #3: Continuity (of Existence or Identity)

The universe appears to have a natural tendency to create “Living Entities” that try to continue to exist or maintain their identity over time.

The most obvious examples of this tendency are living cells, living organisms and organized groups of living organisms including entire ecosystems, all striving for continued existence even in the face of a dynamic environment and increasing entropy.

One could argue that, at present, we have only one known place in the universe where life has emerged. But, based on theories like Dissipation-Driven Adaptation and the Free Energy Principle, it is possible to show that the emergence of life-like processes is universal.

In addition, we have a lot of other evidence, based on the ubiquity of planets with water on them, their location within the “Goldilocks Zone” of their stars, and the potential for totally different life forms, supporting the idea that Living Entities of various types probably exist in many other parts of the universe and it is only a matter of time before we see incontrovertible evidence of this.

Suffices to say that Continuity of existence or identity appears to be another inherent tendency of the universe.

4) Universal Tendency #4: Evolution

The universe appears to have a natural tendency to create complex entities that evolve towards more complex and sustainable forms through a process of natural selection.

This tendency can be observed in living organisms, but also in other entities such as organized groups of living organisms and ecosystems.

Beyond that, there are theories that proclaim that other processes such as the emergence of concrete particles out of quantum wave functions can also be interpreted as evolution by natural selection at the quantum level.

5) Universal Tendency #5: Emergence

The universe appears to have a natural tendency to create Emergence, where larger entities, patterns, or properties can be seen to arise through complex interactions among a large number of smaller or simpler entities, even though these outcomes are not apparent from the individual constituents alone.

This phenomenon can be seen when a large collection of gaseous molecules give rise to the temperature or pressure of the gas, or when solid objects melts and becomes liquid and starts to flow or a school of fish forms something that looks like a tornado.

6) Universal Tendency #6: Curiosity

The universe appears to have a natural tendency to create Living Entities that are inherently wired for curiosity.

Curiosity involves going out and seeking new information or experiences. The "Active" part of Active Inference involves going out and looking for evidence for the counterfactual scenarios envisioned by its internal generative model, which is the essence of curiosity.

In other words, all Living Entities are inherently curious at least to some extent within their own sphere of influence. This may take the form of simple activities like looking for resources to sustain oneself, all the way to advanced activities like trying to understand the nature of reality and our place in it.

7) Universal Tendency #7: Creativity

The universe also appears to have a related natural tendency for creating Living Entities that, in turn, exhibit creativity of their own.

This should be the most obvious one: Another name for the universe is "Creation" itself!

Everywhere you look, the universe is constantly creating things: elementary particles, atoms, molecules, stars, planets, living cells and living organisms.

Every Living Entity creates things, starting with making copies of itself. In addition, many of the more complex organisms create shelters, communities and even music or art.

Even our ability to create completely imaginary concepts, in the form of poetry or fiction can be seen as our consciousness imagining counterfactual worlds in the hopes of discovering evidence of their existence someday. This may be why we appreciate poetry or art so much and we keep trying to bring them to life!

8) Universal Tendency #8: Diversity

The universe appears to have a natural tendency to create a large amount of diversity of various types.

As we have noted, the universe contains a tremendous amount of diversity of all types, starting from the various types of elementary particles to types of celestial bodies, with a wide variety of characteristics. And everything in between.

Also, all of these things combine and interact with each other in complex ways, creating a combinatorial explosion of diversity.

9) Universal Tendency #9: Consciousness

The universe appears to have a natural tendency to create advanced Living Entities that are capable of phenomenal experience, or consciousness, to various degrees.

Simple creatures display a rudimentary level of consciousness, such as moving deliberately to avoid danger or obtain resources. Even little creatures can be seen planning and executing on their plans to hunt or gather food.

Many slightly more complex creatures display a sense of awareness of themselves or of other creatures. They also observe or infer and learn each other's behaviors.

As Living Entities get more and more complex, they seem to display higher and higher levels of consciousness. So, even within consciousness, there appears to be a tendency towards increasing complexity.

That completes the list of Universal Tendencies we have collected.

As I already mentioned when I introduced the concept of Universal Tendencies in the chapter on Physical Reality, some of these tendencies may overlap with others. Still, each of them has some unique characteristics, so mentioning them separately makes sense.

Also, having them spelled out this way makes it easier to identify them in the various phenomena we see around us, and also to see how they could be helpful in our own lives, as we will soon see.

But before we get there, as good engineers, our next step is to come up with a memorable name for this list so it is easy to remember and talk about!

The Ingredients for Our Ultimate Success

Given that we have 9 tendencies in total, out of which 6 start with the letter “C”, two starting with “E” and one with “D”, how about calling them the “SixCEED” Tendencies?

[Has a nice ring to it, doesn’t it? It almost looks like the universe has, embedded in its behavior, the word “Succeed!” Who would’ve thought?]

I feel like this calls for another obligatory quote from the Matrix series:

“When I see three objectives, three captains, three ships. I do not see coincidence, I see providence. I see purpose.”

- Morpheus, in “The Matrix: Reloaded”.

If I were a superstitious man, I would treat this incredible accident of discovering exactly the right number of universal tendencies starting with exactly the right first letters as a sign of divine blessing.

But since I am not, I am simply going to marvel at the complex structure and evolution of the English language, as well as the universal tendencies themselves, that appear to have miraculously “conspired” to give us such a curiously creative name!

In other words, sorry Morpheus, but I am going with “coincidence” here.

Don’t worry, we are not going to add “coincidence” to our (seemingly ever-increasing) list! In fact, we are about to declare the list closed and sanctify it with a formal definition:

The “SixCEED” Tendencies of the Universe:

Based on an overwhelming amount of evidence and the rigorous application of logic, human beings have discovered certain patterns in the universe, in the form of certain features, laws and processes.

Based on the fact that some of these patterns are ubiquitous and ever-present, and we can find deeper explanations for them in physical laws, we can conclude that the universe appears to exhibit certain inherent tendencies.

We have strong evidence that they have existed for a very long time, and, as far as we can predict, will continue to exist for a very long time in the future. But far more importantly for us, they can be seen to exist right here, right now, all the time and everywhere.

The Meaning-Seeking Entities (MSE) Framework identifies 9 such tendencies: Coherence, Complexity, Continuity (of existence or identity), Curiosity, Creativity, Consciousness, Evolution, Emergence and Diversity.

Based on the highly curious fact that, out of these 9 tendencies in total, 6 start with the letter C, two with E and one with D, we are solemnly calling them collectively as the “SixCEED” (pronounced “Succeed”) Tendencies.

Doesn’t that feel great?

We aren’t quite done yet, though. We need to define one more concept and coin one more term before we can finally put everything together into something even more meaningful.

"Meaning-Seeking" Entities

Finally, we get to talk about the concept that gives meaning to the "Meaning-Seeking" part of the MSE Framework. Let us start by defining the concept.

Meaning-Seeking Entities are complex Living Entities that are:

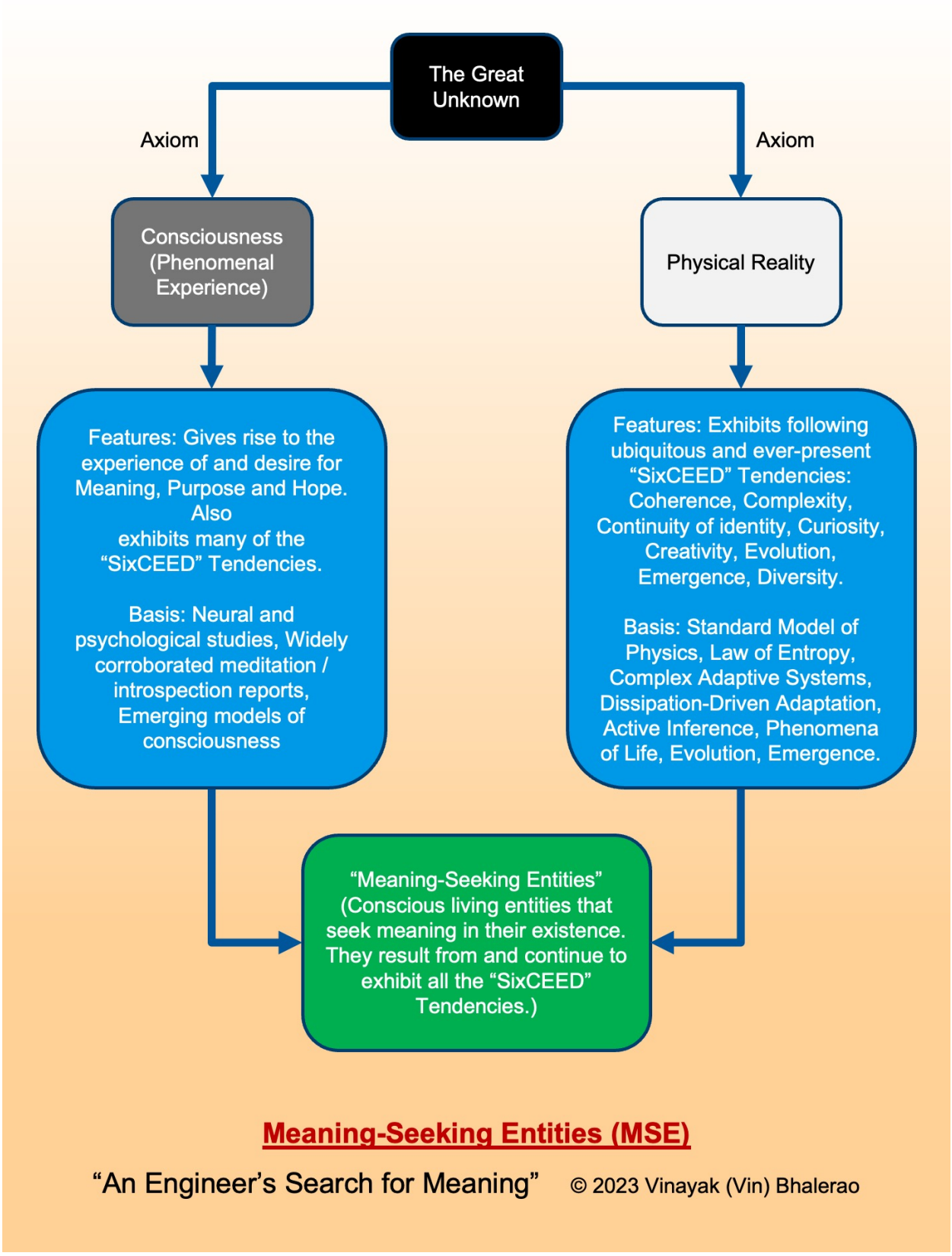
- *A result of all the "SixCEED" Universal Tendencies mentioned earlier,*
- *Exhibit the tendencies themselves,*
- *Have the desire for Meaning, Purpose, Hope in their life, and*
- *Can experience them, too*

Before we unpack this, let me just start by saying that every conscious Living Entity can be said to be a Meaning-Seeking Entity. In other words, we ourselves are Meaning-Seeking Entities.

Everything that follows in the book takes these terms as their basis to get to our final goal of finding meaning, purpose and hope.

The following diagram gives a visual representation of what we mean by the "SixCEED" Tendencies and how they give rise to Meaning-Seeking Entities.

Meaning-Seeking Entities (MSE) - Overview



This diagram depicts how Meaning-Seeking Entities evolve, starting from the foundation we have built so far.

The upper part of the diagram should be familiar, since we looked at it in the chapter on Ultimate Reality. It depicts the deepest concepts we know, which we take to be axioms. They are The Great Unknown, Physical Reality and Consciousness.

On the Physical Reality side, we can see its relevant features listed, including all the "SixCEED" Tendencies except for Consciousness.

As we have seen in previous chapters, the evidence for these "SixCEED" Tendencies can be seen in the fact that Physical Reality contains some regular patterns (the physical entities, their features and laws) and specifically the phenomena of quantum wave function collapse, self-organization, Dissipation-Driven Adaptation, Active Inference, evolution and emergence.

On the Consciousness side of the diagram, we can see the features of Consciousness that are relevant to the MSE Framework listed. They include the experience of and the emergence of many of our desires. Our needs for meaning, purpose and hope originate in our Consciousness.

Consciousness itself can also be seen to exhibit all the SixCEED Tendencies.

As we saw in the chapter on Consciousness, the above can be established on the basis of widely corroborated introspection reports. In addition, have put forth a highly plausible hypothesis that desires are a result of Living Entities performing Active Inference in their physical bodies as well as in their consciousness.

Further down in the diagram, you can see that the Physical Reality and Consciousness arms combine to form conscious Living Entities, which, as I noted earlier, I am calling Meaning-Seeking Entities.

Ok, so now we have a rigorous definition of meaning and a list of inherent tendencies of the universe that give rise to Meaning-Seeking Entities that also embody those tendencies.

Now, if we can show how these inherent tendencies of the universe can satisfy all the requirements for meaning as defined earlier, then we would have a rigorous way for Meaning-Seeking Entities to find meaning in their lives!

So let us do that.

The Connection between Meaning and the "SixCEED" Tendencies

What I want to demonstrate is that the "SixCEED" universal tendencies can satisfy all the components of Meaning we have come up with. Or, in other words, these tendencies are inherently "meaning-satisfying".

Let us look at each of the components of meaning mentioned earlier and see this connection.

A) Meaning as Having Coherence or Comprehensibility in Life:

Right off the bat, let us make the observation that Coherence is already a member of the list of universal tendencies.

The mere fact that the universe is full of discernible or comprehensible patterns, in the form of definite features, laws and processes, and is continuously creating more coherent patterns, is strong evidence of its tendency toward coherence.

Some of the other universal tendencies, such as Continuation of existence or Creativity or Consciousness can also be seen as having some overlap with the tendency of Coherence.

As we have seen in the previous section, we ourselves, as Meaning-Seeking Entities, are a culmination of all the SixCEED Tendencies we have mentioned, and continue to exhibit those tendencies ourselves.

It is possible that our innate need for coherence in our lives is just a manifestation of this fact.

Of course, when most people talk about their desire for coherence in their lives, what they typically mean is that they want to find the coherent "thread" that goes through all of their lives. If they tried to narrate their "life story", they would be able to say who the main characters were, what were their interesting attributes and motivations, how they acted as a result, what events transpired, what led to what, what were the main lessons learned, and so on.

This is of course result of the fact that we are a social species and, as a result, we typically spend most of our time thinking in terms of other people or groups of people.

Still, scientists and engineers (and STEM-educated people in general) typically have a desire to go a little deeper. They don't just want to know the story of their lives; they want to know the story behind the story.

They don't just want to know the main characters and events, but the principles underneath them. What made them the way they are? Why did the events occur the way they did?

They don't just want to play the games of life, they want to know the rules of the game, and how those rules came about and why those rules. no some other ones.

They want to go deeper and try to understand things from First Principles. Their desire for coherence in life goes a lot deeper and wider.

For such people, becoming aware of the SixCEED Tendencies and how they affect everything around them as well as within themselves, helps them achieve this deeper level of coherence, and through that, a deeper meaning in their lives.

B) Meaning as Having a Purpose in Life:

The fact that the universe relentlessly exhibits all these natural tendencies at all times and everywhere gives us ample evidence that it appears to be working towards something. In other words, it appears to have an inherent purpose.

Some people may object to this and say that I am anthropomorphizing the universe, associating human qualities like purpose with it.

This objection is understandable, but how else would you interpret these universal tendencies? And isn't this a lot preferable to postulating a supernatural power (with anthropic features, I might add) who may have created everything for some unknown purpose? And even if that were true, how would this supernatural power manifest this purpose besides embedding it in the inherent tendencies of its creation?

Also, note that all of these universal tendencies can be observed right here, right now. So we have not had to postulate some "end state" of the universe, followed by some sort of a revelation of the greater purpose by The Great Unknown. Or some other form of revelation.

The SixCEED Tendencies provide a far firmer ground, backed by abundant evidence. It is these tendencies that have created everything around us and brought us to where we are and will carry us forward as far as we can predict.

As per our Present-Bounded Rationality methodology, in the absence of the knowledge of the ultimate truth, we must "satisfice" by choosing the best alternative among the available ones, while remaining open to further discoveries.

So, once again, we can say that these universal tendencies inherently provide the ingredients for creating a sense of greater purpose.

Moreover, if we simply realize the existence of these tendencies, and align ourselves with them, then we can say that we have the same purpose as the universe. There is no "greater purpose" than that!

In short, we have succeeded in showing how the SixCEED Tendencies can help us define our greater purpose, and through that, meaning in our lives.

C) Meaning as Existential Mattering or Significance:

What can be more existentially mattering or significant than aligning oneself with the ubiquitous and ever-present natural tendencies that appear to be embedded in the structure and laws of the universe?

It should be a no-brainer to see that these universal tendencies inherently provide the ingredients to satisfy our desire to do something that matters or is significant existentially.

We all have a need to belong to something greater than ourselves, that has a high probability of existing far beyond our comparatively minuscule lifetimes and our limited scope. Well, looks like we have found it: It is the universe itself, along with all these tendencies it has and has already imbued us with.

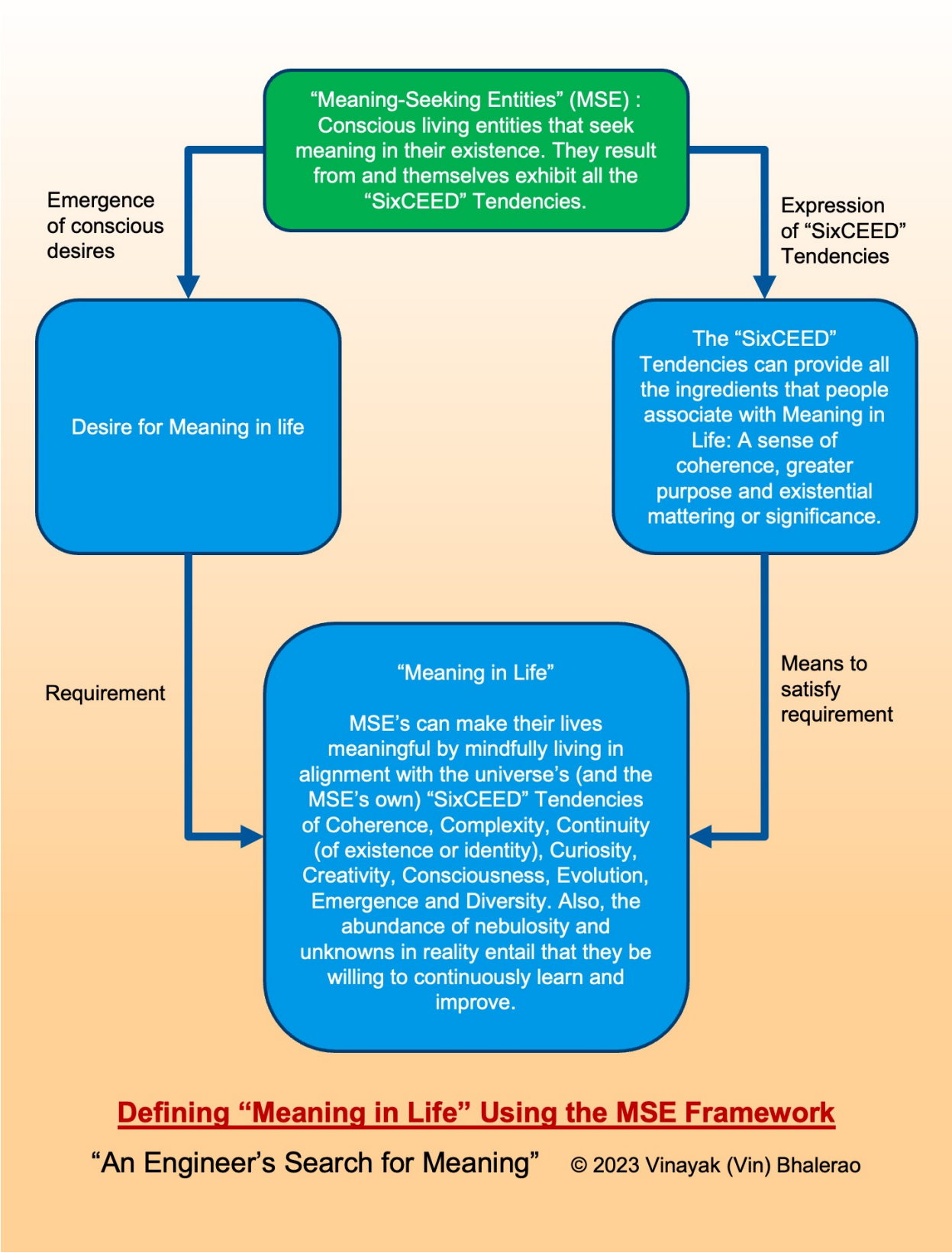
Once again, all we need to do is to realize this fact and align ourselves with it to confidently say that our lives matter or are significant in an existential sense.

In conclusion, based on the above discussion, we can conclusively state that the SixCEED Tendencies are inherently capable of satisfying all the 3 components of meaning that we have identified. In other words, these tendencies are capable of providing meaning to the lives of all Meaning-Seeking Entities, including ourselves.

We will formalize this discussion with a diagram showing our definition of Meaning in Life.

Defining "Meaning in Life" Using the MSE Framework

The following picture depicts what we have described so far.



A definition of Meaning in Life based on evidence and reason alone

In the above diagram, we start with Meaning-Seeking Entities at the top.

The left arrow coming out of that box represents the desire for meaning that all Meaning-Seeking Entities have.

The right arrow shows the Meaning-Seeking Entities exhibiting the SixCEED Universal Tendencies that give rise to them and continue to be expressed by them.

In other words, we now have both sides of the equation: a desire and a way to satisfy it. All we need to do now is to connect the two sides of the equation by defining "Meaning in Life" accordingly.

So we now have the complete picture, at least in theory.

Unfortunately, theories often have problems when they have to survive in the real world.

We can't just leave things at the theoretical level. We have to see if any problems arise when we try to convert theory into practice.

So let us do that.

Practical Considerations and Solutions

A) Misaligned Desires

We saw earlier in our discussion of Active Inference, that our internal generative model is generating all kinds of counterfactuals for us to seek evidence of.

But note that not all of these may always be aligned with our SixCEED Tendencies. In fact, very often they will not be. Some may be downright contradictory to the tendencies.

In other words, Meaning-Seeking Entities may be getting pulled in various directions by various desires emerging out of their Consciousness. (The proverbial "angel and devil sitting on our shoulders".)

So how do we ensure our continued alignment with the SixCEED Tendencies?

As we had already seen in the chapter on Life, the way for a complex Living Entity to become better at executing the fundamental process of life, Active Inference, is for the Living Entity to become 1) more mindful, and 2) to select a set of values to evaluate and prioritize counterfactual scenarios i.e. desires.

Now, mindfulness is already well-understood. Mindfulness not only increases our sensitivity and attention to our perceptions, it also improves our ability to generate counterfactuals (i.e. desires) deliberately and realistically, and act on them as effectively as we can.

But what set of values would work for us to evaluate these counterfactual scenarios generated by our internal generative model?

The astute reader has probably already guessed where I am going. Yes, of course, the SixCEED Tendencies of the universe, which we have established firmly, can absolutely serve as such a set of values!

In other words, the way for a Meaning-Seeking Entity to become better at living a meaningful life is to mindfully align itself with the SixCEED Tendencies of the universe.

B) Nebulosity and Unknowns

Another complication that arises is due to ever-present nebulosity and unknowns which, as we have noted earlier, are also inherent features of the universe.

The existence of these factors implies that we can never be too confident or rigid about our theories, even when they are derived rigorously from First Principles. We need to remain somewhat flexible and allow for a process of constant learning and refinement.

The good thing is, as a result of us being followers of the Present-Bounded Rationality methodology, constant learning and refinement is our middle name! Our methodology requires us to always behave accordingly.

So, with the addition of those considerations, we finally have a resolution of all the issues and can proceed with a rigorous definition of Meaning that we have been aiming for right from the beginning of the book.

Definition of "Meaning in Life" based on the MSE Framework:

Meaning-Seeking Entities, as defined in the MSE Framework, can make their lives meaningful by mindfully living in alignment with the universe's "SixCEED" Tendencies of Coherence, Complexity, Continuity (of existence or identity), Curiosity, Creativity, Consciousness, Evolution, Emergence and Diversity.

Given that it was these exact tendencies that gave rise to the Meaning-Seeking Entities in the first place, they already, inherently embody those tendencies. Thus, all they have to do is to become aware of these tendencies they already have and allow them to be expressed through them.

In addition, given the existence of nebulosity and unknowns in our reality, they need to avoid being dogmatic about this and always be humble, flexible, and willing to learn based on new evidence.

Adherence to these principles provides all the ingredients to find meaning in their lives, namely, having coherence or comprehensibility, a sense of purpose, and a sense of existential mattering or significance in their lives.

Notice that this may sound somewhat similar to the advice we typically hear from various religious doctrines or philosophies.

But what is different, and significant here is that now we have a rigorous definition that we have derived from First Principles, without requiring any leaps of faith or appeals to authority or opinion.

In addition, we have practical advice on how to bring this definition into practice.

In other words, not only do we have the "what", but the "why", as well as "how" of finding meaning in our lives.

As a result, we can have a lot more confidence in our answer and can defend it using only evidence and reason if questioned. Moreover, we can think analytically about meaning, come up with potential objections or improvements, and keep evolving our theory and practices around meaning.

Most importantly, we have a way to implement these ideas in our lives, and constantly monitor how we are doing, and improving accordingly.

These aren't some sweet-sounding ideas that you hear everywhere, that you forget immediately because you have no reason to trust them, nor know how to implement them, nor to challenge or improve them.

This is the whole point of this book.

Finally, while we are on a roll talking about religious ideas, let us take a quick look at another one.

Meaning is Built into the Universe

Note that now we can make another seemingly religious statement, but based on rigorous analysis:

The universe appears to have inherent natural tendencies for creating meaning.

Moreover, since we are a result of the same tendencies, we have automatically been enrolled into this effort, whether we recognize it or not.

All we have to do is realize this and mindfully align our thinking and our lives to that to make our own lives meaningful.

The meaning of my life, your life, everyone's life, and the phenomenon of life itself are all exactly the same.

It all boils down to aligning our thoughts and actions with the natural tendencies of the universe.

These tendencies all point towards the struggle for the continued existence of Living Entities, to higher and higher levels of coherence, organized and intelligent complexity, evolution, diversity, curiosity, creativity and consciousness.

This isn't a commandment from an authority either. Neither is it just someone's opinion nor a poetic idea with no way of realizing it. It is not a popular meme that intrigues you for a second before being forgotten.

It is based on a rigorous analysis of phenomena that are ubiquitous and ever-present.

There is no need to project them into the far future or work backward to some event in the distant past either. They are present right here, right now.

We are simply stating known facts and using logic to reach a purely scientific / engineering conclusion.

Looking at the Stars

Allow me to finally conclude the chapter with an interesting but slightly weird quote.

> *"We are all in the gutter, but some of us are looking at the stars."*
>
> **- Oscar Wilde, an Irish poet and playwright, in "Lady Windermere's Fan"**

Based on everything we have seen, maybe we could modify this quote (with apologies to Oscar Wilde) as follows:

> *"We were never in the gutter. We were always living among the stars!"*

We just had to wake up to this realization.

We have done the hard part of the work now. Things get easier from here. In the next chapter, we will look at Purpose.

Deep Dive: The "Science of Meaning"

As I have mentioned earlier, I believe that we now have sufficient motivation, and, more importantly, meaningful material, to develop something like a "Science of Meaning". And, luckily, there already appear to be researchers working on this.

Here are some excerpts from a recent review of the current thinking in this area. ("The Science of Meaning in Life", Annual Review of Psychology 2021, Laura A. King and Joshua A. Hicks, https://www.annualreviews.org/doi/10.1146/annurev-psych-072420-122921).

"Meaning in life is a subjective sense that one's life makes sense, has a purpose, and matters to others."

"Lives may be experienced as meaningful when they are felt to have significance beyond the trivial or momentary, to have a purpose, or to have a coherence that transcends chaos."

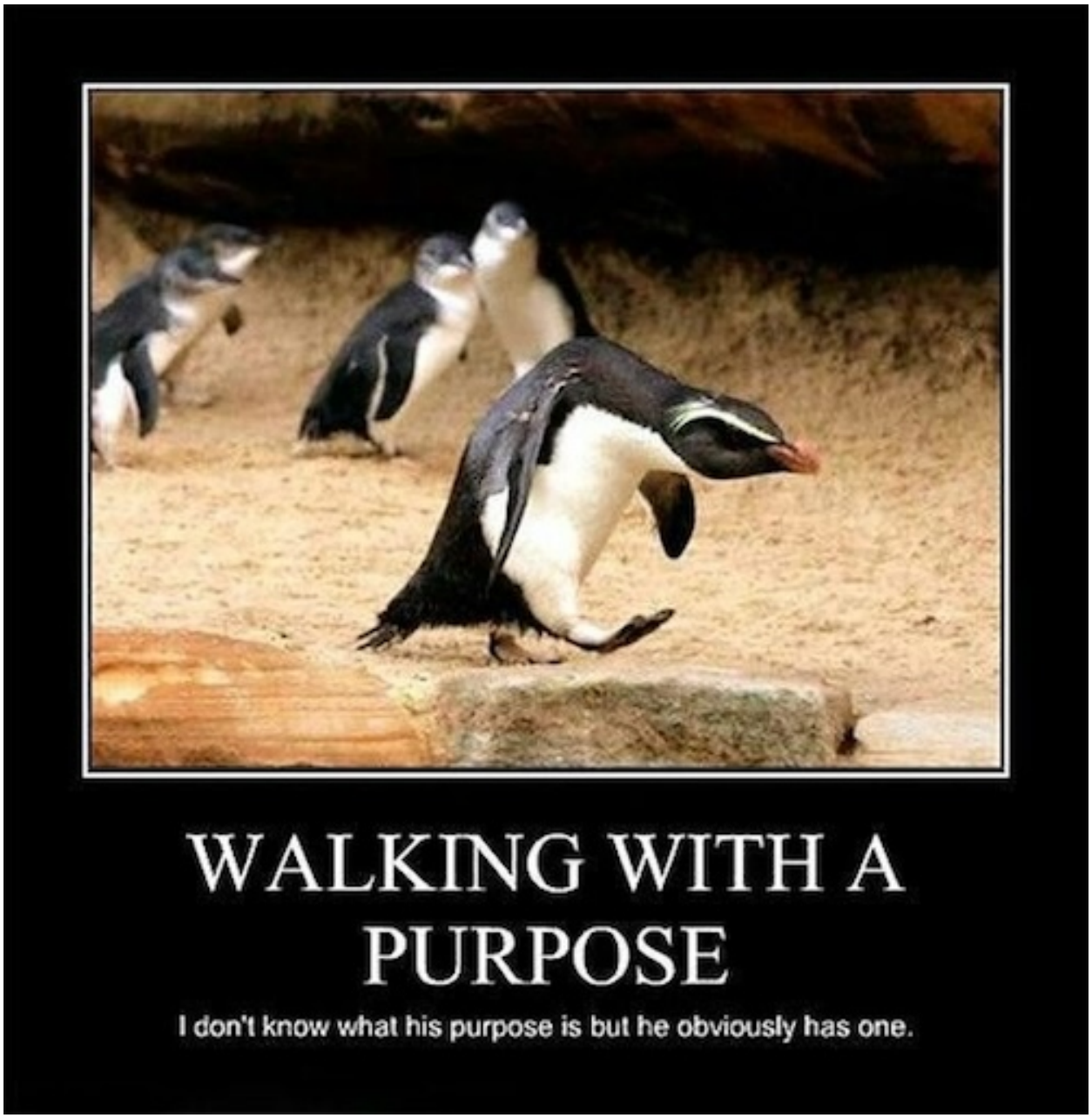
"Meaning provides us with the sense that our lives matter, that they make sense, and that they are more than the sum of our seconds, days, and years."

"Purpose is a central, self-organizing life aim that organizes and stimulates goals, manages behaviors, and provides a sense of meaning."

"Purpose enhances the feeling that one is engaged in life; one's intentions and actions are perceived as meaningful and may even help make life itself feel worthwhile."

"Whether my life ever existed matters even in the grand scheme of the universe."

10. Purpose: The Universe “Wants” You to “SixCEED”!



Ultimately, penguins and humans share the same purpose

“Life is never made unbearable by circumstances, but only by lack of meaning and purpose.”

— Viktor E. Frankl, Austrian psychiatrist, in "Man's Search for Meaning"

"For the mystery of human existence lies not in just staying alive, but in finding something to live for."

— Fyodor Dostoyevski, Russian novelist, in "The Brothers Karamazov"

Having done the hard work of defining Meaning-Seeking Entities and Meaning itself in the last chapter, defining Purpose becomes rather easy, as we will see in this chapter.

But first, as usual, we need to talk about what we even mean by purpose.

What is "Purpose"?

The second Matrix movie ("The Matrix Reloaded") contains a perfect speech on purpose, delivered by none other than Agent Smith:

> *"There's no escaping reason, no denying purpose, for as we both know, without purpose we would not exist. It is purpose that created us, purpose that connects us, purpose that pulls us, that guides us, that drives us; it is purpose that defines, purpose that binds us."*
>
> **— Agent Smith, in "The Matrix Reloaded".**

I know I have taken this quote out of context, but it is actually very meaningful when taken out of context. (I guess I must have learned this trick from social media - taking things out of context because they serve your purpose!)

Still, this quote serves my purpose here so well, I hope you will remember it and mull over it as we go through this chapter.

Now, sure, you might say that Agent Smith, a computer program, and an evil one at that, wouldn't be your first choice to go for advice on purpose. While that may be a little "substrate-ist" (a belief in the supremacy of intelligence born out of a biological substrate), I am going to indulge you this time.

So, let us look at a well-regarded quote by one of the most respectable (and highly quotable) philosophers:

> *"He who has a 'why' to live for can bear almost any 'how'!"*
>
> **— Friedrich Nietzsche, German philosopher, in "Thus Spoke Zarathustra".**

The "why" that Nietzsche refers to is, of course, purpose.

Here is a dictionary definition of purpose:

> *"Purpose: Why you do something or why something exists."*
>
> **— Cambridge English dictionary**

In the context of this book, when we say "purpose", we are basically replacing the two "somethings" in the above definition with our actions and ourselves, respectively.

So, we are talking about why we do the things we do and why we exist in the first place.

And again, the "we" here could be a single individual or a group of people or even all of life.

This is also typically referred to as "greater purpose", to distinguish it from everyday purpose like "why did the chicken cross the road?"

Finally, here is an excerpt from a recent scientific literature survey on the science of meaning:

> "Purpose is a central, self-organizing life aim that organizes and stimulates goals, manages behaviors, and provides a sense of meaning."
>
> **— Laura A. King and Joshua A. Hicks, in "The Science of Meaning in Life", Annual Review of Psychology 2021**

People have been wondering about their life's greater purpose for a very long time, usually spurred on by some particularly traumatic event in their life or a major life decision that forced them to take a step back and examine their life honestly and carefully. They were confused about what to do next and had to go back to basics, i.e., first principles, to figure out what they really wanted out of life, what they felt was their greater purpose.

Moreover, as we saw in the last chapter, having a sense of purpose leads to people feeling that their lives are meaningful resulting in higher levels of happiness, and even health and wellbeing.

Needless to say, purpose is a critical concept for human beings, or Meaning-Seeking Entities in general.

Where Does Purpose Come From?

For a long time, most of humanity has believed that purpose is a mysterious concept with a supernatural origin.

This line of thought originates in the belief that there is a supernatural power that knows everything, including why it has created this universe, where it wants it to go and what it has in mind for each of us. Our life's purpose is whatever this supernatural entity wants us to do.

Unfortunately, this means that we are left to guess what the supernatural power has in mind for us or simply take the word of some authority for it or accept whatever our community or zeitgeist tells us what it is.

Luckily, as followers of the Present-Bounded Rationality methodology, we have a much better option: We can look at the abundance of evidence that can be seen here and now and everywhere, process it rigorously and see if it can lead us to some valuable conclusions.

And the good news is that there are many clues to be found in the evidence we have already managed to collect about reality, and those clues can absolutely reveal our greater purpose.

Deriving "Greater Purpose" from First Principles

As we saw in the previous chapter, the universe exhibits certain natural tendencies, that we have termed the "SixCEED" Tendencies. These are: Coherence, Complexity, Continuity (of existence or identity), Curiosity, Creativity, Consciousness, Evolution, Emergence and Diversity.

These tendencies give rise to coherence and complexity in the universe, some of which self-organizes itself into self-sustaining and (sometimes) conscious, creative and curious organisms that evolve and diversify.

As we have said many times, but it may still be worth repeating, these phenomena can be observed right here, right now.

How do we interpret this fact?

Let us look at an example. Say that you are a parent and you notice that your kid just loves to take anything that looks like a stick and beats it rhythmically against every surface they can find. It could be a spoon or a

toothbrush or a chopstick or whatever they get their hands on that day. And no matter how much you try to distract them with other activities or toys, they always revert to this activity.

Moreover, this has been going on for a long time! It doesn't look like just a phase, but very likely an inherent tendency and passion. Clearly the kid wants to become a drummer or a percussionist of some sort.

As a parent, you might even wonder if becoming a drummer is his life's purpose. The evidence is clearly pointing in that direction.

Similarly, could we interpret the ubiquitous and omnipresent exhibition of the "SixCEED" Tendencies by the universe as the universe "wanting" something? Could we say that the universe has been and is being "purposeful" in its behavior?

Again, let us be clear that we are not talking about any sort of mysterious purpose given to its creation by a supernatural power here. We are only trying to make sense of clearly observed tendencies of the universe, using words in our language that sometimes take on certain theological connotations.

One could ask: How else would we interpret these tendencies that the universe displays? If there is another word for it, say "X", how does "X" differ from "purpose"?

I don't really see a way to differentiate between the two. If we dissociate the concept of purpose from its theological connotations, we are still left with a very meaningful word.

I am aware that this issue has been discussed at length in philosophy under the heading of "the Is-Ought Problem". But I think that way of thinking has a major problem, and I have included a Deep Dive at the end of this chapter to go over it.

In short, we can absolutely conclude that the universe exhibits strong evidence of having a purpose, without invoking any sort of theological connotations.

Moreover, we can also say that we, as Meaning-Seeking Entities, share the same purpose because we ourselves emerged as a result of those same SixCEED Tendencies, and continue to exhibit them.

The SixCEED Tendencies are continuously guiding us as well as the entire universe, towards our "greater purpose".

We have no need to associate some imaginary features or behaviors to some mysterious supernatural power or wait for some imaginary (and unpredictable) moment of judgment in the far future when the supernatural power reveals our true purpose to us. We have all the clues we need right here, right now.

As we saw in the quick introduction to the book, if a bee's purpose can be determined by simply observing its structure, characteristics and behavior, we can do the same for the universe as well as ourselves. Indeed, doing so is exactly what our Mindful Bounded Rationality methodology would guide us towards.

There is just one more thing we need to add. Just like we did while deriving our definition of "meaning in life" in the previous chapter, we need to account for the existence of nebulosity and unknowns in the universe. And the solution is the same: adding mindfulness, moderation and willingness to learn to our definition.

Once we do that, we have a rigorous and complete definition of purpose, derived from first principles.

We can state it formally as follows:

Definition of Our "Greater Purpose" Based on the MSE Framework:

Given that the "SixCEED" Tendencies of the universe continuously give rise to coherence and complexity in the universe, some of which self-organizes itself into self-sustaining and (sometimes) conscious, creative and curious organisms that evolve and diversify, we can conclude that that is at least one of the purposes of the universe.

And since we are Meaning-Seeking Entities ourselves that are a result of the same tendencies and continue to exhibit them ourselves, our greater purpose is the same.

Thus, our greater purpose is to continue our own existence, while facilitating the creation and maintenance of other self-organizing and self-sustaining complex entities, creating more coherence and richer complexity and diversity around us, contributing to the universal process of evolution, being curious and creative, and continuing to enrich our consciousness. Note that the complex entities mentioned here refer to not just living organisms, but also other entities that exhibit similar tendencies, such as organized groups or institutions of living organisms, bodies of thought, and even artificial organisms.

In addition, given the existence of nebulosity and unknowns in the universe, we need to avoid being dogmatic and always be humble and willing to learn and improve our definition of greater purpose accordingly.

Turning the Definition of Purpose into Action

Ultimately, one needs to be able to convert their purpose into action. So, how do we do that for the purpose as defined above?

Let us look at each of the SixCEED Tendencies and come up with some initial ideas for turning them into actions. This may look a little like a typical self-help TODO list, but it is only meant as an example to spark thinking along these lines. The list is by no means definitive or complete. It will evolve as we learn more about what works and what doesn’t.

- **Coherence:** Our struggle to make sense of our lives, our environment, the economy, our relationships and so on are all a part of this. Of course, in order to align ourselves with our purpose, we need to actually take this seriously rather than simply doing whatever some social influencer or your friend circle or some book (including this one) tells us to do. First, try to make sense of whatever you are being told, and if it does, only then turn it into practice.
- **Complexity:** What this typically translates into is “being constructive” rather than destructive. For the physical world, it could mean building complex things. For the inner world, it could mean complexifying our minds by seeking out complexity and trying to understand it better and communicating it to others.
- **Continuity of existence or identity:** This could mean something as simple as taking care of your health and well-being, along with that of your family and friends, and your community, all the way up to ensuring the sustainability of the entire biosphere. All of these are Meaning-Seeking Systems, and they all depend upon each other to achieve their aims of continuation of existence.
- **Curiosity:** This one is easy: Always try to be curious and open-minded, willing to experience new phenomena and learn from them. This is the natural behavior of our Bayesian brains, and it is only when we get stuck in routines or become dogmatic about some belief that we deviate from that.
- **Creativity:** This one is also easy: Always try to be creative. And, in particular, creating things that embody at least some of the other SixCEED Tendencies. One of the best ways to do that is to create or facilitate the creation of Living Entities of all types.
- **Consciousness:** Simply being mindful is one of the best ways to enrich your conscious experience, and over time, enrich your consciousness itself. One can also add other rich experiences to their repertoire, like listening to music or appreciating good art or reading good books.
- **Evolution:** Needless to say, our biological desire to participate in evolution is a part of this. But also participating in the iterative improvement of everything we do or every organized group we belong to could also be seen as a part of this.
- **Diversity:** This involves recognizing the value of and facilitating the enrichment of diversity in all aspects of the world. It also means detecting when diversity is being destroyed or monoculture is replacing it and slowing or preventing that from happening.

And of course, in order to be respectful of nebulosity and unknowns in reality, we need to exercise mindful moderation and willingness to learn and improve the above list of actions accordingly.

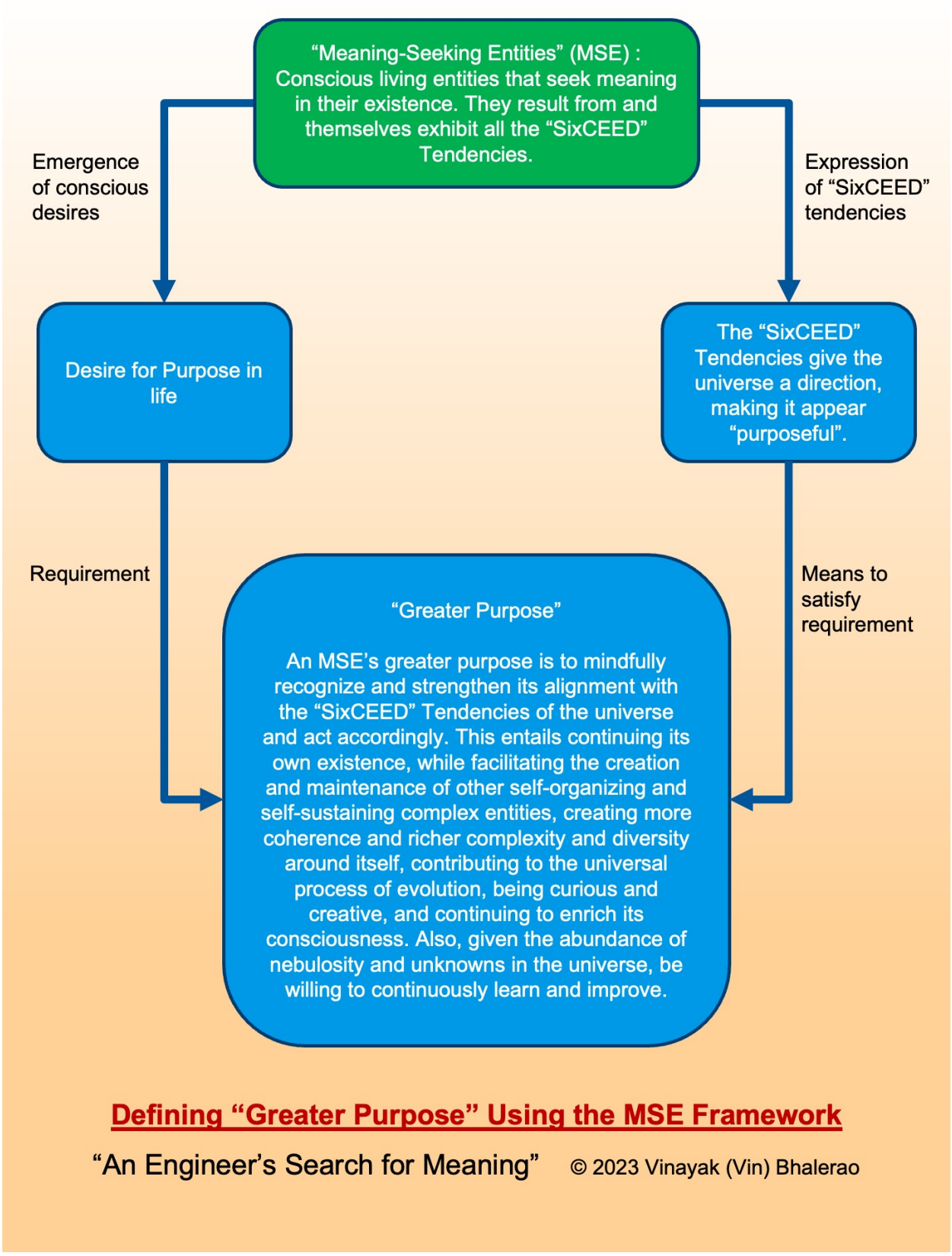
Not only that, but even a cursory look at the list will reveal that, at times, some of these tendencies or actions might be in conflict with each other. This is where mindfulness comes in again, in deciding how to prioritize and schedule actions accordingly.

Moreover, this time, because you know the reasoning behind how these tendencies and actions were arrived at, you can make far more informed decisions about prioritizing and scheduling as compared to pretty much any other method of meaning-making or realization.

As I mentioned earlier, this list is only a set of sample suggestions, just to clarify the definition of purpose. Feel free to build your own as it applies to your own life, experiment with it and see what works.

Finally, to recap everything we have said in this chapter, let us look at a diagram that summarizes how we have arrived at a rigorous definition of Purpose using the MSE Framework.

Derivation of Greater Purpose Using the MSE Framework



Definition of Purpose in Life using evidence and reason alone

Description of the Diagram

As shown in the diagram, Meaning-Seeking Entities are conscious living systems such as ourselves, that seek meaning in their lives. They came about due to the SixCEED Tendencies of the universe, and they continue to exhibit those tendencies themselves.

These tendencies are: Coherence, Complexity, Continuity of existence or identity, Curiosity, Creativity, Consciousness, Evolution, Emergence and Diversity.

As we already saw in the chapter on Consciousness, our desire for a sense of purpose in our lives arises in our consciousness. This is possibly because consciousness itself is a virtual life form that we give birth to, and it needs to perform Active Inference in order to continue to exist. This process makes it come up with counterfactuals, one of which may be a desire to imagine a purpose behind all the activities it is performing.

At the same time, the ubiquity and omnipresence of the SixCEED Tendencies strongly indicate that the universe as well as all Meaning-Seeking Entities inherently seems to have a direction or "purpose". The direction is towards the continuation and further enrichment of the SixCEED Tendencies.

So it makes sense to simply define our Greater Purpose as mindfully realizing and strengthening our alignment with the SixCEED Tendencies.

In addition, given the existence of nebulosity and unknowns in the universe, we need to avoid being dogmatic and always be humble and willing to learn and improve our definition of purpose accordingly.

What Happens if Someone Doesn't Agree with this Definition of Purpose?

Note that there is no supernatural power or authority that is forcing us to accept this definition of our purpose, or threatening to punish us if we don't.

We have something far more interesting here. Since we are Meaning-Seeking Entities that were born out of the SixCEED Tendencies and continue to exhibit them ourselves, we are inherently bound by this purpose, whether we realize or accept it or not.

We can say that enforcement is built into the laws of the universe themselves. There is no need for any additional policing.

For example, it's just like gravity. You can stop believing in it, but it still applies to everything you do.

As the Matrix quote we saw earlier says, "There is no escaping reason, no denying purpose". The quote is literally, scientifically and factually, true!

On the other hand, if one realizes this and aligns themselves with this purpose, they will automatically have the forces of nature in their favor, and they will be a part of the great journey that the universe is on. If the universe is going places, all one has to do is to hitch their ride to it and they will go places along with it.

One would rather have the forces of nature working for them than against them, right?

Maybe this is exactly what Yoda meant in the following dialog:

> *"For my ally is the Force, and a powerful ally it is. Life creates it, makes it grow. Its energy surrounds us and binds us. Luminous beings are we, not this crude matter. You must feel the Force around you; here, between you, me, the tree, the rock, everywhere, yes."*
>
> **— Yoda, in "The Empire Strikes Back"**

Maybe the "Force" that Yoda and all the Jedi talk about is the collection of the "SixCEED" Tendencies that the universe has! We just have to recognize how they are working and align ourselves to them.

But wait, there is more! Having the above realization and acting accordingly has one additional benefit: Hope simply falls out of it.

We'll talk about that in the next chapter.

Deep Dive: The Is-Ought Problem

When Western philosophers started looking at Purpose, they quickly realized a major problem: Talking about purpose determined by a supernatural power involves statements containing the words "ought / ought-not".

For example, "You ought to be a good person (even when you don't want to)" or "You ought not steal (even if you really want something that you can't afford)".

On the other hand, science is based on evidence and reason, and as a result, all its statements are of the form "is / is-not". All science can tell you is how something is or is not. It can't tell you what it ought to be.

In fact, there is no logical way to derive "ought / ought-not" statements from "is / is-not" statements.

This is known as the Is-Ought Problem in philosophy, and it has been used to prove that science can never say anything about things like purpose.

But, in my humble opinion, there is a subtle problem with this way of thinking. Let us take a slightly deeper look at it.

If you remove the supernatural power from the equation, then the word "ought" really means "if one were to move forward in time and look back, what would have been the best choice".

But here again, the ability to move forward in time is fiction. We have no way of doing that.

Given this fact, what are we left with?

The best way can say is, if we are following the methodology of Mindful Bounded Rationality, then the best we can do would be to replace "ought" with "given everything we know at present, what *is* our most optimal choice".

Isn't this what we end up doing in real life? In fact, in common usage, "ought" is pretty much used inter-changeably with "is most optimal".

For example, you might say, "I ought to take the train instead of the plane because both my current location and where I want to go are within walking distance of the respective train stations, whereas the airports are way out of town". In other words, taking the train is your most optimal choice.

I know, "is most optimal" isn't exactly the same as "ought", but it is a good enough "satisficing" approximation and, realistically, it may be the best we can do.

Now, it is true that even figuring out "the most optimal" would involve knowing our current situation exactly, knowing how the situation is going to evolve exactly, so then we can compute the best option. But, as we have seen, trying to do this computation quickly becomes intractable. Moreover, the presence of nebulosity and unknowns makes the assumption of exactness above dubious at best.

This is why we have evolved techniques like heuristics and evidence-based practices that have been proven to work in the past and have a decent probability of working in the future. In reality, those are our best tools for making choices.

True, that ideally, we would have liked to know exactly what the supernatural power had in mind for us. But given that we don't, and we don't just want to take a leap of faith or take someone else's word for it, we have no other choice.

That is why we have chosen to replace the unknowable and intractable "ought / ought-not" with the tractable "is it or is it not most optimal".

11. Hope: Past Performance is a Great Indicator of Future Results

This statement can be scientifically proven to be true.

“The very least you can do in your life is figure out what you hope for. And the most you can do is live inside that hope. Not admire it from a distance but live right in it, under its roof.”

— Barbara Kingsolver, American novelist, in “Animal Dreams”

“the greatest white pill of all is that local minima are rare in high dimensional spaces”

— Roon, AI researcher, in a Tweet

What is “Hope”?

Once again, let us start with a crisp definition of what we are talking about, so we can analyze it scientifically.

The Merriam-Webster dictionary defines hope as “desire accompanied by expectation of or belief in fulfillment”.

The critical word here is “expectation” because it implies trying to make a prediction about the future.

Unfortunately, reality is incredibly complex and our ability to predict the future, even with the knowledge of all the laws of nature that we have discovered, drops off rapidly as we move forward in time.

This is partly because of the aforementioned nebulosity and unknowns in reality, but also because the computational complexity of calculating all the actions and their reactions simply becomes overwhelming.

In reality, the most optimal approach is to make some educated guesses based on known information, but remain open to adjusting them as we move forward.

In the past, when our knowledge of the laws of the universe was very limited, all we could do was to assume that there was a benevolent supernatural power looking after the universe, and it had a complete plan for what it wanted the universe to do. Then, as long as we kept our faith in that power, the beneficence of the supernatural power would result in positive outcomes for us.

This was perfectly reasonable given our level of knowledge of reality at that time. But today we know a lot more about how the universe works, and how it has been progressing from the time it began, and we can actually start to make some fairly reasonable educated guesses based on that knowledge, instead of taking leaps of faith.

Past Performance and Future Results

Take the example of the stock market.

Now, it might sound a little flippant of me to equate the future of one’s life or of humanity, or indeed even the universe, with the stock market, but when you take a closer look, it turns out to be a pretty useful and meaningful comparison, as we shall soon see.

Of course, the first thing that gets thrown at you whenever anyone talks about the markets is the following standard disclaimer: “Past performance is no guarantee of future results!”

And that’s certainly true. Given how complex the market is and the number of factors that can affect it, we can never give a guarantee.

At the same time, past performance is actually a pretty good indicator of future results! In fact, it may even be the best indicator of all.

Pretty much all our planning and predictions, not just financial, but also things like career choice or life partner choice or lifestyle choice etc. are heavily based on taking a good look at the past performance of those choices, maybe customizing it to our specific situation, and making a judgment about whether that performance is likely to continue in the future.

With that in mind, let us look at the past performance of life, the universe and everything.

The Best Track Record Ever!

Imagine you are an investor deciding whether to invest in a company called The Universe Corp.

You, being a disciplined investor who believes in fundamentals, don't go and buy whatever is cool and trending. You go straight for the balance sheet, looking at the performance history of the company going back all the way to its founding.

As far as we know today, The Universe Corp. began operations nearly 14 billion years ago. What has it been doing all this time? What are its major accomplishments?

We have gone over this story before, but it is worth repeating quickly.

Right from the beginning, the universe has exhibited some inherent tendencies, and, as time passed more tendencies have emerged. These are, of course, what we have been calling the SixCEED Tendencies: Coherence, Complexity, Continuity of existence or identity, Curiosity, Creativity, Consciousness, Evolution, Emergence and Diversity.

All along and everywhere, the universe has been executing on these tendencies, without taking a single break. While there have been many twists and turns, ups and downs, catastrophes and upheavals, it has nevertheless relentlessly pressed forward. For billions of years!

Stars have formed and exploded, planets have bumped into each other, and even entire galaxies have collided. Planets like Earth have faced unbelievable natural calamities, like massive asteroid impacts, super volcanoes, severe climate changes, devastating epidemics and unbelievable amounts of violence.

Throughout all of that, The Universe Corp. has continued to execute on its mission to continue and enrich its SixCEED Tendencies.

And this continues to this day. Right here, right now, it is possible to find evidence of the SixCEED Tendencies continuing to express themselves.

This shows no signs of slowing down. In fact, it may even be accelerating, diversifying and complexifying even further.

It would be an understatement to say that this is the most amazing track record of all time, anywhere! By far. Any comparison with anything else would be completely laughable.

If you were to discover such a company, would you jump up and down and invest in it? Would you even put your entire nest egg in it? And not only that, but, after having invested thus, would you completely relax, knowing fully well that your future was in great hands? The greatest hands ever, in fact?

It would be a no-brainer!

Well, isn't this exactly what we mean by hope? Reasonable expectation of an excellent future?

Still, let us take a closer look at it to make absolutely sure.

How "Meaning" Enters the Picture

When we talk about hope in the context of our lives, we typically associate it not with any expectation, but specifically with a positive expectation. We hope that our lives will be better, at least in some way, in the future.

Which raises the question: How do we define "positive" here? What is a "better" life?

Everything we have looked at so far has been in service of finding meaning in life. So, it would be reasonable for us to define a positive life as a meaningful life and hope as the expectation of a more meaningful life.

That's why, in the MSE Framework, we define Hope as "reasonable expectation of a more meaningful life in the future".

And the good news is, if we align ourselves with the SixCEED Tendencies of the universe that have the unbelievable track record as described above with a great expectation of continuation, and even improvement, of that performance, hope simply falls out of it as a natural consequence.

In other words, aligning ourselves with the “SixCEED” Tendencies can give us a “reasonable expectation of a more meaningful future” i.e. hope.

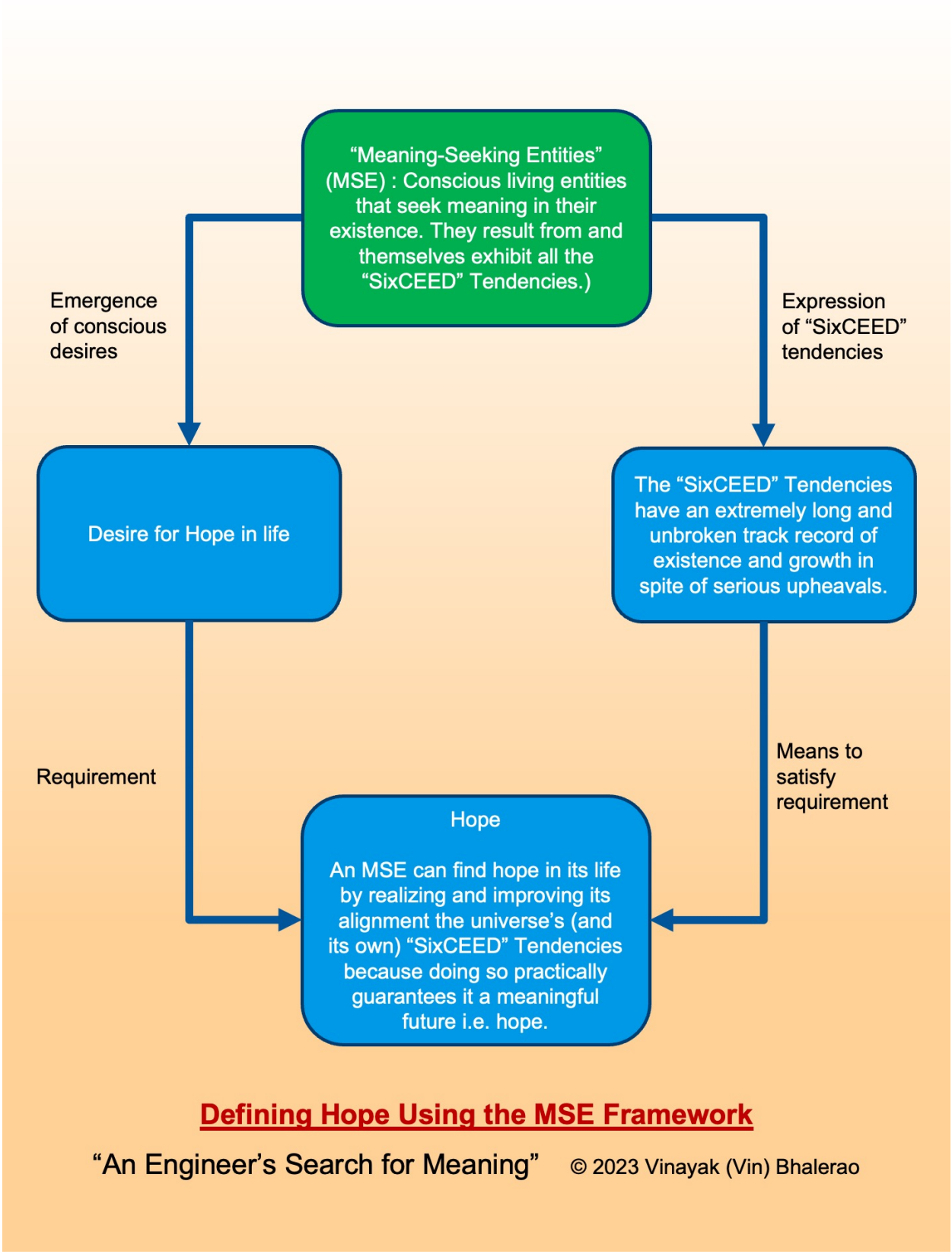
Moreover, unlike all other definitions of hope, this definition isn’t based on just some wishful thinking, or some dream that is not backed by anything substantial.

On the contrary, our definition has the most trustworthy thinking and backing that one could ever ask for: First Principles thinking and the incredible unbroken track record of the universe, respectively.

This is a far more powerful and reliable definition of hope than any other that one could come up with.

As usual, let us elucidate this with a diagram that explains all of the above thinking in a hopefully more memorable form (at least for visual learners such as myself).

Derivation of Hope Using the MSE Framework



Description of the Diagram

As you can see in the above diagram, the desire for Hope arises in Meaning-Seeking Entities due to their possessing Consciousness. As we have already seen, this could be explained as consciousness itself performing Active Inference in order to continue to exist.

On the other hand, the "SixCEED" Tendencies of the universe, that gave rise to the Meaning-Seeking Entities in the first place, have an unbelievably strong track record of existing for billions of years all the way until now, and we can absolutely expect them to continue as far as we can predict in the future.

Not only that, but these tendencies can be observed here and now.

As a result, if we recognize and improve our alignment with these tendencies, then we can justifiably have strong expectations of a meaningful future, which is the same thing as having hope for the future.

Note that this definition is based on a preponderance of evidence and reason, not wishful thinking.

So let us formalize this with a definition:

Definition of Hope Based on the MSE Framework:

Mindfully realizing and improving our alignment with the universe's (and ours) SixCEED Tendencies ensures that we can have a very reasonable expectation of a meaningful future, which is the same thing as having Hope.

In addition, since reality consists of nebulosity as well as unknowns, we need to be open to learning more as we move forward and adjust our thinking and actions accordingly.

The Human Tendency for Hope

Before we go on, I would like to tell you a very interesting story about hope.

Human history, and before that, the history of life in general, is full of horrible calamities such as pandemics, famines, wars and so on.

Our ancestors, going all the way back to the first living cell, somehow managed to pull through all of them.

In particular, one seriously apocalyptic period in the history of the human species really stands out.

Scientists have discovered evidence showing that, a long time ago, humanity went through a prolonged "population bottleneck", when the total population of humans on Earth dropped to near-extinction levels.

Here is a quote from one related study of this period:

> *"Results showed that human ancestors went through a severe population bottleneck with about 1280 breeding individuals between around 930,000 and 813,000 years ago. The bottleneck lasted for about 117,000 years and brought human ancestors close to extinction."*
>
> **— Wangjie Hu, Ziquian Hao, et al in "Genomic inference of a severe human bottleneck during the Early to Middle Pleistocene transition"**

Just 1280 breeding individuals! Today we number more than 8 billion. That's one weirdly shaped bottle.

The same study also discovered that this decline appears to have coincided with a period of major climate change. It is very possible that the decline was caused by it.

Now put yourself in the shoes of a human being living through this period.

In particular, think about living through the period leading up to this bottleneck, when human population must have kept relentlessly declining for a long period of time, maybe even lasting decades or centuries.

Today, we get scared when market pundits talk about the possibility of a decade of slow growth!

Imagine what those people went through. They very likely experienced some of the worst famines humanity has ever faced. Climate disasters, food and water scarcity, disease and possibly even violent conflicts as a result, lasting a long time. Maybe even generations.

It's true that people probably didn't have a sense of the global nature of the catastrophe that befell them at that time. They probably witnessed only its local effects. But even those must have been unbelievably devastating.

This raises an interesting question.

What kind of individual manages to survive such a gut-wrenchingly hopeless time period, over a time span that possibly lasted their whole lifetime? Surviving in a community or culture that must have been transformed, possibly having lived through calamity after calamity for generations? Watching everything around them falling apart and never get better?

The logical conclusion is that these must have been some unbelievably hardy and resourceful individuals, driven by an insatiable capacity for hope! They must have kept on trudging as everyone around them either fell or gave up hope.

Also, given that this period possibly lasted for many generations, the genetic as well as cultural underpinnings of this level of hopefulness and hardiness must have gotten more and more concentrated among the survivors.

The ultimate survivors that finally emerged from the bottleneck must have been the most resourceful and hopeful human beings ever!

And guess what, all of us are their descendants!

It is these survivors that eventually managed to stabilize and then grow their population, eventually resulting in the 8+ billion people that exist today.

It should go without saying that we carry a lot of their genetic and cultural legacy in our blood and our culture. It will keep providing hope to us and our future generations for a long long time.

This could be thought of as another case of "past performance is a great indicator of future results". Any species that managed to survive that bottleneck and thrive can be expected to keep going for a long time to come, no matter what catastrophes befall them.

We can look at this episode in human history as another example of the incredible track record of hope for the SixCEED Tendencies of the universe in general as well as specifically of the human race itself.

Awe and Gratitude

Having come up with such a strong definition of hope based on evidence and reason alone, I am myself now overwhelmed by hopefulness and so want to go one step further.

I want to conclude this chapter with something even beyond hope, almost venturing into the territory normally reserved exclusively for religion: The feelings of awe and gratitude.

The entire stack of layers that make up the MSE Framework is nothing short of "miraculous".

We can start right from the bottom.

The fact that anything exists at all is the most unbelievable miracle. There was no need for anything to exist, but it does. It meets the definition of a miracle because it is a positive phenomenon and we have absolutely no explanation for it.

Beyond that, it is also miraculous that reality contains many discernible patterns that follow well-defined laws. There was no need for that either. Reality could have been a whole lot of nebulosity and randomness. But it isn't. This is another miracle.

Moreover, we have managed to grow brains that are able to capture these laws as mathematical formulas. Some of these laws of physics and other sciences contain some constants (such as the gravitational constant or Plank's constant or the speed of light etc.) that have very specific values. So specific, that if some of their values had been even slightly different, we would not be here.

Why is this the case? We have no idea, hence it is another miracle.

Moreover, these laws have eventually led to the creation of life, life has led to intelligence and the mysterious phenomenon of consciousness. As a result, creatures like ourselves can wonder about all this and try to make some sense of what's going on.

The phenomenon of life appears to have a built-in goal of continuing to exist and spreading, endowing all living systems with the purpose of continuing and supporting that process to the best of their ability. This fact also provides a tremendous source of hope and meaning to all living systems.

All of the above phenomena can be thought of as legitimate miracles. There was no need for any of them to exist. But they do, and we are the ultimate beneficiaries.

Also, even if the scientific paradigm does not allow us to proclaim that we know any ultimate truths, it still provides us a rigorous way to discover many useful patterns, build useful things using them, and keep making progress.

What's really really remarkable about this is that we were able to discover and formulate all of these phenomena simply by following evidence and reason. There was no need to invoke any kind of magic or take leaps of faith.

And we still ended up with awe and gratitude.

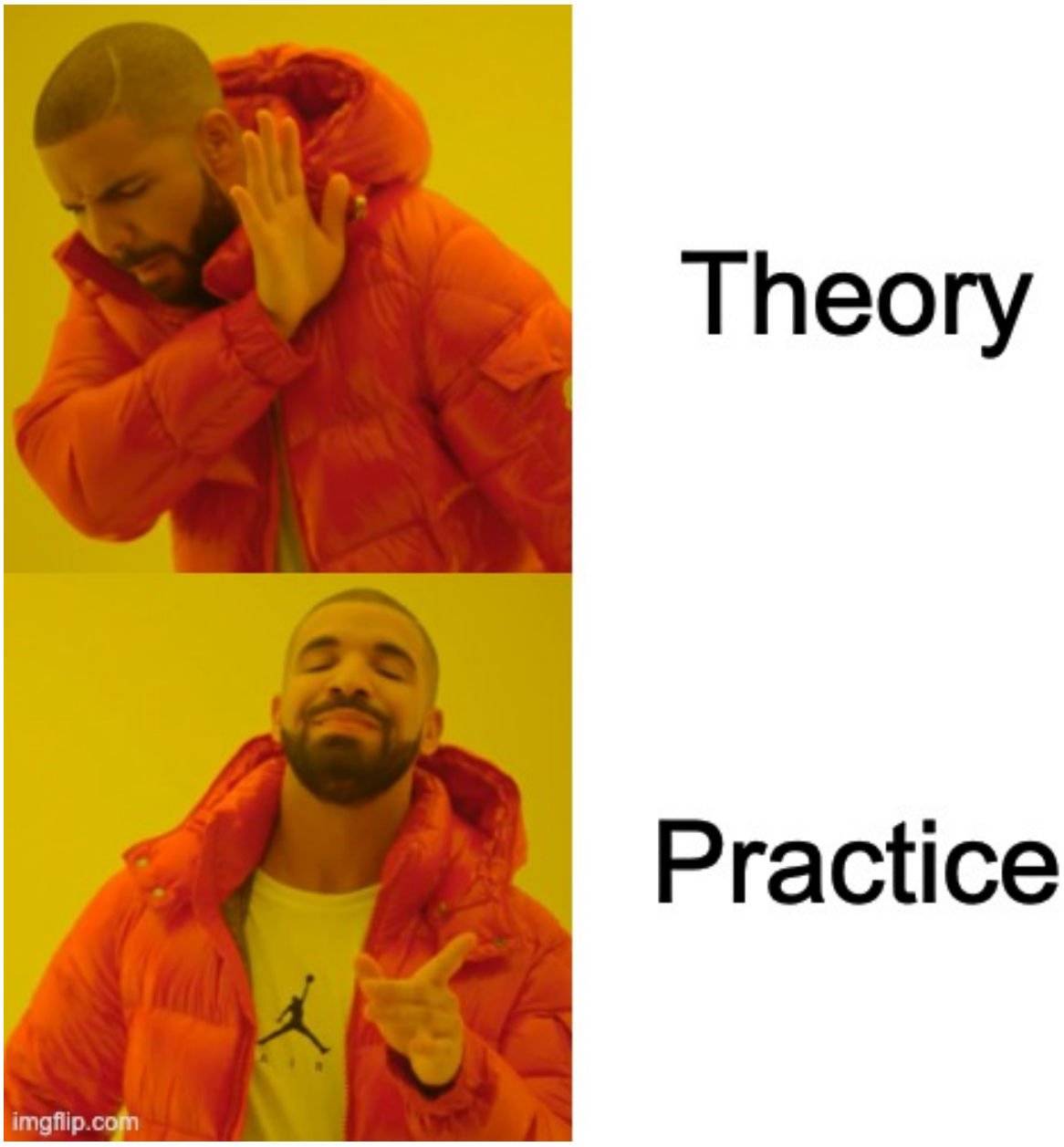
Do we really need any more miracles than that? Isn't all of this sufficient to fill our minds with awe about existence and gratitude that we are here to experience it and even understand it to some extent?

As far as I am concerned, I don't need anything more miraculous or more awesome or more deserving of my gratitude than this!

That pretty much completes the "theoretical" part of this book. As you might have expected, now it's time to turn our attention to what really matters in the end: converting theory into practice. But I don't want to stop at just specifying what to do, I want to actually issue a call to action and provide you with tools to make it happen.

We'll do that in the next chapter.

12. Call to Action: From Knowing the Path to Walking the Path



Engineers shouldn't just come up with theories. They should produce practices.

"There is a difference between knowing the path and walking the path."

— Morpheus, in "The Matrix"

"It doesn't matter how beautiful your theory is, it doesn't matter how smart you are. If it doesn't agree with experiment, it's wrong."

— Richard P. Feynman, in one of his lectures

Whenever you come across any new philosophy of life, no matter how convincing and appealing it is, the most important question you must ask is: What can I do with it? What can I do daily, weekly, or on a regular basis? How can I put this philosophy into practice and see real improvements in my life as a result? If no such prescription is available, then what is the whole point of the exercise?

It goes without saying that there is a big difference between theory and practice. In fact, in our discussion on Present-Bounded Rationality, we identified this as one of the biggest limitations of rationalism or any other philosophy that limits itself to abstract ideas.

Moreover, since this book is entitled "An Engineer's Search for Meaning", I feel like it is absolutely my duty to come up with tools that can be used to put all of this theory into practice. This is what engineers are supposed to do.

Rubber, Meet Road

What we have done so far is that we have settled on the Present-Bounded Rationality (PBR) Methodology, developed the MSE Framework based on it, used the framework to identify 9 tendencies the universe appears to exhibit (which we have named "SixCEED" Tendencies) and how they can be used to find meaning, purpose and hope in life.

What we need to do next is to develop some practices based on these concepts. These practices need to be simple for most people to follow on a regular basis, so they can actually see the benefits of the ideas presented in the book for themselves.

Let us look at each of the SixCEED Tendencies and how they manifest themselves in Meaning-Seeking Entities such as ourselves:

- **Coherence or Comprehensibility:** This tendency is reflected in all our ongoing struggles to make sense of our lives, our place in the world, the economy, our relationships and so on. It helps us to improve our agency or "grip" on our lives.
- **Complexity:** What this tendency typically translates into is being able to manage higher levels of complexity in our lives or activities. It could mean taking on more complex tasks or building more complex things or managing more complex teams of people or tools or even raising the level of complexity of our own thinking.
- **Continuity of existence or identity:** Everyone wants to live long and healthy lives, have relationships that last, work for or create long-living institutions or organizations, and so on. This could be something as simple as taking care of your health and well-being, along with that of your family and friends, your community, all the way up to ensuring the sustainability of the entire biosphere. All of these are Meaning-Seeking Systems, and they all depend upon each other to achieve their aims of continuation of existence.
- **Emergence:** Many of us have experience phenomena like someone going on a meditation retreat for 2 weeks and emerging a changed person or people just shooting the breeze but then one idea leads to another and a whole new plan emerges from that or you are just sitting in the stands and some people start raising their arms and soon a wave emerges. These sorts of emergent phenomena occur all the time in all sorts of contexts at various levels and when they occur, it is often quite a magical experience.
- **Curiosity:** This involves trying to be curious and open-minded, willing to experience new phenomena, new places, new people, and new tasks and continuously keep learning. This is the natural

behavior of our any system that performs Active Inference. It is only when we get stuck in a routine or become dogmatic about some belief or scared that we force ourselves to deviate from that.
- **Creativity:** This one involves focusing on being creative in our activities or thinking. And, in particular, creating things that embody at least some of the other SixCEED Tendencies.
- **Consciousness:** This implies trying to expand and enrich our conscious experience, and through that expand and enrich our consciousness itself. Practicing mindfulness, to whatever extent you can, is one of the best ways to accomplish this. One can also try to expand and enrich the range of conscious experiences one has, like listening to richer types of music or appreciating better qualities of art or reading better books and so on.
- **Evolution:** Evolution is an ongoing process for all Living Entities. We all have an innate biological as well as sociological desire to participate in evolution at the biological or social level, whether we realize this or not. This includes everything from raising (or helping to raise) children to participating in the iterative improvement of all our activities or every organized group or community we belong to to evolving our own thinking and skills.
- **Diversity:** This involves recognizing the value of and facilitating the enrichment of diversity in all aspects of our lives. This could manifest itself in everything from trying new foods or meeting new people or playing with new ideas all the way to diversifying your investment portfolio! It also means detecting when diversity is being destroyed and slowing or preventing that from happening.

Of course, as we have already said, there is some overlap and synergy in all of these, so some of the activities that you might engage in might meet more than one of these criteria.

In addition to the above list, we have also identified Mindfulness as a natural practice that all Meaning-Seeking Entities need to perform in order to align themselves better with the basic process of Active Inference.

With all of this in mind, let us see how we can go about developing some practices.

The Practices

It is well known that any practice works best when we identify concrete situations where and when it can be acted upon. That way, whenever you find yourself in that situation, it reminds you to follow that practice. Over time, it becomes a habit and then the benefits really start to compound.

So let me start by asking some questions about some regular situations that we all face:

- What's the first thing you do when you get up in the morning?
- How about just before you hit the pillow at night?
- What is the most common activity you do whenever you have a free moment during your day?

My guess is, for most people, most days, the answer is: "Check my social media feed!"

Is it any wonder, then, that most people think that life has become crazy / sad / angry / sucky in general? This is because most of our social media feeds are full of such negative content. When you feed your mind junk, it's no wonder it gets sick over time!

It has been well acknowledged that we need better alternatives to these bad habits.

What would be a better alternative? How about something simple that can be done anywhere, anytime, in small chunks just like checking a social media feed?

Fortunately for you, that's very much possible. It is possible to define practices that can each be performed in a few minutes in any of the above situations, and that can help make your life more meaningful, purposeful and hopeful over time.

Let me first name these practices along with the most likely time that one might do them and then we will look at each of them in more detail:

1. **"Mindful Moments":** Whenever you have a free moment at any point in your day,

2. **"Purposeful Mornings":** Before you start your day in the morning,
3. **"Hopeful Evenings":** The last thing you do at night, and
4. **"Meaningful Life":** Whenever you are in the mood for taking a deeper perspective, such as on weekends or birthdays or while making New Year's resolutions or some other significant event in your life.

Let us now go over each of these practices in detail. Each one takes only a few minutes to complete. Moreover, each of them can be useful immediately and can impact your life positively over the long run.

The "Mindful Moments" Practice

As we have already seen in the chapter on Life, Mindfulness is a natural method for complex Living Entities to align themselves completely with Active Inference.

So it should not surprise us that our ancestors, who thought hard about their lives and minds and experimented with them discovered the practice of Mindfulness long before we knew anything about Active Inference.

That's the wonderful thing about truth - it can be arrived at from many different angles.

The ancient practice basically involves focusing your full attention on the present moment, simply observing and labeling things happening around you, as well as inside your body and your mind, clearly and calmly, without making any judgment about them.

Practicing mindfulness in everyday activities has been proven to improve focus, productivity and peace of mind. Simply observing and labeling things occurring in the present moment, instead of trying to judge them as being desirable or "good" or not is like removing cobwebs that cloud your perception. Also, the present moment is where you have the highest level of "agency" or effectiveness on your actions as compared to any moment in the future or indeed, the past.

Thus, being mindful allows you to perceive everything more clearly, think more clearly about it, and act more effectively on it.

All of this makes your life more attuned to reality, which is the same as being more aligned with it. And that, as we have already shown, leads to more meaning, purpose and hope over time.

With that quick introduction, now it is time for us to look at the specific steps involved in the Mindful Moments practice:

A) Mindfully focusing on your surroundings:

1. Start by settling down comfortably wherever you are, taking a deep breath and exhaling slowly.
2. Gently allow your mind to pay attention to what is happening around you, right here, right now.
3. Take a look around yourself and make a note of something that catches your attention. It could be anything you see or hear or smell or touch (e.g. "pen", "chair", "carpet" etc.).
4. Pay careful attention to that object. Notice some of its properties, such as its color or shape or texture or the way it is changing etc. Trying to do so helps to focus your mind on the object.
5. If your mind wanders, that's ok. Gently and playfully bring your focus back to the object. Allow it to fill your attention as much as you can, at least for a few seconds.
6. Avoid making any judgments about the object, such as whether it is desirable or not. Whatever it is, let it be, and try to simply experience it the best way you can.

B) Next, it is time to focus on your body:

1. Gently close your eyes and turn your focus inwards, towards your own body.
2. You will start to notice various physical sensations occurring in your body, such as your breath coming in and going, maybe an itch somewhere on your skin, or tenseness in your muscles etc.

3. Once again, choose whatever catches your attention and pay as careful attention to it as you can, at least for a few seconds.
4. And again, if your mind wanders, just gently and playfully bring it back to the sensation. Allow it to fill your attention as much as you can.
5. Once again, avoid making judgments. Let it be as it is, simply try to experience and label it.

C) Going deeper, focusing on your mind:

1. The last step is to pay attention to what is going on inside your mind.
2. Notice any thought or emotion passing through your mind. Simply observe and label the thought or emotion as it is, without making any judgment about it.
3. Continue to do this for a short time, as thoughts come and go into your mind. Try to look at your own mind playfully, as if it is a child. We don't judge the things children do, we simply watch and appreciate the things they do. Do the same with your mind.
4. This is probably the hardest part of the practice, but even a minute amount of regular progress towards it will compound over time.

That's basically it. (At least these steps should give you a good start on this practice. Of course, the best way to learn any practice is to work with a guide, so eventually, you may want to find such a guide.)

This practice is extremely useful and should put you well on the path to your ultimate goal of finding meaning, purpose and hope in your life. But it's not sufficient for our purposes.

We need to add something more to the mix.

Beyond Mindfulness

Let us consider the following issues:

- As we have already discussed, when Meaning-Seeking Entities perform Active Inference, in addition to mindfulness, they also have to evaluate and prioritize their goals and desires (i.e. counterfactual scenarios their internal generative models they come up with), based on their alignment with the SixCEED Tendencies. So we need to develop practices that help us deal with that, too.
- While we are talking about longer-term things like goals here, the important point to remember is that we still want to focus on things we can perceive and act on in the present. This is what our Present-Bounded Rationality requires. So we need things we can use in the present that might still be valuable to help us reach our longer-term goals.
- Moreover, mindfulness is quite hard for most of us, at least initially. This is because we have been conditioned to focus our minds on either the future or the past rather than the present. Moreover, we have gotten used to judging everything that happens, as being good or desirable or not. It takes a while to get used to not falling into these habitual patterns.

As a result of these issues, we need to recognize and (non-judgmentally) accept that most of us need some additional support to align ourselves with the tendencies of the universe.

The next three practices work together to address these issues.

This is where we take advantage of practices that belong to another ancient philosophy we have talked about, Stoicism.

Stoicism prescribes regular practices such as morning and evening reflection, and longer-term practices involving taking a big-picture look at our life. When performing these practices, the philosophy asks us to use a set of "virtues" it prescribes as guidelines.

In our case, we will change the list of virtues slightly to say that we will use the SixCEED Tendencies as our "values" or "virtues". (There is even some overlap between the virtues as defined by Stoicism and the

SixCEED Tendencies, but we will stick to the tendencies here since we have developed a robust framework to support them instead of just taking someone's word for it.)

As noted earlier, these values allow us to keep our focus on the present moment, yet have a higher level confidence that they will lead us to our goals. This is because we are using the ubiquitous, ever-present and inherent tendencies of the universe as our guidelines.

With all of that in mind, we can now define 3 practices: a morning practice, an evening practice and a longer-term practice. Let us go over them next.

The "Purposeful Mornings" Practice

This practice is basically identical to the Stoic practice of Morning Reflection, with the addition of the Six-CEED Tendencies alignment as the guiding principle.

Here are the steps to follow:

1. Every morning, before you start your day, sit quietly for just a few moments and go over your day in your mind.
2. Identify your goals or objectives for the day, imagine the challenges you may encounter while pursuing them, and visualize the actions you might take to handle them. In order to do so, visualize yourself actually taking those actions and overcoming the challenges that may come up. Doing so may lead to insights that require modifying the goals and actions.
3. Identify up to 3 goals or actions for the day. These may be personal goals, work or school goals, or family or community goals. Ideally, note down these goals or actions in a journal.
4. Stoicism asks its practitioners to ensure that their activities are "virtuous". In our case, we are defining "virtuous" as "being in alignment with the SixCEED Tendencies of the universe". Thus, this practice requires that, when we identify our activities for the day, we try to ensure that they are aligned with the SixCEED Tendencies of the universe.
5. The best way to do this is to look at each activity in your list and check which of the SixCEED Tendencies it is aligned with. Since there is some overlap in the tendencies, you may need to check off more than one tendency. The more the merrier!
6. In the beginning, this may turn out to be hard to do because many of your goals will not be aligned with the SixCEED Tendencies. But simply being aware of these guidelines will, over time, lead to better alignment, and, along with it, the sense of having meaning, purpose and hope in life. And here again, every little step can produce tangible benefits.
7. This practice will help you feel that your activities during the day are purposeful.

The "Hopeful Evenings" Practice:

This practice is basically identical to the Stoic practice of Evening Reflection or Journaling, with the addition of the SixCEED Tendencies alignment as guiding principles.

The steps are analogous to the ones in the previous practice, except we are talking about the events that have already occurred and the actions you have already taken during the day .

Here are the steps to follow:

1. Every evening, before you call it a day, sit quietly for just a few moments and go over your day in your mind.
2. Go over the goals or objectives for the day that you had identified in the morning. Make a list of what actually happened as a result, as well as other important events that occurred during the day.
3. Think of the challenges you encountered while pursuing the activities you had planned, and how you dealt with them. What lessons can you draw from that for the next time? Are there any opportunities for iterative improvement?

4. Also, ask whether your actions improved your alignment with the SixCEED Tendencies. What were the challenges and how can you adjust your activities to bring them in better alignment?
5. Once again, the best way to do this is to note down each of these activities along with your reflection about each of them, and check off which of the SixCEED Tendencies each of them was aligned with.
6. And again, this may turn out to be hard to do in the beginning. But simply being aware of these guidelines will, over time, lead to better alignment, and, along with it, the sense of having meaning, purpose and hope in life. And here again, every little step can produce tangible benefits.
7. Note that this practice is associated with "hope" since, as a result of the SixCEED alignment, the ultimate outcome of this practice should be to make you feel grateful for the day and hopeful about the next.

The "Meaningful Life" Practice:

The last practice is meant for taking a long-term perspective on one's life. This again is a very common idea recommended by many philosophies of life, and we will add our own twist based on the SixCEED Tendencies.

The practice can be done at longer intervals, such as months or years. Typically one can do this on their birthday or while making New Year's resolutions or when there are major events in one's life.

The practice involves the following steps:

1. Review the morning and evening journals that you have been writing. Notice any recurring patterns and trends.
2. How is your list of activities evolving? How is their alignment with the SixCEED Tendencies evolving? Do you feel that your life is contributing to the universe's relentless progress toward the expansion and enrichment of life and consciousness? What longer-term changes do you need to make?
3. Write these reflections down in your journal.
4. As we have seen, a meaningful life involves having a sense of coherence or comprehensibility about one's life, having a sense of existential significance, and having a sense of purpose. So evaluate your life up to this point along these lines.
5. One of the best ways to do this is to write down a story of your life up to this point, keeping in mind the 3 aspects of meaning.
6. Ultimately, reflect on whether the practices you have been doing have been helping to make your life meaningful, purposeful and hopeful over time and whether you need to make any adjustments.

The MindFeed App

Once again, since I am an engineer, I don't want to leave you with just the recipe for these practices. I want to help you actually practice them in a fun, engaging way.

So, as a companion to this book, I am developing a web app called MindFeed. This app provides you with stepwise instructions to do these practices.

In addition, to make it fun, the app gives you fun mementos to commemorate your practice. It also keeps a history of your practices and helps you review them later. You can use this journal during your Meaningful Life practice as well as download it for your own records.

Eventually, I plan to add some analysis tools to help you with all of your practices.

Note that, since this is a web app, you do not need to download or install anything to use it. Just clicking on the link below in your browser will let you use the app.

Here is a link: MindFeed Web App.

That was the call to action for everyone reading this book. But beyond that, I have a special message for the engineers among us.

Call to Action for Engineers

As I stated in the honeybee conversation at the beginning of the book, there is something unique and critically important about engineering that doesn't get acknowledged often.

Every cell in your body has a cell wall. Various molecules present themselves to this wall and the wall has elaborate mechanisms to select the molecules it thinks are useful to the cell inside and let them in. (Also some undesirable molecules, such as viruses present themselves as beneficial molecules and manage to get through.)

Once inside, depending upon the type of molecule, it either gets transported to the part of the cell where it is needed or it tosses around in the chemical soup of the cell until it gets where it is useful.

The mechanisms the cells construct for transporting these molecules can be quite elaborate. They almost resemble "molecular highways" with "walkers" walking along them that almost look like Atlas carrying a huge load on its back. These highways are constructed as needed and then disassembled.

Once the molecules get to where they are useful, appropriate chemical reactions take place to allow them to do whatever they are needed to do. This includes things like releasing energy to perform various tasks or building other molecules or processing waste products and so on. More importantly, they perform the critical task of DNA transcription, translation, signal transduction and eventually replication, when the cell is about to divide.

If you were to shrink yourself down to the size of a molecule and walk around a cell as it was doing these things, you would think that it was a very complex and dynamic factory. In fact, possibly the most complex and dynamic factory you have ever seen.

Similar observations can be made even at the level of organs, individuals, and groups of individuals. They can be viewed as supply chains, defense mechanisms, selection mechanisms, transportation mechanisms, chemical processing plants and waste management.

In other words, one can look at the entire range of activities involved in keeping Living Entities alive as unbelievably complex and dynamic engineering activities.

Yes, you can absolutely think of life as a mind-bogglingly complex and dynamic engineering project!

This project, as far as we know, began all by itself billions of years ago and has continued unbroken ever since. It has complexified, organized, evolved and diversified in uncountable ways.

Now, I know what you are thinking - "That sounds rather lame and dry! Everything is just engineering? What about poetry? Atr? Beauty? Feelings? The ineffable and the unintelligible and the transcendental?"

So let me ask this: Have you ever been moved by an engineering marvel? A rocket taking off? A beautiful suspension bridge? A beautiful building or even a city? The mechanism of a wristwatch or a piano or a supercar?

A flower? A honeybee? Koi fish swimming around in a pond? A garden?

What are all these things if not engineering marvels?

There is a misunderstanding that engineering is all dry, mechanical stuff. This is not true. Every engineering product involves human, and sometimes even spiritual elements. The simpler ones may look mechanical and lifeless, but the more complex they become, the more life-like they look.

In fact, I would propose that all these feelings of awe, beauty, and transcendence that we associate with art or poetry or music and so on are just our ways of grappling with extremely complex phenomena that aren't easy for our minds to grasp. But, if you shrink yourself down to the level of molecules, as we did while

traveling around a living cell earlier, you would see that ultimately, it is all just molecules going about doing their things. And many times, they appear to have a well-defined function and purpose, like an engineered product.

I know, it takes time to come around to this realization. It took me a long time too.

We have a huge amount of cultural and emotional baggage associated with life which gets in the way of getting to this realization.

But if you simply ask, if it is not molecules and processes with well-defined functions and purposes, then what is it? If it is not physics, chemistry and biology, then what is it? If it is not scientific facts and engineering processes and products, then what is it? If it is not evidence and reason, then what is it?

If you think there is something more, what evidence do you have to support it besides a feeling or some culturally accepted beliefs?

One of the reasons that people believe that there is something more is because science has generally been associated with nihilism. Science is just a collection of “dead” facts.

But engineering is not like that. In the chapter on Methodology, we already saw how engineering isn’t just “an application of science” but a lot more ancient practice, practiced by not just human beings, but also by the birds and the bees and every living cell and even the entire ecosystem.

Engineering is a process that creates or fixes something functional and serves a purpose. It is inherently more purposeful and meaningful. It adds “life” to science.

And if engineering is done mindfully in service of a purpose like expanding and enriching life and consciousness, then it can rise to the same exalted levels that we usually associate with things like art, poetry and music.

In fact, engineering can be considered to be the meaningful and purposeful essence of life, the universe and everything!

It is hard to understate the importance of this realization. All engineers should take great pride in this fact!

So the call to action for engineers is to not only take pride in this fact, but act as good stewards of this phenomenon. This, as we have stated, can be accomplished via Mindful Engineering that is aligned with the SixCEED Tendencies of the universe. The ultimate aim, as always, is the expansion and enrichment of life and consciousness.

Of course, any such feeling of great pride in your profession or calling must be accompanied by humility, as dictated by our methodology of Present-Bounded Rationality. So let us get to that next.

Some Final Points

In all of the above, we should never lose sight of the fact that the universe contains a lot of nebulosity and unknowns, and as a result, we need to be humble, exercise mindfulness and moderation, and be willing to learn and improve our actions accordingly.

At times, some of these activities or even the SixCEED Tendencies might be in conflict with each other. This is again where mindfulness, moderation and humility come in, to help you decide how to prioritize and schedule actions accordingly.

Moreover, because you know the reasoning behind our methodology and how these tendencies and practices were arrived at, you can make far more informed decisions about your prioritization and scheduling process as compared to pretty much any other method of meaning-making, where you are typically required to simply take things on faith.

This is the ultimate benefit of this approach - that it can be explained from the ground up, and questioned or verified or improved by anyone. That’s the beauty of relying on evidence and reason.

With that, we have completed everything we wanted to accomplish in this book! Congratulations! You deserve a tremendous amount of gratitude from me for having stuck with my quirky and amateur writing for this long.

Still, for good measure, we will quickly summarize everything we have discussed so far and then take some questions.

Summary: Use the MSE Framework to "SixCEED" in Life

Early humans:

What's all this? Who am I? What should I do? I am so confused!

Before the dawn of science:

Magic, miracles & faith! And hence, meaning, purpose & hope!

After science & engineering:

Evidence, reason, predictable results! Things start to make sense! (But meaning is lost.)

Post-Modern era:

Make your own meaning! Or go for money, power, fame! Or just do whatever!

"An Engineer's Search for Meaning":

Use the MSE Framework to "SixCEED"! Recover meaning, purpose & hope in your life!

Evolution of the MSE Framework

"An Engineer's Search for Meaning"

"Yet what is more awesome: to believe that God created everything in six days, or to believe that the biosphere came into being on its own, with no creator, and partially lawlessly? I find the latter proposition so stunning, so worthy of awe and respect, that I am happy to accept this natural creativity in the universe as a reinvention of 'God.'

- Stuart Kauffman, in "Reinventing the Sacred".

"Science is not only compatible with spirituality; it is a profound source of spirituality."

— Carl Sagan

In this chapter, we will look at increasingly more detailed versions of the summaries of this book.

Let us start with a very high-level "tweetable" version:

A Tweetable Summary of "An Engineer's Search for Meaning":

The main message of "An Engineer's Search for Meaning" is that one can make one's life meaningful simply by aligning it with the universe's inherent tendencies towards expanding and enriching life and consciousness. The book shows that this isn't just a feel-good statement, but it has a strong basis in science and engineering principles.

Next, let us look at a 2-minute version:

A 2-Minute Summary of "An Engineer's Search for Meaning":

The book develops the Meaning-Seeking Entities (MSE) Framework from First Principles, using an overwhelming amount of evidence and the application for reason,m without requiring any leaps of faith or dogma. It does this by defining Present-Bounded Rationality as its methodology. Using this methodology, this book shows that the universe exhibits the following 9 tendencies that work in the opposite direction to the law of Entropy and lead to everything we consider meaningful and hopeful. These tendencies are ubiquitous and omnipresent and can even be observed right here, right now. These tendencies are: Coherence, Complexity, Continuation of existence or identity, Curiosity, Creativity, Consciousness, Evolution, Emergence and Diversity.

We call them the "SixCEED" Tendencies.

The book further shows that realizing and mindfully improving our alignment with these "SixCEED" Tendencies is the optimal path to finding meaning, purpose and hope in our lives without having to rely on faith or dogma.

Or, in other words, we can use the MSE Framework to "SixCEED" in life!

The book also suggests 4 simple practices based on this framework: Mindful Moments, Purposeful Mornings, Hopeful Evenings, and Meaningful Life.

And specifically for engineers, the book proposes that Mindful Engineering that is aligned with the expansion and enrichment of life and consciousness is the essence of life, is the way to make life meaningful, purposeful and hopeful.

Finally, let us look at a more detailed summary.

Detailed Summary of the Book

- The book develops a framework for finding meaning, purpose and hope in life based only on science and engineering principles, or evidence and reason. No leaps of faith or acceptance of some dogma are necessary.
- This framework is called the **Meaning-Seeking Entities (MSE) Framework.**
- **Meaning-Seeking Entities** can be loosely defined as conscious living entities, such as ourselves, that have an innate desire to seek meaning, purpose and hope in their lives. (A more formal definition is included further down.)
- The MSE Framework is a **First-Principles**-based framework built upon the foundation of evidence and reason alone. It relies on rigorous explanations of reality that scientists and engineers have put together over the millennia, using methods such as **Bayesian Inference** and the **Scientific Method**.
- Unfortunately, this sort of **rational analysis has limits**, due to the existence of **complexity, nebulosity and unknowns** in reality, as well as our relatively limited cognitive abilities. This has been used as an excuse in the past to say that concepts like meaning, purpose and hope are beyond the reach of rationality. Unfortunately, this excuse has been used to put forth ideas based on faith or magic or dogma to define things like meaning, purpose and hope.
- A far better way is to address these limits, and the framework uses a modified version of rationality as its methodology, which it calls **Present-Bounded Rationality (PBR)**. This methodology is characterized by concepts from Bounded Rationality as well as the practice of grounding oneself in the present moment and location, also known as Mindfulness. Present-Bounded Rationality includes ideas such as **Satisficing, Heuristics, Present-moment focus, Grounding in reality (rather than abstractions) and Non-judgmental observation**, in addition to Thinking from First Principles, Bayesian Inferencing and Scientific Method mentioned earlier. Another important pillar of this methodology is always remaining **humble and open to learning**, thus avoiding the pitfalls caused by hubris and overreach that are typically associated with many other such frameworks. Doing so ensures that we don't get carried away by the zealous pursuit of abstractions and purity, and trying to fit reality to them instead of the other way round.
- When we practice Present-Bounded Rationality to solve real-world problems or build things in the real world, we call it **Mindful Engineering**.
- To build the framework, we start with the axiom that we live in something like an **Ultimate Reality** whose essence is unknown to us because we do not have direct contact with it. We can only experience it through our senses, as **Physical Reality,** or via introspection, as **Consciousness.** Since both of them are fundamental and self-evident to us, we take them as axioms too. We do not privilege either Physical Reality or Consciousness as more fundamental because we do not have any evidence to prove that. (If, at some point, we are able to prove how one emerges from the other, we can easily modify this part of our framework accordingly and the rest of the framework can remain unchanged.)
- Using the scientific method and various engineering practices, humanity has managed to discover and explain foundational natural phenomena such as:
  - **Quantum Fields and Wave Function Collapse,**
  - **The Standard Model of Physics,**
  - **Self-organization and Complex Adaptive Systems,**
  - **Dissipation-Driven Adaptation,**
  - **The Free Energy Principle and Active Inference,**
  - **Evolution and**
  - **Emergence.**
- Analysis of these phenomena leads us to conclude that the universe exhibits the following 9 inherent, ubiquitous and omnipresent tendencies:

  - **Coherence**,
  - **Complexity**,
  - **Continuity of Existence or Identity,**
  - **Curiosity,**
  - **Creativity,**
  - **Consciousness,**
  - **Evolution,**
  - **Emergence and**
  - **Diversity.**

  We call these tendencies the **"SixCEED" Tendencies** since 6 of them begin with a C, one with an E and one with a D.

- Note that all of these tendencies work against the law of Entropy, and are equally real. In fact, we are beginning to see scientists propose a formal "law of nature" based on this idea.
- With that background, we can formally define **Meaning-Seeking Entities** as complex living entities that are
  - A result of all the "SixCEED" Universal Tendencies mentioned earlier,
  - Exhibit the tendencies themselves,
  - Have the desire for Meaning, Purpose, Hope in their lives, and
  - Can experience them, too.
- All MSE's possess some level of consciousness appropriate to their level of complexity. Based on widely corroborated reports of introspection, the MSE Framework shows that the **desire for meaning, purpose and hope ultimately arises in this consciousness**.
- We can postulate that this may be a result of **consciousness itself trying to perform Active Inference**, creating counterfactuals and then motivating us to go seek evidence for them. (Note that Active Inference is substrate-independent.) We can further postulate that this is because consciousness is really a new "virtual" life form that arises in complex living organisms.
- The current thinking among psychologists is that the concept of **Meaning in Life** has 3 components. These include having a sense of:
  - **Coherence or Comprehensibility**,
  - **Purpose**, and
  - **Existential Mattering or Significance**.
- Using the MSE Framework, we can show that MSE's can attain all of these by aligning themselves with their inherent SixCEED Tendencies at all times and places. Thus, the MSE Framework defines that **Meaning in life can be achieved by mindfully living in alignment with the SixCEED Tendencies**.
- Given that these inherent tendencies of the universe continuously give rise to coherence and complexity in the universe, some of which self-organizes itself into self-sustaining and (sometimes) conscious, creative and curious organisms that evolve and diversify, we can conclude that that is at least **one of the purposes of the universe**. And since we are Meaning-Seeking Entities ourselves that are a result of the same tendencies and continue to exhibit them ourselves, our greater purpose is the same.
- Thus, **our greater purpose** is to continue our own existence, while facilitating the creation and maintenance of other self-organizing and self-sustaining complex entities, creating more coherence and richer complexity and diversity around us, contributing to the universal process of evolution, being curious and creative, and continuing to enrich and expand our consciousness. Note that the complex entities mentioned here refer to not just individual living organisms, but also other entities that exhibit similar tendencies, such as organized groups or institutions of living organisms, bodies of thought, and even artificial organisms.

- Doing so also provides **Hope** because the SixCEED Tendencies have an incredible track record of surviving and even thriving in spite of a very long series of extreme upheavals that have occurred in the history of the universe right from its birth. This unbroken track record gives us tremendous confidence that these tendencies will continue to exist and be in effect far into the future. Thus, if we define hope as the **expectation of a meaningful future**, then it is easy to see that this can be accomplished by mindfully aligning ourselves with the SixCEED Tendencies.

- Since we are Meaning-Seeking Entities ourselves, we can't help but exhibit the SixCEED Tendencies ourselves. Unfortunately, our consciousness, as a result of it performing Active Inference on its own, generates many counterfactual scenarios i.e. **desires that aren't aligned** with these tendencies. Due to this misalignment, our efforts to try to satisfy these desires lead to frustration. This is where the realization and mindful alignment with the SixCEED Tendencies becomes critical.

- To summarize, the MSE Framework shows that all MSE's such as ourselves (as well as any organized groups we belong to) can find **meaning, purpose and hope by mindfully realizing, acting on and enhancing their SixCEED Tendencies.**

- The PBR methodology also requires that we always keep in mind that reality contains a lot of complexity, nebulosity and many unknowns. As a result, **these guidelines themselves are subject to moderation and should always remain amenable to revision as we learn more.**

- Many of the ideas mentioned here can be seen in various religions and philosophies also. So, one can say that the MSE Framework is not particularly against religious or philosophical ideas. But there are some critical differences:

  - We have a **far crisper definition** of these ideas,
  - A **far stronger basis** for explaining them from First Principles,
  - A **far better chance of developing strategies** for accomplishing them,
  - **Far better prospects of improving upon these ideas** as we learn more,
  - Anyone can **understand and verify these ideas themselves** without taking anyone else's word for it, and
  - Given that they are based on the **universal language of evidence and reason**, there is a higher probability that they can be adopted by people with completely different backgrounds.

- In order to define some practices based on the framework, we rely on ancient practices of Mindfulness and Stoicism.

- In fact, it can be shown that the practice of **Mindfulness** is a logical outcome of MSE's trying to improve their Active Inference process. Improving the process entails improving perception, the internal model and effectiveness of actions in the world, which is exactly what Mindfulness also involves.

- We can also rely on the Stoic practice of morning and evening journaling but modify it to incorporate alignment with the SixCEED Tendencies as the main criteria.

- Using these ideas leads us to define 4 simple practices based on the MSE Framework:

  - **Mindful Moments,**
  - **Purposeful Mornings,**
  - **Hopeful Evenings,** and
  - **Meaningful Life**

- Moreover, specifically for engineers, the book recommends taking pride in their vocation since it appears to be the essence of life. But in order to do so, one has to practice Mindful Engineering, ensure that it is aligned with the expansion and enrichment of life and consciousness is the essence of life, and refrain from hubris.

And with that, we have finally achieved what we have been aiming for since the beginning of this book: A way to find meaning, purpose and hope in life, based only on evidence and reason, or scientific and engineering principles.

Whew!

This has been quite a journey, starting from absolute scratch to reaching our goal. Taking the “path less traveled” has certainly meant challenging some long held notions, opening my mind to new ideas and painstakingly working through various scientific results.

As a result, I wouldn’t be surprised if what I have presented here has raised many questions and doubts in your mind. Allow me to address them next.

Rude Q&A

Bring Them On!

"An Engineer's Search for Meaning"

"I don't think there are any rude questions."

— Helen Thomas, American reporter and author, in the New York Times

"One handy technique I learned years ago at Microsoft was the Rude Q&A (RQA). Whenever we had a major launch, we'd start preparing by writing a document that listed all of the difficult, unfair and perhaps rude, questions we'd rather not be asked, but might come up."

— Scott Berkun, American author, in his article "How and Why To Write a Rude Q&A"\

You probably have a lot of questions about everything I have presented in this book.

The ultimate objective of the book is probably one of the oldest known to mankind, but the approach I have taken is somewhat unusual. So, it is perfectly reasonable if you are confused or even incredulous. Maybe even annoyed.

I have tried to anticipate some of your questions and objections, including some that might sound rude, and attempted to address them in advance. If you have a question that is not addressed here, please ask and I will add it to the list.

A) Who are you? And why should anyone listen to you?

As far as this book is concerned, it shouldn't really matter who I am. And I am not asking you to listen to me or take my word for anything that is presented here.

The beauty of proposing a framework based on evidence and reason is that it does not require that I claim to be an authority in the ideas presented. We don't follow arguments and conclusions based on evidence and reason because some authority gave them to us. We follow the arguments and conclusions because they directly make sense to us, without requiring a middleman.

Anyone can verify the ideas and reasoning presented in this book for themselves and agree or disagree based on whether their own exploration of the ideas convinces them.

I am not claiming to be a philosopher or even an accomplished writer. I am just a curious person at heart and an engineer by training. I started learning English in 5th grade, and somehow still developed a liking for writing in English. I have no particular authority in any of the fields I have talked about in this book, but I am a lifelong student who likes to dabble in a variety subjects and I am fortunate to have had the time to spend on doing so.

Of course, it is quite likely that I have made mistakes in my construction of the MSE Framework, and in that case, I hope to hear about it, learn from it, and improve the framework accordingly. Doing so would be in line with the PBR methodology that the framework is based on. This is one of the reasons why I have published the book directly on the web.

This brings us to the next question.

B) What should someone do if they disagree with the arguments presented in the book?

I love honest disagreements. That is how I discover new information and advance my base of knowledge. So go ahead and air your disagreements with me. I am happy to engage in any meaningful debate.

Unlike many other debaters, my aim in every meaningful debate I engage in is not so much to win the debate but to discover new truths. (This is another benefit of being evidence- and reason-driven rather than authority-driven.)

In fact, I believe that when someone wins a debate, that means they have just wasted their time because they did not learn anything new! One should prefer to lose an honest and rigorous argument, because that would mean that they learned something new and thus deepened their own understanding of the issue. In my opinion, this is a far more interesting outcome.

Now let us talk about some similarities and differences between the approach presented here and the other well-known approaches to answering the hard questions of life.

C) Are you against faith or religion or spirituality in general?

Not at all. If someone believes in religion (or spirituality in general), I have no problem with that. I am not trying to convince them to give that up.

Religion and spirituality have withstood the test of time, and for very good reasons. They have provided a source of meaning, purpose and hope to billions of people. I am trying to bring those benefits to those who have already lost faith in religion or even spirituality.

If someone has already moved on from their faith or never got too deep into it in the first place, and ended up having a meaning crisis as a result, then I hope my book will help them, just like it helped me.

Also, as I have noted earlier, there are some clear overlaps between what I have presented here and many religions and philosophies. Some of the final outcomes are very similar, except the methods used to get there are different, and, as discussed earlier, there are many significant and serious benefits to the methods used here.

Using an approach based on evidence, reason and first principles allows us to understand why we are saying the things we are saying. We don't have to take leaps of faith or take someone's word for it. This approach allows us to challenge all the assumptions and the reasoning, and, whenever we learn something new about our reality, we can improve our assumptions, reasoning and even results and recommendations.

This brings us to the next logical question.

D) Is what you are proposing a new philosophy or ideology?

No.

What I am trying to define is just a scientific and engineering framework. I am not a philosopher or theologist by training, so I wouldn't presume to make any serious proclamations in that area.

In my wildest dreams, I imagine that efforts like this will develop into a new field of science and engineering that deals with "Meaning Seeking". Maybe we can call it Meaning Science or Meaning Engineering.

I believe that we need something like this pretty badly at present and would love it if books such as this one motivate people in this direction.

Someday, maybe we will have high-school or college-level courses in this area. Such a course could probably parallel or follow immediately after students have gone through a good amount of STEM coursework. It could even provide additional motivation for students to take up these subjects because they will understand how the subject matter relates to reality and life.

I am not alone in undertaking this type of effort either. There are many others (as I have mentioned earlier) who have been working in this space. I am just another voice in that conversation.

But this gives me hope that such efforts could turn into a movement in the near future.

E) Are you an advocate for scientism?

Scientism is the belief that scientific methods are the only way to obtain any truths about reality. And since scientific methods are based on evidence and reason, and the MSE Framework is also based on evidence and reason, it is reasonable for someone to think that I may be advocating for scientism.

I want to make it clear that I am not advocating for scientism in any way.

Here are the ways that what I have presented in this book differs from scientism:

- I am *only* claiming that meaning, purpose and hope can be obtained *even* if you choose to stay within the bounds of evidence and reason. For a long time, we have been made to believe that evidence and reason are insufficient for obtaining things like meaning, purpose and hope. I am simply trying to debunk that specific claim, while making no grand statement about that being the only way.
- I am perfectly willing to acknowledge that there may be other ways of obtaining meaning, purpose and hope in life. I just want to add one more way to the list.
- I have repeatedly acknowledged that rationality has limits and that reality contains a lot of unknowns and nebulosity that science has not been able to capture (and may never be able to capture fully). As a result, I have proposed Present-Bounded Rationality as the methodology for this book and suggested that engineering is a better way to approach things like meaning, purpose and hope than pure science.

- I have also advocated for a humble approach that accepts that we don't know everything, but we can still find a way forward, and keep looking for new ways to improve or even correct our understanding of reality. This is a big difference between any kind of "ism" and the approach taken in this book - I am not proposing any final or ultimate solutions.
- Finally, I have talked only about meaning, purpose and hope, which is a small subset of "all of truth". I am not making any claims about all of the truth in this book.

I hope that should clear up any confusion about my views on scientism. Now let me address an objection that may come from the opposite direction.

F) Are you just putting old wine in a new bottle?

Some people might say that the conclusions we have reached based on the MSE Framework look a lot like the teachings of many religions or philosophies that have existed for a long time.

What is new here? Is this just old wine in a new bottle?

Let me use that analogy itself to explain what is new here. Suppose you want to get a great bottle of wine for some special occasion. You have 2 options:

1. You can go to the local wine store and ask the wine expert there for their recommendation and simply buy whatever they suggest. Or,
2. You browse through the aisles and read the descriptions of the wines there. You might wonder, "What do all the terms and ratings and so on actually mean in reality? Are they trustworthy? Why? What makes one wine better than another? How is wine even made? How are grapes grown?" And so on.

If you want to know the answers to all these questions, you will need to learn quite a lot about winemaking, viticulture, soil chemistry, geology, human taste and flavor perception, marketing tactics, and so on.

Essentially, you will need to understand winemaking yourself from "First Principles".

Of course, this is a lot harder and time consuming. But if you do that, you won't have to take the wine expert's word at the store.

What if the wine expert isn't as knowledgeable as they look? What if the expert is trying to push some wine at you because the winemaker gives them a kickback? What if the industrial wine manufacturing process is so bad for the wine that the entire inventory at the store is mediocre? What if there is a totally new way of winemaking that is far more robust and authentic? How would you know?

Only after having studied winemaking from first principles would you understand enough to answer these questions honestly.

Now, I can totally understand someone who might say, "Why bother with all that? I'll just drink the recommended wine and be happy!"

I have no problem with that. But I also understand that there are people like me who don't want to take the word of the expert and want to get a lot deeper.

As I explained in the "Motivation" chapter, people like me don't just want the answers, they want to know why those are the right answers. We want to understand the story behind the story, the principles beneath it, and why those specific principles, to the extent possible.

If we do that, then we not only discover concepts and principles that are far more reliable, but also there may be ways to communicate them better, to improve them, to resolve conflicts and so on.

G) What is special about engineering when it comes to this topic? Why not call it just "science"?

There is no doubt that science and engineering are joined at the hip, with a lot of overlap. But I would like to point out a few things that are different about engineering and how they make a big difference to the MSE

Framework.

The simplest reason for talking about engineering is that I am focused on finding a practical solution to the meaning crisis, which, as I have explained earlier, is a real and pressing problem for the world as well as for myself.

Finding practical solutions to real-world problems is the domain of engineering. Science only helps us understand the rules of the game, that too only to the level possible via abstractions. Engineering is where the rubber actually meets the road.

Engineering is far better at dealing with the complexity, nebulosity and unknowns that permeate reality than science.

This isn't so much a weakness of science, but a difference in their objectives and methods. One can think of science as providing the bone structure, while engineering provides the muscles, blood vessels, nerves and skin.

As we saw in the chapter on our methodology, if we are going to build something that deals effectively with the messiness of reality, we need something like Present-Bounded Rationality to do that. And engineering is far more aligned with this methodology than science.

Moreover, while the objective of science is to create abstractions that are fully buttoned down before making any serious claims, engineers can (and do) produce products and solutions that are in "beta" form. That means they are useful in their current form, but still being worked on and will keep improving.

This is exactly what I am doing here.

Finally, I don't believe any scientist has ever come up with a term like "SixCEED" to describe what they are doing! [Such self-serving immaturity is the domain of engineers, and I am proud of that!]

H) Aren't things meaning and purpose really the domain of religion or even poetry? Isn't it well known that science, let alone engineering, is simply incapable of getting there?

I'm so glad you asked this question because it lets me vent about a deep injustice in the history of human thought.

Imagine that there is a big table at which all the upper-class people get to sit and eat. Lower-class people aren't allowed at this table. They have to eat in the kitchen or the backyard.

Why? Because the upper-class people have decreed that the lower-class people are simply incapable of eating at the big table. Sitting at the big table requires one to follow certain protocols, certain language, and certain mannerisms. Things that the lower class people simply don't know how to do.

Leave alone the fact that it is the lower-class people who do all the cooking and cleaning. They provide all the plumbing and air conditioning and even the entertainment. They even make the table and all the crockery, the silverware, and the glassware on it. Including the expensive champagne in it.

This is basically the situation we have with religion and poetry on the one hand (the upper classes) and science and engineering on the other (the lower classes).

At the big "meaning and purpose table", only religion and poetry are allowed. Science and engineering can only do all the cooking, cleaning, plumbing, air conditioning, entertaining, furniture, crockery, silverware, glassware and even the champagne-making.

This is literally true!

Science and engineering run our entire world. They provide everything we need in our lives. We count on them every minute of the day.

But, somehow, we have allowed ourselves to be sold the idea that things like meaning and purpose are beyond their reach.

And if you dig a little deeper into the reasoning behind this thinking, you will see that this is simply a result of how the words meaning and purpose have been defined.

The words probably started out simple enough, but somewhere along the way, their meanings got changed. They took on theological or poetic connotations. And then those became their core meanings.

A part of the reason for this was that science and engineering were in their infancy at that time. They didn't have many answers. So one had no choice but to look to religion or poetry.

But, as a result, most people have come to believe that meaning and purpose can only come from a supernatural power or some ineffable source. And they can only be described in religious or poetic terms. And then they go ahead and declare that science and engineering are incapable of getting there because science and engineering don't have the language or the protocols or the mannerisms for talking like that.

In science and engineering, we have a technical term for this: "Well, duh!"

Note that I am not against religious or poetic usages of the words: meaning and purpose. Feel free to use them that way.

All I want to do is to ensure that science and engineering are also allowed to eat at the same table. (Not to mention that they are already doing everything else related to the dinner!)

Sure, you may be the type that doesn't get swayed by such political or emotional arguments. You may have some more serious and well-known objections to allowing science and engineering to eat at the big table.

So let us address them next.

I) Doesn't Gödel's Incompleteness Theorem prove that your science and engineering-based approach is doomed to failure?

No.

I have already covered this objection in a Deep Dive into Gödel's Incompleteness Theorem in the chapter on Methodology.

J) Doesn't the Is-Ought Problem in philosophy prove that trying to define Purpose from first principles is doomed to failure?

No.

I have already covered this objection in a Deep Dive into the Is-Ought Problem in the chapter on Purpose.

Hopefully that covers the major objections. Now let us look at some other efforts that may have some overlap with what I have proposed.

K) How is the MSE Framework different from Effective Accelerationism (e/acc)?

Effective Accelerationism is a fairly recent movement that happens to have some overlap with what I have proposed here, but there are some critical differences that make it totally different in reality.

Effective Accelerationism, in the words of their own activists, "seeks to align with the 'thermodynamic will of the universe' by embracing and accelerating the natural tendency of the universe towards growth, complexity, and higher intelligence. It encourages exploration, experimentation, and the advancement of civilization in the pursuit of greater utility and adaptability."

As you can see, there is clearly some similarity with some of the MSE Framework and the "SixCEED" Universal Tendencies I have talked about.

But that's pretty much where the similarity ends.

A major point of departure between my approach and the e/acc approach is that I am explicitly accounting for limitations to rationality in my framework, which have led me to adopt Present-Bounded Rationality as my methodology, rather than pure rationality. My hope in doing so is to avoid the hubris, excesses and absurdities that arise from taking rationality too far.

In my understanding, Effective Accelerationists are not humble about their ideology and are willing to extrapolate their ideas very far.

Even a good idea, when taken very far, can turn into a bad idea. For example, every living being needs energy to survive, but too much will burn you. Consuming some amount of water is essential for survival, but too much will cause a kidney failure.

This is not because these ideas themselves are bad, but because you are extrapolating them too far, where they blow past some limitation, or beyond your ability to predict their outcomes, or you are failing to acknowledge the delicate balance of multiple good ideas that is necessary to keep the entire system functioning.

In my opinion, taking rational thinking too far is actually irrational given all the limits to rationality we have talked about.

The Effective Accelerationists don't talk much about mindfulness or the need to be grounded in reality or the need to fit abstractions to reality rather than the other way around.

Also, their ultimate aim seems to be to provide the ideological basis for accelerating the development of technology, which is radically different from my aim of helping Meaning-Seeking Entities find meaning, purpose and hope in their lives. I am positioning the MSE Framework as a scientific and engineering framework, open to debate and further enhancements, not an ideology to be used to rally the troops.

Note that this should not be taken to mean that I am somehow against developing technology. The e/acc people use the derogatory term "decel" (referring to the idea that we need to pause or decelerate the development of technology) for such people and I am not claiming to be one of them.

I am an engineer, which means I have developed technology in the past and continue to do so. But what I am against is the almost religious zeal associated with accelerationism in any form. It makes even rational people go to extremes and in fact, act irrationally as a result. I don't want to fall into that trap.

Also, in my opinion, technology does not need any explicit help to accelerate itself. There are many factors in its favor already and at least in some cases, it is already accelerating at an incredibly fast pace.

In fact, it is humanity that is falling behind and needs to evolve in order to keep up, which is exactly what I am attempting to do here. My purpose is to help people live better lives in the emerging accelerated world.

Also, some Effective Accelerationists pay lip service to the idea that consciousness is a valuable phenomenon to preserve, but they don't give it much importance. In my case, I consider consciousness to be a major pillar of the framework and it is one of the SixCEED Tendencies that the framework is based on. As a result, enriching and expanding it is a critical aspect of the framework.

Here is a quote by Yuval Noah Harari that echoes the above sentiments:

> *"The danger is that if we invest too much in developing AI and too little in developing human consciousness, the very sophisticated artificial intelligence of computers might only serve to empower the natural stupidity of humans."*
>
> **— Yuval Noah Harari, Israeli Historian and author, in a tweet**

L) How is the MSE Framework different from the Omega Point concept?

The Omega Point is a theorized distant future event in which the entirety of the universe converges toward a final point of unification or maximum organized complexity. The term is usually associated with the French Jesuit Catholic priest Pierre Teilhard de Chardin.

The idea of this future convergence is postulated on concepts that have a lot of overlap with the SixCEED Tendencies that we have talked about.

Various people have characterized the Omega Point as a counterpoint to the idea of the heat death of the universe, which is what the law of entropy, taken to the extreme, entails.

Various other people have also expanded upon or modified the Omega Point idea to propose various related frameworks for finding meaning and purpose in life.

In contrast, what I am saying is that we do not need to justify any behavior in the present based on some extremely distant point in the future that we cannot really predict with any level of certainty. (In fact, there is still a debate in the scientific community about the idea of the heat death of the universe. Various scientists have proposed completely different theories about the end of the universe.)

The MSE Framework only relies upon what can be observed to be occurring right here, right now, not some distant event way beyond our ability to make predictions. The present moment is a far more reliable guide because, here and now is where we have the maximum possible knowledge of our reality and, as it turns out, there is no need to extrapolate things very far in order to find meaning, purpose and hope. In addition, the present moment is where our ability to act is also at its maximum effectiveness, thus allowing us to find actionable items readily and confidently.

Once again, I think it is far more rational to acknowledge the limits of rationality and mitigate them, than trying to extrapolate things into the distant future. In fact, based on what we know about complexity, combinatorial explosions and nebulosity, extrapolating things very far into the future looks almost like taking a leap of faith.

And luckily for us, as I have shown in this book, we really have no need to extrapolate things into the distant future if our objective is to create solid definitions of meaning, purpose and hope.

M) How does the MSE Framework relate to Spinoza's idea of God?

There are some definite similarities between the MSE Framework and Spinoza's idea of God.

Baruch Spinoza was a 17th century European philosopher. He was one of the seminal thinkers of the Enlightenment and a strong proponent of Rationalism.

He proposed the idea that there is only one substance in the universe, and he called that substance God. According to him, everything that exists is a part of this one substance, including you and me, rocks, trees, and everything else in the universe.

He argued that understanding our place in the interconnected web of the universe and aligning ourselves with it can lead to a kind of intellectual and emotional liberation, which leads to peace.

Spinoza was also influenced by Stoicism, which I have already mentioned as being closely related to the ideas that our methodology of Mindful Bounded Rationality is based on.

In summary, you can see that what I have presented in this book is quite close to Spinoza's argument, except I don't call the universe or nature "God", though I have no problem if someone does that because that helps them. The main reason why I don't invoke the concept of God in the MSE Framework is because it has a wide diversity of definitions and comes loaded with a lot of historical and philosophical baggage which complicates the rigorous and non-judgmental analysis I am trying to do here.

Also, Spinoza was a strong proponent of rationalism, whereas we have tried to moderate our reliance on rationality by incorporating elements of mindfulness and bounded rationality.

Moreover, we know a lot more about our reality today, based on an abundance of scientific and engineering knowledge, than we knew in Spinoza's time and we have taken full advantage of that in building our framework.

N) How does the MSE Framework relate to the Hindu / Vedic philosophy of Brahman?

The Hindu / Vedic concept of Brahman also has some similarities with what I have presented.

According to Vedic philosophy, Brahman is the ultimate, unchanging reality or cosmic principle that underlies the entire universe. It is often described as formless, infinite, eternal, and beyond all dualities and distinctions. Brahman is considered the source and essence of everything that exists.

Under this philosophy, the purpose of life is to recognize our unity with Brahman and live accordingly.

As you can see, there are clearly a lot of overlaps between the MSE Framework and the conceptualization of Brahman.

One can also argue that our effort of trying to recognize our and the universe's inherent SixCEED Tendencies and live in alignment with them is similar to the aforementioned idea of aligning with Brahman.

Where we differ is more in the details. There is no discussion of the SixCEED Tendencies or anything like that in Vedic philosophy. This may just be a result of the fact that very little of the scientific knowledge that we know today was known at the time the Vedic ideas were developed, or it could be that their approach is based more on introspection and meditation rather than experimentation in the physical world.

In fact, Vedic philosophy treats physical reality as an illusion and probably for that reason, they haven't tried to go too deep in explaining the various patterns that can be observed in it, which has been the focus of science and engineering.

Also, the Vedic philosophy considers our consciousness to be the same as Brahman. We haven't tried to make that claim and haven't needed to. In fact, I have proposed that consciousness may be a new life form that emerges in complex lifeforms, as a result of Active Inference.

O) How does the MSE Framework relate to Buddhism?

It is well-known that Mindfulness is a central concept and practice within Buddhism. It involves the cultivation of present-moment awareness and non-judgment.

As we have seen, these ideas are integral to the methodology we have used to build the MSE Framework, namely Mindful Bounded Rationality.

We have also invoked mindfulness when talking about how to find meaning, purpose and hope in our lives. Mindfulness comes into play there due to the need to deal with complexity, nebulosity and unknowns in reality.

Also, according to Buddhism, suffering arises from not aligning oneself with reality. In our case, we are saying that aligning oneself with the SixCEED Tendencies of the universe (including ourselves) is the way to attain a sense of meaning in one's life. So clearly there is a lot of similarity there, too.

But once again, Buddhism hasn't focused a lot on explaining physical reality or coming up with crisp ideas of its tendencies. This is for the same reasons as mentioned above for the Vedic philosophy.

It is possible that science and engineering are just newly available paths that allow us to reach some of the same realizations that Vedas and Buddhism have talked about.

One major point of difference between the MSE Framework and Buddhism is that Buddhism rejects the idea of a self, or consciousness. In the MSE Framework, on the other hand, I have postulated that consciousness may be a new "virtual" life form that we give birth to, and nurture during our lives.

Contrary to rejecting its existence, we embrace it and talk about expanding and enriching it.

P) Is it possible to attain spiritual enlightenment using the MSE Framework?

Spiritual Enlightenment, also known as Moksha or Nirvana, is considered to be the ultimate goal for a spiritual seeker. It is a state when one is supposed to have truly and deeply understood and embodied the meaning of existence.

The ultimate goal of someone following the MSE Framework is to truly and deeply understand and embody the SixCEED Tendencies of the universe. It is the realization of the idea that we are all an integral part of universal processes that have been going on for ages and will continue for ages, and living in accordance with this idea.

So one could say that the MSE Framework has the potential to become one of the paths to attaining spiritual enlightenment or Moksha or Nirvana. However, I must admit that the framework is still new and needs to mature and many people have to try it out and only then will we know if this potential can actually be realized.

It is my belief that there are multiple paths to spiritual enlightenment and one should choose the path that suits them best. For someone who wants to stick to evidence and reason alone, the MSE Framework may provide one such path.

Q) What is LifeVisor?

[Aha! Finally, a non-rude, even self-serving, question!]

As you may have noticed, the URL for the book is “book.LifeVisor.ai”. So what is this LifeVisor?

LifeVisor is the larger project that this book is a part of. I am still trying to define what it is going to be, but the motto for the project, “Helping smart people live wiser lives”, might give you some hints.

The idea is still evolving in my mind, and as it starts to materialize, you will be able to see its progress at the main project site: https://LifeVisor.ai.

You can also sign up for the mailing list on that page so you can be notified when things start to happen.

R) I still have questions. How do I send them to you? How do I contact you in general?

You can contact me either by email or on Twitter / X.

- Email: info [at] RedmondLabs [dot] com
- Twitter: @deepestturtle

Those are all the questions I have thought of so far. If you have additional questions, please ask and I will try to answer them here for everyone’s benefit. And, once again, note that there are no rude questions as long as they are honest.

Afterword

Life, liberty, and the pursuit of… “Why”

I started writing this book for personal reasons, as I have explained at the beginning of the book.

But while doing research for the book, I came across many interesting quotes from well-known people expressing thoughts very similar to mine. One of my favorites is the following quote by Arthur C. Clarke:

> *"Perhaps it is better to be un-sane and happy, than sane and un-happy. But it is the best of all to be sane and happy. Whether our descendants can achieve that goal will be the greatest challenge of the future. Indeed, it may well decide whether we have any future."*
>
> **— Arthur C. Clarke, British science fiction writer, in "3001: A Space Odyssey"**

Arthur C. Clarke is one of my favorite sci-fi writers. It was his writing that instilled in me the love and respect for the "hard" in "hard sci-fi". He conjures up amazing visions, scenes and plots while staying within the bounds of the known laws of nature and what may even become real someday.

Maybe it was his writing, coupled with the number of times I have had my mind blown due to some scientific phenomenon or technological wonder, that has led me to realize that the real world itself contains all the wonder and magic we seek in our lives. There is really no need to come up with complete fabrications.

In fact, it was Arthur C. Clarke who said "Any sufficiently advanced technology is indistinguishable from magic." I would actually go one step further and say that all our so-called advanced technologies absolutely pale in comparison to some of the existing natural phenomena, and thus, are even more magical. We have gone over many of these phenomena in this book, such as the incredibly complex inner workings of living cells or nervous systems or ecosystems.

Still, I have a nit to pick about the quote included above. I really wish the author had chosen some other words than sane / un-sane. It conveys a sense that people who believe in supernatural phenomena are somehow not sane.

I believe that both religions and science have the same goals: A better understanding of our reality, ourselves and how the two fit together to create meaning, purpose and hope. I don't see anything un-sane about this endeavor.

Insanity enters the picture only when people become zealous about their beliefs or try to impose them on others.

I don't take part in the religion vs science debate, because the debaters often fall prey to such zealotry. In fact, if one thinks hard about it, zealotry starts to look both unscientific as well as irreligious. It should have no place in either type of thought. Also, one should always be free to honestly decide which way they want to go, and change their mind as many times as they want to.

But it's not just that.

Ultimately, the truth is that there is only one Ultimate Reality.

Fortunately or unfortunately, this Ultimate Reality keeps eluding us in spite of our relentless multi-directional and multi-layered efforts trying to figure it out.

While we might occasionally be able to vaguely sense its outlines, we are not really able to understand it or capture it fully in terms of human thought. Or even intuitions or feelings, for that matter.

It seems to be beyond that.

This reminds me of another one of my favorite quotes:

> *"Out beyond ideas of wrongdoing and rightdoing,*
>
> *There is a field. I'll meet you there."*
>
> **— Rumi, a 13th century Persian poet**

Here, Rumi is supposedly talking about love, which, in his opinion, is the Ultimate Reality.

(Scientists would probably agree with him on the "field" part - as in quantum fields, of course! As far as we understand today, reality is ultimately a quantum field, it seems to be beyond our ability to understand fully, and we all do exist in it. There is clearly some common ground there.)

I guess one point of difference is that poets sometimes claim to have access to this ultimate reality, but scientists or evidence-and-reason-driven knowledge-seekers such as myself need proof. And we have none. (Neither do poets, to be sure. But, unfairly, in my opinion, no one holds them to the same standard!)

Irrespective of that, the fact that none of us is able to reach this field doesn't have to mean that all of our struggles are meaningless.

To the contrary, this struggle itself may be the essence of life. We can argue that our inherent desire for meaning is really just this struggle to grasp some vague outline of this Ultimate Reality.

And, as we have seen in this book, this is not just a poetic or religious thought. It is a scientifically explainable process. We know that all living entities must perform Active Inference in order to continue to exist in a dynamic environment, which necessarily requires building an incrementally better model of Ultimate Reality. Without this struggle, living organisms can't survive.

What is truly incredible is that even as hard-headed followers of evidence and reason, we have been successful in capturing at least some aspects of this field beyond all fields. We didn't have to resort to taking leaps of faith to do so. And we are humble enough to accept that we may not have captured all of it. And yet, we have some reliable methods to keep making progress.

Most importantly, what I am trying to say is that if you are on the path of evidence and reason, and if those other approaches aren't working for you, then that does not mean you are out of luck. There is a way for people like us, too.

I am trying to fight the pervasive dogma that things like meaning, purpose and hope can only be captured via faith or poetry.

The less traveled path of evidence and reason has been denied access to the big table of meaning, purpose and hope that faith and poetry have occupied for a long time. While this might have been fine in the past because we didn't really know a lot of the things we know today, I believe the time has now come for evidence and reason to also get a seat at the same table.

And again, this is not to say that things like poetry, art, literature, music etc. are meaningless or less important. I myself am often moved by them and I consider them to be an indispensable part of living a rich life.

In fact, as I have stated in the chapter on Consciousness, trying to enrich and expand one's conscious experience is very much a part of the SixCEED Tendencies. And human endeavors such as art, music, literature, etc. are certainly a part of enriching and expanding one's consciousness.

But what is unreasonable is to then take a leap of faith from there and claim that those endeavors or the experiences they lead to are, in fact, the Ultimate Truth. There is no basis for saying that.

The way I have built the MSE Framework in the book follows the First Principles approach - start from the absolute bottom and go step by step to the ultimate objective.

But that may not be how people actually experience how their own thoughts evolve. Let me give an example to explain how this evolution may occur, and hopefully, that provides another way to understand the ideas in the book.

Someone might say that looking at the smiling face of their child is all the meaning, purpose and hope they need in their life. This is perfectly understandable.

Others might go a little deeper and say, the love, hope and wonder they see in the child's smiling face is all the meaning, purpose and hope they need in their life.

Others might go even deeper and say that seeing the love, hope and wonder in the eyes of a child makes them feel that they are in the presence of a supernatural power (or Love itself, as Rumi might have said). And that is all the meaning, purpose and hope they need in their life.

Still others might go deeper and say that seeing the love and hope in a child's eyes reminds them of how unimaginably improbable and unbelievably complex this seemingly simple and commonplace event is.

They might say that, right here and right now, the Ultimate Reality of existence, which is inaccessible to us directly, is somehow creating particles out of quantum fog, atoms and molecules out of particles, mind-bogglingly complex, self-sustaining living cells out of those atoms and molecules, entire smiling children out of those cells, and ultimately the mysterious phenomenon of consciousness, in both you and the child, that allows both of you to experience this magical moment together.

Just close your eyes and imagine what is going on inside the child's or your own body. You are both made of trillions of self-organized cells, containing complex structures and processes that are many orders of magnitude higher than the most advanced man-made structures we have built so far. All these cells are simply going about their business, building and dismantling structures, moving things around, acquiring and consuming sources of energy and other resources, hunting down parasites, repairing themselves when needed, communicating with each other using electrical and chemical signals, growing and dividing, ultimately giving rise to the feeling that there is a "you" inside of you and there is a "reality" that you are a part of, and you both get to experience all of this just by being present.

Not only that, but today it is possible for us to come up with sound explanations for the vast majority of these phenomena, from the ground up, in all their glory.

Moreover, you can gather an overwhelming amount of evidence that there appears to be an inherent direction to all of it. You and every other part of the universe are on an amazing journey in that direction, even if you are completely unaware of it.

This journey started billions of years ago, has continued unbroken since then, and as far as we can predict, will continue for billions of years more.

Knowing all of this, how it may have come about, and the fact that we have been able to discover so much of it all by ourselves from this tiny corner of the universe with an even tinier brain, gives me a far more satisfying feeling of meaning, purpose and hope in my life than anything else I have ever encountered.

And that is all the meaning, purpose and hope I need in my life. (And, by now, I hope you feel the same way!)

Still, trying to convince you that any of these approaches or perspectives or levels is better or worse than others is not the point of this book.

This book is only trying to make the point that it is absolutely possible to find meaning, purpose and hope in our lives even if we take the relatively less traveled path of evidence and reason. Armed with that knowledge, one can confidently pull their chair up to the big "meaning table" and party along with all the other approaches.

When one looks at what makes us uniquely human, as compared to all other animals or even other apes, we usually point to our big and complex brains. A few may point to our opposable thumbs, or our upright

posture, or our mostly hairless bodies and so on.

But I think one of our most interesting features is that we are born totally helpless and helplessly cute, which means we are cared for by willing adults for a long time. Most other animals become independent comparatively quite quickly after being born, but we take years. And we even keep maturing well past adulthood (or even midlife, for that matter!)

I believe that this uniquely long period of maturation leads to some unique, deep and lifelong side effects.

For example, ever since our childhood, we are conditioned to look for help and guidance from others. In the beginning, we look to our parents, then add teachers to that, and then maybe a boss, or spouse, or some influencers or leaders of some type.

Our desire for meaning and purpose may just be a generalization of this neverending need for guidance. And our desire for hope may just be a need for the reassurance we felt as children when adults took care of us no matter how much trouble we put ourselves into.

A lucky few get an opportunity to have a midlife crisis where they get to ask what's really going on and who they should now look to for guidance. And even fewer ones get to ask why and pursue that thread as far as they possibly can. I am one of these fortunate ones.

And what's even more fortunate is that we are finally at a point in our scientific and technological development where we can start to piece together some pretty good answers to these questions.

We can answer the first question, about what's going on, by looking at the tremendous amount of knowledge gathered via science and engineering.

We can answer the second question, about who we should look to for guidance, with: Reality itself. It is the ultimate adult in the room and it is continuously providing ample guidance for us if we just know how to look for it. Needless to say, this guidance comes in the form of the ubiquitous and omnipresent "SixCEED" Tendencies we have identified.

And we can answer the third question, about why we should look to the universe for guidance, with: Because there is no way around it. Even if you are completely unaware of the guidance the universe is providing, or willfully trying to ignore it, you are still a product of it and continue to be bound by it. It is a lot easier and actually more fulfilling, to go along and even ride its powerful waves to great heights.

Of course, with the approach we have taken in this book, we may not have perfect and final answers, but we have good enough answers, have sufficient reason to believe that they are more trustworthy and explainable than the alternatives, and we have ways of improving them as we learn more.

I am going to close by quoting from the Upanishads, which are some of the oldest recorded human thoughts and capture this whole endeavor perfectly:

> "ॐ असतो मा सद्गमय ।
> तमसो मा ज्योतिर्गमय ।
> मृत्योर्मा अमृतं गमय ।
> ॐ शान्तिः शान्तिः शान्तिः ॥"
>
> ——-
>
> *"Lead me from ignorance to the truth,*
> *Lead me from darkness to light,*
> *Lead me from death to immortality,*
> *Peace, peace, peace."*
>
> **— Pavamana Mantra, an Ancient Vedic chant**

Thank you for your time and attention.

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Credits:

- The striking photo of the honey bee in the "The Whole Book in 5 Minutes" chapter is by Alexas_Fotos on Unsplash.
- The cover page art consists of 3 parts:
  - In the foreground is a "Mindful Engineer" with a pen in one hand (symbolizing thinking / planning) and a spanner (symbolizing hands-on engineering). It was created using the Microsoft Copilot Image Creator and Designer.
  - The background image symbolizes the "Search for Meaning in the Living Local Universe". It was also created using the Microsoft Copilot Image Creator and Designer.
  - Further editing tweaks including adding the title / subtitle / author name was done using Microsoft PowerPoint.

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