An Ordinary World

The Role of Science in Your Search for Personal Meaning

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Preface to the Second Edition

One of my most powerful childhood memories is of watching Carl Sagan's PBS series *Cosmos*. Sagan's integrated portrayal of the multi-faceted human quest to understand the cosmos —weaving together its scientific, historical, philosophical, and artistic aspects—touched deeply my own emerging questions about the universe and my place within it. At the time I had little understanding of what it meant to be an astronomer or a physicist, but I was hooked: I wanted to spend my life investigating the universe in the manner that Sagan outlined.

Two core themes emerged from my subsequent reading and pondering of the universe. I'll explain these themes because they form the foundation for this book and really all of my scientific work.

The first is a strong impression that there is something deeply wonderful and meaningful beneath the surface of our everyday awareness. The more I learned about the vastness and subtle interconnectedness of the cosmos, the more clearly it struck me that *we humans are an integral part of this grand tapestry*, and our lives have some deep meaning as part of its context. We may never fully grasp or articulate exactly how our lives matter within this vast context, but we can sense it during moments of inspiration. For example, looking up at a dark starry sky or listening to the musical background from *Cosmos* always send shivers of wonder up my spine, a sign of my unconscious awareness that I'm connected to something grand.

The second theme is a recognition that we have an extraordinary capacity for self-deception. It is a mysterious but obvious fact that we're capable of believing things that are not true, particularly when it's in our best interest for those things to be true. Wishful thinking is a powerful force, and we must guard carefully against being drawn into believing something

just because we wish it were so. Science is important as an error-correction process, keeping us honest as we search for understanding of the cosmos and our place within it.

This book is about the apparent tension between these two forces: the desire for meaning and the desire for accuracy. For reasons I don't completely understand, it's easy to feel that a commitment to scientific accuracy requires an acceptance of the ultimate meaninglessness of human life. That impression is hard to shake partly because I'm aware of how much I *wish* my life to be meaningful. This strong desire puts me on guard, wanting to make sure I'm not carried away by wishful thinking that is contrary to the evidence. So I'm very vulnerable to interpretations of science telling us that the cold, hard facts require us to accept the meaninglessness of life.

This tension is related to the widespread belief that science is somehow dehumanizing, removing meaning and magic from the world and making it ordinary and dull. The title of this book comes from one of my early attempts to express in a poem this common impression that science turns a magical and meaningful world into an "ordinary" world:

An Ordinary Night

The sparkling of the winter moon
On the newly fallen snow
Is only a distant rock's reflection
On some frozen H-2-0.

And the stars so brightly shining
Against the moonlight glow
Are only spheres of plasma blazing.
That we certainly know.

Even the whisp'ring of the icy wind,
Which does so softly blow,
Is mostly moving nitrogen
As anyone could show.

The steam that drifts from the chimney tops
Is of course just condensing water.
But so softly it drifts before my eyes
In air so cold that it crackles and pops,
That it gives the scene a dreamy feel
Yet, somehow, makes it seem more real.

For the ingredients of this winter night
Are ordinary and plain.
But combined together exactly right
They become a magic scene.

In the following pages I investigate how to understand and reconcile the apparent tension between accuracy and meaning. I conclude that it is possible to maintain a balance between the two forces. We can guard against being seduced by wishful thinking, while also not mistakenly over-interpreting the science as telling us that no meaning is possible.

Since many people seem to share this conflicted relationship with science, I hope this attempt to articulate the problem and suggest a direction for solving it will help others as well. Please use the book as a starting point for your own explorations, and feel free to share with me any ideas and insights you discover along the way.

The approach here is intentionally very exploratory and open-ended. This book outlines a possible framework and a perspective for approaching science, rather than trying to teach any particular science or particular worldview. I'd like to leave

the way as open as possible to a variety of interpretations. Other tasks are for other books. A much more detailed survey of our modern scientific understanding of the universe can be found in my text with Craig Tyler, *Your Cosmic Context: An Introduction to Modern Cosmology*. And for readers interested in my take on what a realistic worldview might look like, given what we know about the universe so far, I'm working on a book called *Looking for Meaning in the Modern Universe*, which I hope to finish within the next year.

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Introduction

Science has had an uneasy relationship with the human desire for personal meaning and significance to our lives. Yet science and meaning are also deeply intertwined. Any honest attempt to better understand the universe and ourselves cannot ignore the remarkable success of the scientific process—we want any meaning we construct to be on solid ground. Science has worked so well that it is difficult to deny it a central role in telling us about how the world really is. Even if we don't like some of what the science tells us, because it may conflict with ideas on which we happen to base our current sense of meaning, we feel obligated to pay attention and look to it as a source of information.

Evidence that many people sense this can be seen both in our fascination with science and in our reactions against it. The widespread interest in popular science books reflects a feeling that science must be relevant to the search for meaning. But scientific accounts of even the most fundamental theories of physics have a hollowness to them that always leaves us wanting. In one sense they profess to offer the whole story. But in another, more intuitive sense, we know they can never be the whole story because they leave out what is the very stuff of life to us. Scientific descriptions of the universe seem too far removed from our experience, with nothing that brushes against the universe as we experience it in everyday life, the one in which we make choices and laugh and cry and seek a place for ourselves and our thoughts. Science provides a mental map of the universe, but it is in many ways an unfamiliar and unhelpful map, without clear connections to the concepts we operate with in our immediate experience. Most glaringly, it seems to lack a clear "you are here" marker needed to place ourselves

within the framework of the map and use it as a guide to the choices we face in life.

This situation may explain some of the vigorous resistance to scientific ideas and the popularity of views that run counter to scientific evidence, but address directly the daily concerns of life. They offer something we have a deep and real need for, which science seems not to provide.

> *We feel that even when all possible scientific questions have been answered, the problems of life remain completely untouched.*
>
> —Ludwig Wittgenstein[1]

We all operate within a framework of concepts that make sense of the world to us, which we use to formulate our goals, hopes, and dreams, and to seek ways to overcome problems and obstacles as we build our lives. Certainly the universe out there has much to say about all this, but it's hard to figure out what it says when the scientific description exists for us as a remote framework without clearly articulated connections to the concepts with which we operate in daily life. So we live in a disconnected state: abstract and evolving knowledge of the grand universe on one hand, and the immediate need for a guide to our individual choices on the other hand. How do we bring these together, so that we can guide our immediate choices from a perspective that is informed by and connected to the big picture?

These connections exist, but they are easily disguised, lost in the abstractions. In some way we remain detached from the scientific descriptions, still not quite feeling they tell us much about the essence of the world as we experience it. For sciences that describe distant places and distant times, the links can seem almost impossible to maintain. The connections must be

consciously made, the insights from science explicitly appropriated into our day-to-day awareness of who we are and how we interact with the world. We can learn to think not of the scientific universe out there, far away and long ago, but right here, where we live and experience the world. The big bang, for example, happened *here*, in the little region of space we can now hold in our hands, as well as out there in regions that are now more than ten billion light years away. We are just now receiving the glow from a condition once experienced billions of light years away, but that condition was also experienced right here, a long time ago. Bizarre properties of electrons and atoms and photons described by quantum theory can seem abstract and detached, until we realize we're talking about us, too—our atoms, the air we breathe, the sunlight which sustains us. Many of the remarkable insights from science remain disconnected from our personal worldviews which are the maps we use to guide our choices and our lives. But this need not always be the case.

I suggest that the meaning behind our individual lives, which science can help us uncover, is not to be looked for only in regimes where our current scientific understanding is stretched or incomplete—in exotic theories of the early universe, in black holes and warped spacetime and the arcane mathematics of grand unified theories. It is found, rather, in the "ordinary world"—the world in which we live every day, but which really is so full of mystery and wonder that it seems inappropriate to call it ordinary. If we can learn to live with a full awareness of our connections to the universe we are a part of, the world may never seem ordinary again.

My goal in this short book is to illustrate that the seemingly opposing aims of "personal meaning" and "consistency with science" need not be in conflict. On the contrary, the process

and insights of science can act as a valuable filter and guide to developing our sense of being part of a bigger context, within which our lives have meaning. We live our lives motivated and guided by a set of beliefs about how the world works and how we connect to it. These connections are all around us, in every action and every assumption about what is important for us to do. And science, while certainly not capable of providing all the answers, has a great deal to say about these assumptions. We just need to be aware of how to use the science, and what to look for.

My hope is that science can begin to play a much more central role in our varied individual efforts to construct an overall context for our lives. I hope we will learn to see new discoveries in basic science not as detached and esoteric curiosities, justified by the vague possibility of technological spin-offs, but as crucial steps in the process of uncovering humanity's role in the cosmos.

To help move us in that direction, I offer a point of view from which science can be seen as an important tool in your personal search for meaning in your daily life. Along the way, I also present some concrete suggestions for putting it to use for yourself.

Working Definitions

The following are not meant as formal definitions, but will provide an idea of my meaning in using these terms:

Science

> The word science refers both to a *process* for obtaining knowledge about the world, and to a *set of insights* about the world which have been built up through this process.

My working definition thus has two components:

1. Science is the process by which we invent possible explanations (theories) describing what we observe in nature, and then filter out explanations that work from those that do not work by testing (through experiment and observation) the predictions they make about what else we will observe. Two key features characterizing this approach are the important role of observation (disagreements are ultimately to be settled by experiment and observation—nature has the last word) and the search for unifying principles that attempt to connect many different phenomena with as few explanations as possible.

2. Science also refers to the body of knowledge produced by this inquiry process.

Personal worldview

The mental map by which we each view our relationship to the world, and which guides our choices and actions through the perspective it gives us on our individual role as part of the universe.

Science integration

The process by which scientific insights are incorporated into a person's personal worldview.

Meaning

A context within which our choices and actions are significant, so that what we do truly matters in some way.

This book is intended as an introduction and a gateway to your own exploration of your universe. Ongoing discussion and suggestions for putting the ideas expressed here into action in your everyday life can be found on the website of the Science Integration Institute at http://www.scienceintegration.org.

Chapter 1

Worldviews: Placing Your Actions in a Bigger Context

Summary: Our sense of what matters in our lives is grounded in a context of beliefs and assumptions about what the universe is like and how we as individuals fit into it. This context is a driving force behind most of our actions, so becoming more aware of it, and of the assumptions we make in constructing it, will have a direct and powerful effect on our everyday lives.

Our "mental models" determine not only how we make sense of the world, but how we take action.

—Peter Senge[1]

Most of the time, our awareness includes only a tiny fraction of all that's happening in the universe. We are naturally focused on the pressing concerns of our personal interactions with immediate surroundings. It's hard enough just to stay aware of the concerns of other *people* in our lives. It is even more difficult to back away and grant any tangible, direct, and immediate reality to the *overall* framework within which our individual lives are situated. Still, we are certainly aware that we're not individually responsible for our own existence. Our existence now is a result of events and processes that extend through space and time far beyond our immediate awareness; almost incomprehensibly far beyond, as modern cosmology research has enabled us to learn. Your body is like a fossil record of the entire history of the universe. The pattern of matter and energy that forms your identity as you sit there reading these words is an expression of a much vaster pattern spanning billions of years and including the entire ecosystem of Earth that nourishes and

sustains us, the nuclear reactions in the sun from which light pours out as the driving force behind all life on Earth, ancient stars whose deaths produced some of the elements that now make up our bodies, and earlier cosmic processes that created the environment in which these stars could form. What you're doing and what you're thinking right now is not just you; it is a vast web of which you form the consciously aware part.

Though we may be largely unaware of our connections to a broader perspective, a little probing of our ordinary choices and actions reveals that they are expressions of an underlying "mental map" which incorporates our beliefs and assumptions regarding this universal context. Expressed in the form of this map, these assumptions have a direct and powerful impact on how we live our lives. In fact, the shape and direction of human society is largely a collective reflection of the mental maps or personal worldviews that encapsulate what the world is like, and how we relate to it, for each of us. The pervasiveness of these personal worldviews in guiding our lives and society increases as we become more technologically advanced, more able to shape our surroundings according to our mental maps.

We have the capability now for a society in which nearly everyone could have what he or she needed.[2] Many people are currently not doing work to directly produce things that are necessary for our survival. Entertainment, news media, fashion, advertising, banking, writing, art, much of science; none of these seem essential. Thus it is clear that we as a society have a great deal of time for non-essential things. If used properly, it seems we have the power to create a nearly ideal society. This was the dream of the industrial revolution and the age of technology. It would free us from the more mundane tasks involved in staying alive, freeing us to do greater things.

But what we do with our time beyond survival is all about our worldviews.

However vaguely, we all hold ideas about where we came from, where we are going, and how our decisions interact with the external world and its rules of operation to help or hinder progress in some direction. To see concretely the power of these worldviews, we need only notice that the dominant, driving feature of our lives is the need to make choices. Life presents to us an incessant, urgent demand to choose from an overwhelming array of options. We could never act on even a tiny fraction of all the options available to us as choices. Consider right now all the things you realistically could do: You could move your left hand, or your right hand, or shake your head, or throw this book in the trash (please don't!), or quit your job, or make a donation to the Red Cross, or read a book on surgical techniques, or sign up for a class on computer repair, or get on the internet and buy just about anything you could imagine (and afford), or…well, you get the idea. All of these choices and countless more are immediately available to you, right now, and many could significantly change the course of your future life and even the future of society. It's both empowering and overwhelming to become aware of this.

From all of these possibilities, what guides you into the one you actually choose (reading on to see what I'll have to say next, I hope)? Think about some of your more significant choices. Why did you make those choices, rather than the alternatives? What framework of beliefs and assumptions were you following? What gives you a sense that it makes a real difference which choices you make, so that you sometimes agonize about what to do?

For most things in the universe, it apparently makes little sense even to ask these questions. Most structures in nature

simply do what they do, automatically and blindly following the orders that are somehow built into the fabric of space and time in which they are embedded. When an apple falls to the ground, it has no choice in the matter. We don't think to suggest that a wiser apple might have stayed on the tree a little longer until it was a bit redder and juicier. The apple doesn't feel guilty for hitting you on the head as it falls. Conscious, self-aware creatures like ourselves, on the other hand, have the unique predicament of feeling faced with choices about what to do. So our actions, rather than being guided only by the direct and automatic instructions of nature, are also guided by a mental map or worldview that *represents* the world in our minds. Strangely, we have the ability to create a wide variety of maps, independently of how things "actually" are, many of which conflict with the maps other people hold, and may even conflict with our own previous maps. And the map we hold right now may cause us to do things that are helpful or destructive to the order of things, depending on how well the story we are telling ourselves is in harmony with what's really going on in the universe around us.

> *In human affairs an idea is a greater moving force than any physical influence…So the shape of our future will depend to a large extent on our understanding of our role in the cosmic process.*
>
> —Louise B. Young[3]

We deliberate and agonize over important decisions because we believe the choices we make have significance on some basis. The foundation for the significance of our choices is some kind of overall context we are contributing to, within which it makes a real difference what we do. Of course, our immediate idea of this context may not be coherent or consistent or even

fully conscious, and it may even contradict some of the abstract facts that we know about this context. Our assumptions about it can change from moment to moment, and the immediate personal worldview within which we act may often bear little resemblance to the one we would articulate in a more thoughtful, reflective state of mind. My point for now is simply that we *do* hold in mind such a context, even if only a makeshift one that serves for the moment. However we formulate it, this personal worldview is always operating in the background, and has a profound effect on the decisions we make.

To see this effect in detail, let's take an apparently trivial example. What factors influence my decision process when I go to the store to buy a new pair of running shoes? Well, obviously I want something that is comfortable and fits my feet. I try on a few pairs of shoes, walk around in them, jog a few steps. So far I'm just dealing with a direct and tangible response to what feels good. Then there's the latest information I may have picked up from *Runner's World* about the newest shock-absorbing materials, the best design for the type of running I do, and past injuries I'd like to avoid repeating. Here I'm anticipating future consequences for how I'll feel as a result of my choice. But there's much more thinking going on beneath the surface. Maybe I look for a shoe that's made in the United States, or one that I know uses environmentally-friendly manufacturing techniques. This last preference opens up a whole new set of assumptions. How did that automatic connection between environmental awareness and righteousness form in the first place? How do I know what will hurt the environment? Why do I think resources are limited and need to be conserved? Conserved for what? What sort of long-term value is behind this simple reaction? These thoughts are only the tip of the

iceberg of what's really going on in a situation as simple as buying shoes.

So with nearly every choice, you make assumptions about the nature of the universe you live in. If you believe you should recycle materials, run a government in a certain way, reward certain actions and punish others, encourage or discourage the growth of technology, follow certain morals and goals in life, or even just buy a particular brand of shoes, the foundations of these beliefs hinge on certain assumptions about what the universe contains and how it basically works.

The automatic way in which we draw on our personal worldviews can also be seen in the familiar experience of chiding ourselves for wasting time. To be able to say with any conviction that you are "wasting time," you implicitly assume there is something more valuable you could have done, some purpose toward which your time would be better spent. These beliefs say something about your perception of the universe you are immersed in, even if you never articulate this perspective.

To further develop this idea in connection to your own life, pause to reflect on your activities of the past week. Think about your actions, the decisions you've made, the conflicts and struggles you've found yourself engaged in. This illustration works best with topics you feel most passionate about: the environment, equal rights and fairness, someone you love, a political philosophy or point of view, your career, your community. What really gets you out of bed in the morning and makes you want to face another day? What drives you to volunteer for a political campaign, or incites you to write a letter to the editor of your local newspaper? What ideas do you feel so strongly about that you'll argue them vigorously with others, despite the emotional strain this kind of conflict often entails?

As you continue to probe these questions, once again you'll come up against a complex set of assumptions and beliefs about what is important and what makes the universe tick. For example, suppose you think watching television is wasting our time and harming our society. This belief may cause you to devote time to educating people about the dangers of television, or maybe to avoid owning a television yourself, or simply to make an occasional comment about all the garbage on TV. But to presume that watching television is a negative influence, and to believe it is worth fighting against in any way, is also to hold assumptions about what is important fundamentally, that we would more appropriately spend our time on. Without such a background of beliefs, your argument ultimately runs out of steam, as purely a matter of personal preference, of no greater import than if, for example, you happen to like apple pie while I prefer cherry pie.

Similarly, if you believe that natural products are better than artificial ones (or vice versa), you must have some set of beliefs about what is basically going on in the universe that makes one more valuable than the other. What properties of natural products are different from the properties of artificial substances? What beliefs about the order and harmony of nature, and the extent to which it is appropriate for humankind to fiddle with this order, are behind your preference?

Try continuing this thought process with several important beliefs you hold. Ask of everything that you feel inclined to do: "What does it say about what I think is important, that I want to do that? Why do I think certain actions will produce the result that I want? What core assumptions are behind my choice of friends, career, where I live, what political party I support, what products I buy, what charities I contribute to?" Ask what beliefs or assumptions about the universe are necessary in or-

der for you to have a solid grounding for any particularly strong opinions you hold. In some cases these core assumptions are well thought out and consciously made. In other cases, it can be very enlightening to make these assumptions visible to inspection and consideration for the first time.

The most fundamental conflicts we encounter with other people can often be understood in a clearer light by considering them as conflicting personal worldviews. When you fundamentally disagree with someone, it means that as they see the world at the moment, your purpose runs counter to theirs. Political and religious disagreements, for example, are so heated because they are deeply rooted in personal worldviews. The stakes are high, because the other person's point of view works against your most deeply valued objectives. It's not simply personal taste you're arguing about. You're disagreeing over the fundamental nature of the universe and what ultimately matters, how your life gets meaning in a broader context. Your own internal conflicts on such matters similarly reflect the high stakes involved.

The point here is not to decide whether you are right or wrong for believing in the ideas and causes you support. I'm only suggesting that you can benefit from *recognizing* the vast web of beliefs and the assumptions that lie behind them. This recognition opens the way for thinking about how you can best gain information about the world and your place in it, and how this information is incorporated into the perspective from which you make your everyday choices.

Your beliefs, whatever they are and wherever they originated, are based on some kind of information about the world. You have been collecting ideas and insights all your life (and much longer than that, if you consider the preferences and impulses built into your genetic code), to construct your current

personal worldview; your version of how to put that information together in a meaningful way. As you gain new information, new insights, your perspective can change and evolve. In the next chapter, I'll be suggesting that we could benefit from using some of the tools and insights of science as part of this process that we're always engaged in. We have learned some incredible things about the context within which we live our lives, and our worldviews suffer from a limitation of perspective if they are formulated without an awareness of some of these insights. For now, I just want to point out and establish clearly that we are all involved in this process, constructing an operational "meaning of life" for ourselves, whatever tools we use to do so. We all live as if there is some background purpose behind our actions, but we rarely articulate our sense of this purpose and try to critique and clarify it.

Operationally, the web of beliefs that make up your personal worldview is the meaning of life for you, at this moment. I mention this because the systematic pursuit of the meaning of life is often joked about as a waste of time, an unanswerable question. It's a detached, philosophical question that one thinks about every once in awhile, if at all. But in a very real sense we *always* have an answer to this supposedly "unanswerable" question. We could not hold an opinion or make the decisions we make every day, without reference to at least a makeshift, temporary, and perhaps unconscious idea of what matters, what fundamental purpose we are working toward. Our motivation, sense of direction, and will to keep moving through life come in one way or another from the personal worldview that is our mental map of our world at the moment. And since we live within the context of our current personal worldview, anything that changes it will have a profound impact on our lives and on our society.

Given this, it seems that we would each benefit from becoming more conscious of the elements of our personal worldview, and from making a systematic effort to expand and to refine it. We know that our picture of the world is incomplete and that we can hold mistaken beliefs. We learn, discover mistakes in previous ways of thinking, change our minds all the time. Improving the accuracy and scope of our personal worldviews could thus directly affect the clarity and fulfillment of our individual sense of purpose. There are many possible ways to do this, but we first must be fully aware that we have personal worldviews, and then give some thought to the inputs that shape them. Later we'll look in more detail at the role science might have to play in this process.

The first exercise at the end of this chapter will help prepare the way for this, by continuing the process of making you more aware of your current personal worldview. It is intended to help you orient yourself within the universe *as you currently perceive it*. This will give you a starting point as you continue through the book, and will make your thoughts more conscious, for you to consider in the next chapter.

Reflection and Discussion

• **Describing Your Universe** – This activity is intended to make you more conscious of your own current beliefs about how the universe is set up, what properties of it are important, and how you fit into your own vision of its framework. This will help you to focus your thinking as you read the rest of the book, to be on the lookout for connections that are most meaningful to you.

> *Describe, as carefully and clearly as you can, what you think are the essential properties and features of the universe you live in,*

and what you see as your role in this universe.

It's best if you simply describe whatever comes to mind as important, but here are some possibilities to consider if you are stuck on what to start writing about: Imagine what you would see if you closed your eyes and floated out away from Earth. What would you see as you moved farther and farther away? How big is your universe? Does it have an edge somewhere? How is it arranged? (For example, are things spread uniformly throughout, or are some parts of your universe very different from others?) What guides the processes that happen within it, and makes them occur as they do? Has it existed forever, or if not, how old is it? Are there other planets around other stars? Are there other creatures besides those on Earth? What are the most important laws that control what happens in your universe? How do humans fit into the scheme of things? Are we important or not important? Do we have a specific role to play?

The idea is simply to spell out your own personal worldview in a concrete form that you can refer to. Have fun and see what you can discover!

• Consider whether the following passage seems true of your own life:

> *Man's main concern is not to gain pleasure or to avoid pain but rather to see a meaning in his life.*
>
> ——Viktor Frankl[4]