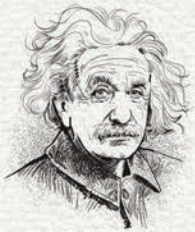
"An answer for those who wonder,
What is the value of religion in a modern scientific world?"

DR. DEBORAH HAARSMA, ASTROPHYSICIST AND PRESIDENT OF BIOLOGOS

ALISTER
McGRATH

a theory of everything (that matters)



A BRIEF GUIDE TO EINSTEIN,
RELATIVITY & HIS SURPRISING
THOUGHTS ON GOD

Praise for
A Theory of Everything (That Matters)

This brief book provides an answer to those who wonder, What is the value of religion in a modern scientific world? McGrath gives an accessible introduction to Einstein's science, then reflects on how the great physicist synthesized politics, ethics, science, and religion in his view of the world. Einstein felt that, while science can help us achieve our moral goals, science alone cannot create those moral goals or the means to instill them in society. McGrath shows that we need both religion and science to best engage the mysteries of the world and everything that matters.

DEBORAH HAARSMA
Astrophysicist and president of BioLogos

Albert Einstein was, without doubt, the most iconic scientist of the last century. In this lucid little book, Alister McGrath provides an accessible introduction to Einstein's great scientific discoveries, as well as a careful analysis of his views on the relationship between science and religion. Einstein was a nuanced thinker on the big questions of life, and who better

than McGrath to guide us on an exploration of this aspect of Einstein's legacy? I recommend this book to anyone who wants a fuller picture of Albert Einstein's life and thought.

ARD LOUIS
Professor of theoretical physics, University of Oxford

a theory of everything
(that matters)

ALISTER
McGRATH

a theory of everything (that matters)

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A Theory of Everything (That Matters): A Brief Guide to Einstein, Relativity, and His Surprising Thoughts on God

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contents

INTRODUCTION Albert Einstein:
The World's Favorite Genius . . . . . *ix*

CHAPTER 1 Approaching Einstein:
The Wonder of Nature *1*

PART 1 A Revolution in Science

CHAPTER 2 The Old World:
Newton's Clockwork Universe *17*

CHAPTER 3 A Scientific Revolutionary:
Einstein's Four Papers of 1905 . . . . . *35*

CHAPTER 4 The Theory of General Relativity:
Final Formulation and Confirmation . . . *79*

PART 2 A Theory of Everything (That Matters)

CHAPTER 5 Einstein and the Bigger Picture:
Weaving Things Together *115*

CHAPTER 6 A "Firm Belief in a Superior Mind":
Einstein on Religion *139*

CHAPTER 7 God and a Scientific Universe: Towards a Christian Reading of Einstein *167*

Notes *189*

Works Consulted. *201*

About the Author *217*

introduction

ALBERT EINSTEIN: THE WORLD'S FAVORITE GENIUS

ALBERT EINSTEIN REMAINS the world's favorite genius, propelled to fame by popular adulation of his revolutionary scientific theories about space and time. Today, a century after the confirmation of his theory of general relativity in November 1919, Einstein remains a cult figure. He has appeared on the cover of *Time* magazine no fewer than six times and was lionized as its Person of the Century in 1999. His equation $E = mc^2$ has become the best-known scientific formula of all time and has regularly—along with Einstein's trademark hairstyle—found its way onto T-shirts and billboards.

Photographers loved Einstein. One of the best-known photos of him is Arthur Sasse's shot of Einstein sticking out his tongue. This iconic photograph was taken right at the end of his birthday party in 1951 at Princeton, as a weary Einstein entered his chauffeured automobile to be driven home. Sasse, who had been

covering the event, ran up to the open door and asked Einstein for one final shot. Einstein turned toward him and stuck out his tongue just as Sasse's flashbulb went off. Einstein liked the resulting photo so much that he used it for greeting cards he sent to his friends.

Einstein's ideas have changed the way we think and live. Without realizing it, we depend on his theory of relativity when using a Global Positioning System (GPS). The light and warmth of the sun are the direct result of the conversion of mass to energy—the process Einstein first recognized in 1905 and expressed in his equation $E = mc^2$. This same principle lies behind nuclear power generators—and atomic bombs. Einstein triggered America's race to build the atomic bomb in 1939 with a letter to President Franklin D. Roosevelt, warning him that Nazi Germany would get there first unless the United States committed itself to developing the necessary technology. (A copy of this typewritten letter was sold at Christie's in New York for $2.1 million in 2008.)

The immense esteem in which Einstein was held by the academic and popular-science community meant that when he talked about larger questions, people were prepared to listen. When his theory of general relativity was triumphantly confirmed in November 1919, he became a media sensation. His 1921 tour of America was front-page news.

Yet Einstein did not simply speak about science. He opened up grander issues of human value and meaning—what the philosopher Karl Popper later called "ultimate questions." People listened to Einstein with attentiveness and respect. He became a celebrity genius, an intellect of colossal status, who managed to achieve iconic cultural status without dumbing down what he said.

Einstein doesn't fit the stuffy stereotype of a scientific genius. On a visit to California, he struck up a surprising friendship with the movie star Charlie Chaplin. Chaplin invited Einstein to attend the premiere of his 1931 movie *City Lights*. The huge crowd went wild as Einstein and Chaplin arrived together. According to a popular legend, Chaplin told Einstein, "They're cheering you because nobody understands you, and me because everybody understands me." Although Einstein was awarded the 1921 Nobel Prize in Physics, his greatest achievement was arguably to become admired, even adored, by the wider public. Many sensed that although Einstein was difficult to understand, he had grasped something profound about our universe that others had failed to find. He was worth listening to—even if doing so was difficult and demanding.

This short book sets out to explain in simple and accessible terms Einstein's revolutionary scientific ideas,

which still shape our world today, and to explore their significance. Nobody thinks a scientific genius is infallible. Still, Einstein's status means he is profoundly worth listening to, especially when thinking about how we make sense of our universe.

Yet this book goes further—as, I believe, Einstein would wish us to do. It takes seriously Einstein's fascination with a "big picture" of our world and ourselves. It considers how Einstein personally wove together science, ethics, and religious faith to yield a richer account of reality—if you like, a theory of everything *that matters*. So how did he do this? What were the outcomes? What remains valuable for us today? Lots of people have written about Einstein's wider vision of life, stimulating and informing our discussion. So why not make Einstein our dialogue partner? After all, he was a genius.

Finally, a word of caution. Many sayings attributed to Einstein have no connection with him whatsoever. Here's one that is regularly attributed to Einstein, which I first came across on a T-shirt at an American university: "Not everything that can be counted counts, and not everything that counts can be counted." It's a great idea—but it's not Einstein's. Throughout this book, I have tried to ensure reliable citation of Einstein's works. Here's an authentic quote that sets up the agenda

of this book: "Science can only ascertain what *is*, but not what *should be*."[1] Einstein here invites us to explore how to hold science and moral thinking together and sets out his own way of doing this. Science, ethics, and religion are quite different undertakings, playing distinct roles in our lives and based on different thought patterns. How then can we weave their unique perspectives together into a coherent whole? It's a genuine issue, and Einstein helps us to think about this.

Although this book explores Einstein's scientific ideas, its real focus is how he attempted to develop a coherent view of the world—a "grand theory of everything" that embraces both our understanding of how the world *functions* and the deeper question of what it *means*. Einstein wasn't just a great scientist; he was a reflective human being who realized the importance of holding together our key ideas and beliefs. His reflections on how to develop such a "big picture" of our world and ourselves might help us move beyond the fragmentation of ideas and values that has become such a core feature of Western culture.

But enough has been said by way of introduction. It's time to engage with Einstein himself.

chapter 1

APPROACHING EINSTEIN: THE WONDER OF NATURE

SCIENCE RARELY MAKES the headlines in British newspapers. But in 1919, a year after the end of the Great War, that changed decisively. On Friday, November 7, the London *Times* printed a headline above a report on a dramatic new development: "Revolution in Science. New Theory of the Universe. Newtonian Ideas Overthrown." Like much scientific journalism, this headline was sensationalist,[1] suggesting that, just as in the then-recent political and social revolutions in China in 1911 and Russia in 1917, an old order had been swept away. Sir Isaac Newton—widely regarded as the greatest British scientist—had been dethroned, his ideas now discredited, lying in tatters. And who was the

cause of this revolution in science? An obscure German physicist, hitherto unknown to the readership of the *Times*—Albert Einstein.

The *Times* headline propelled Einstein to international celebrity. It was an extraordinary moment. Britain and Germany had only just emerged from the most destructive and traumatic total war yet known, which had created distrust and hatred between the two nations on an unprecedented scale. Yet almost exactly one year after the end of the First World War, Britain's scientific elite had embraced Einstein, a German national and former enemy, in the common human search for an understanding of our universe. It seemed to be a symbol of hope in the bleak postwar era. Might international scientific cooperation hold the key to new understandings of our world and ourselves? Einstein found himself propelled into the limelight. A disillusioned and restless postwar generation seized on him as someone who could finally make sense of our perplexing world and our place within it.

By the early 1920s, Einstein had become a cult figure, an international icon of genius, helped to no small extent by the award of the 1921 Nobel Prize in Physics—and perhaps also by his distinctive appearance. Einstein made fuzzy hair a hallmark of intelligence. (At a Hollywood dinner party in the winter

of 1931–32, the movie actress Marion Davies ruffled Einstein's notoriously unruly hair and quipped, "Why don't you get your hair cut?") And everyone knew the equation $E = mc^2$, even if they didn't quite grasp what it meant. Einstein became hugely popular with the American press corps and gained an avid—and growing—popular readership. In 1930, security staff at New York's American Museum of Natural History had to deal with a near riot when four thousand people tried to see a film offering to "demystify" Einstein's ideas.[2] In 1929, Sir Arthur Eddington—who was instrumental in confirming Einstein's theory of general relativity a decade earlier—gleefully wrote to Einstein, telling him that one of London's busiest shopping streets had been brought to a near standstill. Why? Because Selfridges, London's most prestigious department store, had displayed the text of one of Einstein's recent scientific papers in its windows, and Oxford Street was jam-packed with people trying to read it.[3] Eddington himself went on to write what remains one of the most perceptive explanations of relativity,[4] offering a clear and reliable account of the scientific significance of these radical new ideas.

Einstein's influence continues to this day. In 2016, a team of scientists reported they had recorded two black holes colliding. This sound of a "fleeting chirp"

from over a billion light-years away fulfilled the last prediction of Einstein's general theory of relativity.[5] Everything points to Einstein's scientific theories being here to stay and profoundly affecting the thinking of the next generation.

But beyond his scientific discoveries, what I have come to find really interesting is Einstein's *spiritual* significance. I write this book as someone who both encountered Einstein's ideas and discovered the intellectual and spiritual riches of the Christian faith at Oxford University. Although I will be aiming to give as reliable and accessible an account of Einstein's views on science as possible, I will also explore his ideas on religion and how he weaves these together. Yet perhaps more importantly, from my own personal perspective, I will also consider how his approach can be used by someone who, like me, wants to hold science and faith together, respecting their distinct identities yet finding a way of allowing them to enrich each other. My views are not the same as Einstein's, yet he has been an important influence in helping me navigate my way towards what I consider a workable and meaningful account of how this strange universe works and what it—and we—might mean. Einstein opens the way to trying to develop a theory of everything that matters.

I fell in love with science at about the age of ten.

My great-uncle, who was head of pathology at one of Ireland's leading teaching hospitals, gave me his old brass microscope when he retired. It turned out to be the gateway to a new world. I happily explored the small plants and cells I found in pond water through its lens. Then, having read some books about astronomy, I built myself a little telescope. On a cold, crisp winter's evening long ago, I turned it to look at the Milky Way and was overwhelmed by the number of stars I could now see. I was hooked and developed a love of nature that remains with me to this day. Einstein spoke of a sense of "rapturous amazement" at the beauty of nature.[6] I had not read Einstein at that stage, but I would have recognized what he was talking about immediately.

My first encounter with Einstein's scientific ideas dates from about 1966. In my enthusiasm to study science, I eagerly tried to absorb scientific works that I now realize were far too advanced for me. At the age of thirteen I plucked up the courage to ask one of my teachers to explain Einstein's theory of relativity to me. He loaned me one of his books to read. As I tried to take in Einstein's thought experiment about riding beams of light—to which we shall return later—I found myself struggling to grasp the points he was making. I realized that my mind needed to expand before I could make sense of Einstein. My problem as

a thirteen-year-old was that I ended up reducing reality to what I could then cope with.

Happily, I was able to study Einstein in greater depth when I went to Oxford University in 1971 to study chemistry. The Oxford chemistry curriculum required students to specialize in one of a number of advanced subjects in our first year. I decided to focus on quantum theory, a field in which Einstein had made groundbreaking theoretical contributions while also asking some awkward questions. It was intellectually exhilarating. The lectures and seminars I attended opened my eyes to new ways of seeing our world. My research interests subsequently shifted to the biological sciences (my first Oxford doctorate was in molecular biophysics), yet I never lost interest in Einstein, whom I gradually came to see as a scientist whose interests extended beyond the natural sciences to embrace the fields of ethics, politics, and religion. As we shall see, Einstein is a role model for anyone trying to develop a "big picture" of reality that holds together multiple aspects of meaningful human existence.

Although I had no interest in religion as a younger person, seeing the natural sciences as the enemies of what I regarded as irrational superstition, I reconsidered this position during my first year at Oxford. I was aware that science had a wonderful capacity to explain

the complexity of our universe—something Einstein explored in a series of groundbreaking scientific articles published during his *annus mirabilis* ("wonderful year") of 1905, to which we shall return later. Yet although I was thrilled at science's capacity to explain how things worked, it did not seem to be able to address deeper human longings and questions about meaning and purpose.

Many philosophers have explored this important point. Karl Popper, the great philosopher of science, spoke of "ultimate questions" dealing with value and meaning. These are important questions, affecting the lives of most human beings. Yet science cannot, by using its legitimate methods, provide answers to them. The Spanish philosopher José Ortega y Gasset puts his finger on the issue neatly: "Scientific truth is exact, but it is incomplete."[7] If we want to have a "big picture" of life, we are going to have to find some way of bringing together—and holding together—questions about how things *work* and what they *mean*.

Science has an important role to play in helping each of us construct our personal "big picture" or worldview. It can fill in part of that picture—but *only* part. As Einstein himself made clear, the sciences have their limits. They are not equipped to answer questions of value or meaning, and they are not *meant* to. If we are

to make sense of our complex world, we need to use several ways of depicting it to help us appreciate its various aspects or components. Taken on their own, these aspects are like brushstrokes on a canvas. Yet when they are put together, they disclose a picture.

As a teenager, I assumed that my love for science required me to be an atheist. After all, science and religion were meant to be at war with each other—at least, according to the popular atheist tracts I had read. Yet it soon became clear to me that my teenage atheism was not adequately grounded in the evidence. It was a mere opinion on my part, which I had mistakenly assumed was a necessary outcome of reason and science. There were other options available. If I might borrow some words from the novelist Salman Rushdie, I discovered that "the idea of God" is both "a repository for our awe-struck wonderment at life and an answer to the great questions of existence."[8]

Yet perhaps more importantly, I began to realize that Christianity, which I had dismissed as an outdated moral system with at best tenuous intellectual foundations, offered a way of seeing things—a "big picture"—that seemed to bring everything into a gratifyingly sharp focus. In developing my personal understanding of how science and faith could be held together in a productive and constructive manner, I found myself drawn to the

approach of Charles A. Coulson, Oxford University's first professor of theoretical chemistry, who saw science and religious faith as offering complementary perspectives on our world.[9] Coulson set out what I found to be a deeply satisfying vision of reality that offered insights into the scientific process and its successes. At the same time he proposed a greater vision that allowed engagement with questions that were raised by science yet which lay beyond its capacity to answer.

I was interested to note that Coulson regularly cited Einstein in his exploration of the relation of science and faith. It was easy to see what Coulson had found in Einstein—a serious, reflective, and generous thinker, who sought to hold together what the philosopher John Dewey described as our "thoughts about the world" and our thoughts about "value and purpose."[10] Although my work at Oxford had focused on Einstein and quantum theory, it was not difficult to extend it to his other ideas. It is understandable that so many have focused on Einstein's scientific works. Yet Einstein was a remarkable human being, who tried to hold together his science, ethics, and religion in a coherent and meaningful way.

This book aims to explore these multiple aspects of Einstein's life and reflect on how he integrated them into a whole—a theory of everything that really matters. Einstein was an outstanding scientist who epitomized

genius. Yet he was also a reflective human being who found himself caught up in the rise of Nazism in Germany and dragged into political and social debates that were not of his own making and not to his liking. The rise of Nazism seems to have caused Einstein to give careful thought to deeper issues of human meaning and values, which he believed might well be enriched by science but were nevertheless not disclosed or established by science.

As we shall see, one of Einstein's core ideas is that science is able to engage only part of our world. Physics is able to achieve a precise and accurate account of some aspects of our universe. Yet so much that is important cannot be expressed or formulated in this way. "How small a part of nature can thus be comprehended and expressed in an exact formulation, while all that is subtle and complex has to be excluded."[11] So much of what really matters to human beings seems to lie beyond the scope of the scientific method.

In this short work, I try to give a reliable account of both Einstein's scientific breakthroughs and his wider quest for a unified theory of everything. I do my best to explain his scientific breakthroughs as simply as possible, while referring readers to more advanced studies if they wish to consider these ideas further. Some readers may be surprised to find Einstein's religious views taken

seriously, not least because they are so often dismissed and misunderstood. Yet they were an integral aspect of Einstein's identity, and he repeatedly emphasized the importance of holding science and religion together. Whether we agree with Einstein or not on these matters, he merits a respectful hearing on these points. Not only is he interesting; he also helps us work out how we can develop our own frameworks of meaning.

Einstein was a complex and nuanced thinker, making him vulnerable to ideologues who want to shoehorn his ideas into their own ways of thinking. Perhaps the most ridiculous of these distortions is the suggestion that Einstein's theory of relativity provides scientific justification for rejecting moral absolutes and adopting relativism.[12] Sadly, this remains an influential—yet quite mistaken—interpretation of Einstein. Many novelists of the 1920s mistakenly saw Einstein as confirming their moral relativism and weird ideas about time travel. Virginia Woolf, a leading member of London's smart Bloomsbury Group, concluded that, if Einstein was right, "we shall be able to foretell our own lives."[13]

Yet these popular misunderstandings of Einstein must not be allowed to prejudice his scientific achievement, nor do they invalidate informed attempts to open up deeper questions of meaning and value through engaging with him. Let's be clear about this from the

outset: Einstein's theory of relativity does not endorse *relativism* but affirms a regular universe governed by laws. "My God created laws. . . . His universe is not ruled by wishful thinking but by immutable laws."[14] In a letter of 1921, noting some cultural misunderstandings of the scientific term *relativity*, Einstein suggested his approach was better described as a "Theory of Invariance" rather than a "Theory of Relativity."[15] We'll come back to this point later.

Einstein has also been conscripted by some propagandists as a mascot for their scientific atheism. Richard Dawkins's populist manifesto *The God Delusion* (2006) presents Einstein as a closet atheist who was "repeatedly indignant at the suggestion he was a theist."[16] Dawkins does not substantiate this incorrect assertion, offering instead a rather selective reading of some quotes from Einstein drawn from a secondary source.[17] What *really* annoyed Einstein, according to his own writings—which merit reading in their totality, rather than in selective snippets—was the repeated suggestion that he was an *atheist*, or being quoted by certain kinds of atheist writers as if he shared their views, particularly those he termed "fanatical atheists" with a "grudge against" traditional religion.[18]

It is easy to see how a hasty or superficial reading of Einstein—or an unwise dependence on secondary

sources about Einstein—could lead someone to the view that he was an atheist. Einstein made it clear that he did not believe in a "personal God." Atheist apologists regularly interpret this to mean that he did not believe in God at all, overlooking Einstein's statements to the contrary. As Max Jammer, a personal friend of Einstein and professor of physics at Bar-Ilan University in Israel, points out in the most thorough and reliable examination of Einstein's religious views to date, Einstein "never considered his denial of a *personal God* as a denial of *God*" and was puzzled why anyone would even make this suggestion.[19] Einstein's ideas about God and religion don't fit our regular categories, and we need to listen to what he himself had to say about them, rather than forcing him into predetermined categories through selective quotation.

Yet before we begin to look at Einstein's careful calibration of the relation of science and religious faith, we need to consider his scientific theories and the difference that they have made to the way in which we—or at least, those in the know—think about our world. Since Einstein is so often said to have "overthrown" the views of Isaac Newton, it makes sense to begin our assessment of Einstein's significance by considering Newton's approach—often, though not entirely accurately, described as a "mechanical universe."