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When I was a young man, I feel in love with a book called “The Hitchhiker’s Guide to the Galaxy” by Douglas Adams. Actually, on reflection, it was a crush, not true love. It’s a very funny book about a very ordinary man, Arthur Dent, who survives the destruction of our planet and journeys around the universe, eventually discovering that there is no meaning or purpose to anything; chaos is ubiquitous, truth is a fallacy, and nothing matters. I don’t know how that sounds to you but, to a 20-year-old student with a placid exterior but a rebellious core, it was food for the soul!

A few years after Douglas Adams died, the Apple computer company picked up the theme, running a successful ad campaign for their iPod Shuffle music player, with the by-line “Life is Random”. The logic (if it can be called that) was that, since life is random, we might as well listen to our tunes in random order. But, by then, the theme no longer resonated with me and, besides, the idea of listening to the movements of Beethoven’s Fifth in random order had no appeal at all. A scrambled egg is fine but a scrambled symphony — or a scrambled set of driving instructions from Google Maps — is not going to end well.

For the past 35 years, I have been a quantum chemist. You may not have met many of us — and, after this lecture, you may be pleased about that — so let me tell you what we do. Our goal is to use the mathematical equations of quantum mechanics (which were uncovered by some brilliant physicists nearly 100 years ago) to predict how chemicals will react with one another. I’m sure that many of you studied chemistry at school and, sadly, some of you are still recovering from the trauma. One of the more common complaints of chemistry students is that there are so many reactions to remember and it all seems so random. But, I’m delighted to report, that is no longer the case!

The equations of quantum mechanics are very complicated but we can solve them using fast computers and, these days, we can predict chemistry from first principles. This helps to narrow the search for new materials which will make the next generation of solar cells, or polymers to improve our desalination plants, or drugs to attack a coronavirus, and so on. It’s seriously exciting stuff and my research group at the University of Sydney is part of an international collaboration called Q-Chem, which creates software to solve those complicated equations. So, Apple was wrong. Life isn’t random. Once you start digging, you find that there is a wonderful, predictable order behind it all. And we make the most of that order, producing software which is used by tens of thousands of scientists around the world. And, I should probably add, it runs very nicely on Apple computers!

The Hitchhiker’s Guide is hilarious. Its humour is deeply rooted in the fantastical, the absurd, the counterfactual. Like a Monty Python sketch about a dead parrot, or a Ricky Gervais monologue about — almost anything — it makes us laugh because we know that it’s silly nonsense. They offer a view of the world which is deliberately and artfully distorted for comic effect. We laugh partly because we are relieved that we are not there. We watch from the security of a sofa and, often, with a liberal dose of Schadenfreude. In fact, they are modern versions of the medieval Morality Play. But, despite being a fun way to unwind at the end of a long day, galactic hitchhikers, dead parrots and dysfunctional offices in Slough do not seek to provide a satisfying worldview. They are entertaining diversions.

So, where does one find a satisfying worldview? Well, let me kick things off by asserting that it is a truth, universally acknowledged, that human beings crave certainty. It's a remarkably consistent feature of our personalities, irrespective of whether we come from the left or the right, whether we're young or old, rich or poor, Christian, atheist or prefer not to answer. We seem to be wired to hunger for a solid framework of connected facts. Spend some time with small children and you will grow weary of the number of "Why" questions with which they pepper you. But why do they ask why? Because they know instinctively that things happen for a reason and their little brains work assiduously to organise their growing collection of observations into a coherent picture of the world. Albert Einstein mused that the most incomprehensible thing about the universe is that it is comprehensible. But, to our children, that's simply how things must be. To them, it's incomprehensible that the universe could be incomprehensible.

Certainty about our world brings comfort and reassurance and the evidence of our enthusiasm for facts-to-live-by is not hard to find. Many of us devote a significant fraction of our waking hours to listening to, and reading about, news events from around the world. What's the latest on the bushfires? The election? The pandemic? The race for the vaccine? The Kardashian fragrance collection? Others wouldn't consider leaving home without first checking the weather forecast. Or their Facebook feeds. Or their horoscopes. We feel ready to face the world only when we are armed with the facts. Or, at least, what we firmly believe to be the facts.

From cradle to grave, humans reach for a truth-framework to make sense of their surroundings. If I compete in a 100-metre sprint and lose, I will use my truth-framework to make sense of that disaster.

Perhaps I will say that the winner was naturally gifted.
Perhaps I will say that I didn't train hard enough.
Perhaps I will say that the race was rigged.

But, whatever my rationalisation, I will be using my truth-framework to make sense of events. And, as we age, our brains modify and refine our truth-frameworks, as we seek gradually to perfect them.

But, hold on a moment! Perfect? Really? Can we ever hope to grasp the truth in all its fulness. More than 2000 years ago, the Greek skeptical philosophers steadfastly maintained that ultimate truth is unachievable. Were they wrong? And, for twenty centuries since, many of the world's deepest thinkers came to the same conclusion: perfect knowledge and understanding lie forever beyond the horizon, beckoning but unreachable. And, during last century, Kurt Gödel proved the stunning Incompleteness Theorems, Alan Turing produced his famous proof that the Halting Problem is unsolvable, and Werner Heisenberg unleashed the Uncertainty Principle. What are we to make of this long and eminent line of philosophers, mathematicians and scientists? Were they all wrong?

No, absolutely not. I am confident that those ancient philosophers, along with Gödel, Turing and Heisenberg were correct. To quote the 20th-century philosopher Clint Eastwood, "A man's got to know his limitations." We are finite mortals and we should not expect to be able to fathom the unfathomable depths of ultimate truth. But — and this is important — recognising our limitations should never, ever stop us from trying. If Ultimate Truth lies beyond the horizon, there is only one reasonable direction in which to walk: towards the horizon!

Some of the more antiquated among you may have heard of Vince Lombardi. He was one of the greatest coaches in the history of American football — some say the greatest — and he is known for a number of motivational aphorisms. One of them is this: "Perfection is not attainable. But if we chase perfection, we can catch excellence." Lombardi was speaking of football but the assertion has broad application and is helpful as we think about the search for knowledge and truth.

Now, beware! Sometimes our hunger for certainty can lead us astray. Nature abhors a vacuum, and our minds inherit that abhorrence. If I observe something in my world, it is easy to be tempted to embrace an explanation, even when there is no real substance behind it. Did you know that, in 1999, the prestigious journal "Nature" published an article which showed that young children who sleep with the light on are more likely to become short-sighted later in life? The authors of the article concluded that sleeping with the light on causes myopia and this received a lot of coverage in the popular media. But, as a later, more careful, study revealed, it turns out that parents with myopia are more likely to have kids with myopia, and parents with myopia are also more likely to leave a light on in their kid's bedroom.

There is an important lesson for us in this. As we walk toward the horizon, knowing that truth is elusive but reaching for it anyway, our quest must be characterised by humility. The truth-seeker should always be hungry for more illumination, eager to share and willing to be corrected by others along the way, and never puffed up or dismissive. Many of the greatest insights in history have come from wrestling, sincerely, with the foreign and the unfamiliar.

Although they are united in their confident belief that truths exist and certainty is worth pursuing, Truth-seekers come in many shapes and sizes. I belong to a particular group of truth-seekers known as scientists and I want to spend a few minutes telling you what Science is and what it isn't. I feel that I need to do this because, in recent times, science and scientists have received some bad press and I suspect that the general public may harbour mixed feelings about us. So, a bit of history…

About 500 years ago, give or take, a revolution in thought swept across academic Europe. Although there had been murmurings long before — in some of the ancient Greek, Chinese, Indian and Islamic schools — the birth of modern science in late 16th-century Europe was a full-blooded roar which has continued to the present day. One of the architects of the revolution, a man who is often credited with developing the scientific method, was Francis Bacon, who was also the Attorney General and Lord Chancellor of England during the reign of James the First.

Bacon was a devout Anglican and a prolific writer and, in one of his most famous passages, he wrote, “God has, in fact, written two books, not just one. Of course, we are all familiar with the first book he wrote, namely Scripture. But he has written a second book called creation.” Bacon saw a universe which is well-ordered and rational, a universe which was designed and sustained by a transcendent Creator and which, by patient enquiry, a human can seek to understand. To him, it was not incomprehensible that we should be able to comprehend it; it was a consequence of a rational God’s sovereign decision to make humans in His own image.

Bacon proposed that we can improve our understanding of the truths in our universe by a multi-step process: ask a question, make a hypothesis, predict the logical consequences of the hypothesis, test whether or not that prediction is supported by empirical observations, and draw conclusions from the results of that test. (The “Scientific Method”.)

The outrageous proposition that the universe could be subjected to this kind of scrutiny — that we can peer into the mind of God by examining the fabric of His creation — was one of the greatest paradigm shifts ever and created entirely new ways of thinking about life, the universe and everything. In the early days, they were called “natural philosophers”; today they are called “scientists”. But the goal remains the same: the systematic study of what normally happens in the natural world.

So, are scientists modern-day magicians, who pass mystic knowledge from professor to student via secret handshakes and esoteric rituals? It sounds intriguing but, no. As Isaac Newton wrote in the early 18th century, ”If I have ever made any valuable discoveries, it has been owing more to patient observation than to any other reason.” And, as Einstein asserted, 200 years later, “The whole of science is nothing more than a refinement of everyday thinking”.

Now, having accentuated the positive, it is incumbent upon me also to point out the negative effects of external influence on scientists. I live inside the system and so I could be wrong but I suspect that the public is not aware of the pressures that many scientists face these days. When applying for a job as a scientific researcher, or for promotion within a scientific organisation, one needs ideally to show that one has performed a large amount of work in a short time. But, it’s fair to question assessment criteria which prioritise quantity over quality. Honda produces about 5,000,000 cars each year; Ferrari produces about 8,400. Which would you rather have? (By the way, I have a Honda.) The point is simple: if we downplay the importance of truth-seeking in the scientific enterprise, choosing instead to reward some other aspect of the business, we cannot expect that the quality of the science will remain universally high.

And, while I’m in a cautionary frame of mind, I should also mention the dangers of bias and dishonesty in the scientific enterprise. Einstein wrote that “Science can only be created by those who are thoroughly imbued with the aspiration towards truth and understanding” and, in my opinion, that sentence should feature prominently in the mantra of every university. If we scientists find ourselves imbued with something else — a hunger for fame and fortune, a love of money, messy conflicts of interest, or stubborn prejudices — we will not be able to do good science.

Michael Faraday, another giant of the scientific pantheon, and the discoverer of the principles behind electromagnetic induction, wrote, “Nature is our kindest friend and best critic in experimental science if only we allow her intimations to fall unbiased on our minds”. Sadly, not all scientists are disciples of Faraday. Some are hopelessly biased, filtering their results through the distorting lens of their preconceived ideas. Others are downright dishonest, fabricating their results in the zealous pursuit of a decidedly non-scientific agenda.

This may shock some of you but it really shouldn’t. After all, scientists are people — like you and me — and people are complicated mixtures of the good, the bad and the ugly.

As I train the PhD students who work alongside me, one of my most important goals is to teach them how to be self-critical, how to spot the weaknesses in the calculations that they have done, and how to avoid the temptation to “cherry-pick” the results that best support the argument that they’re trying to make. This is sometimes called Integrity Training and you’ll find it in all walks of life — from the gambling industry to government agencies. But it’s especially important in science because we are handling the truth and it is critically important that we retain the trust of the public.

What else should we say about science? Well, contrary to what you may have heard from one or two scientists, science is not the font of all knowledge. The renowned physical chemist, Peter Atkins, has said that, “Scientific knowledge is the only way of acquiring reliable knowledge because it’s evidence-based and it’s consensus based.” However, this is certainly not the view of all scientists. What did Mozart have for breakfast on his 30th birthday? Science doesn’t know and there are no experiments that scientists can perform to answer the question. Does that mean that it is a meaningless question? Certainly not! It simply means that we need another tool for the job. If Mozart’s birthday menu interests you, don’t talk to a physicist. Consult a historian.

The good news — and I think that we need some at this point! — is that the structural framework of science has proven to be remarkably resilient in the face of unhelpful external influences, bias, dishonesty and over-reach. It tends to be auto-correcting, by which I mean that, although its results are inevitably coloured by the fallible scientists who practise it, its errors do not persist forever. Mistakes are uncovered, corrections made and, when necessary, the trajectory of the field is reset. Over time, the wheat is sorted from the chaff.

A brilliant recent example of this is the first two COVID-19 vaccines, just announced by Pfizer and Moderna. The fact that researchers have managed to design and test a vaccine for a coronavirus, less than a year after the virus’ discovery, is amazing. The fact that many other vaccines may soon appear is even more astounding. If the development of effective COVID-19 vaccines proves successful, it will be hailed as one of the great triumphs of science and the scientific method in the early 21st century and it will surely alleviate massive human suffering.

So, let's summarize. Science is the systematic study of what normally happens in the natural world. When it's done well — as a quest for truth — it's a powerful tool which can answer an extraordinary range of questions of importance to people. Its scope is not unlimited and there are many important questions on which it must remain silent. Its claims may be questioned if they were obtained under pressure from external forces, or by biased or dishonest scientists. But it has impressive self-healing properties which have allowed it to recover, again and again, from such corrupting influences. An objective assessment would have to conclude that, notwithstanding the human weaknesses of those who pursue it, the heart of the scientific enterprise is truth-seeking and it continues to be extremely successful.

But now, we modulate into a minor key…

Way back in 1963, Bob Dylan wrote a song called "The Times They Are a-Changin', in response to the nascent civil rights movement in America. Bob is now in his 80th year but I am convinced that the anthem is as relevant today as it was sixty years ago. In fact, I would say that The Times They Are a-Changin' in the early 21st century even faster than they did in the mid-20th. But not in a good way. Let me explain…

The so-called Age of Enlightenment was a period from the early 1700s to the late 1700s and it hosted some truly great philosophical, artistic and scientific figures. Partly in response to an overly authoritarian Church, Enlightenment thinking maintained that reason and empirical evidence are the primary sources of knowledge. Francis Bacon had pointed out that God had written two books — Scripture and Creation — but many champions of the Enlightenment said that they had read both, and preferred the latter! Many thought-leaders of the day hoped that, by downplaying divine revelation and emphasising reason and argument, mankind could complete a glorious revolution, a perfect reformation — call it what you will — and, eventually, we could build paradise on Earth.

The pursuit of objective truths, without fear or prejudice, to improve human existence, was a basic Enlightenment goal. But, by the mid-1800s, the influential atheist Friedrich Nietzsche argued forcefully that, if God is dead, this undermines the very notion of Truth. If there is no outside, external, objective viewer, how can there possibly be any objective truth? You may think one thing, and I may think another but, if there is no Ultimate Arbitrator, no Immovable Judge, we can never discover who is right. Indeed, many words need to disappear from our vocabulary: "right, wrong, good, bad". Even the word "should". The words which can remain, according to Nietzsche, are "strong" and "weak". And the strong will inherit the Earth. It was clear, he argued, that the Enlightenment had sown the seeds of its own destruction.

Now, personally, I believe that God is alive and well. But, if God <u>were</u> dead, it is difficult to disagree with Nietzsche's conclusions. And, if I become a thorough-going atheist, it will be difficult — very difficult — for me to construct a moral platform in which "right, wrong, good, bad" and "should" have fundamentally defensible meanings.

Is this a new problem? Certainly not! The Roman Empire was a splendid example of an atheistic world power where might was right. And when Jesus said to Pontius Pilate, the governor of the Roman province of Judea, "I have come into the world to bear witness to the Truth. Everyone who is of the Truth listens to my voice", Pilate responded simply, "What is Truth?"

During the past 50 years, as increasing numbers of people in liberal democracies like Australia have turned their backs on the notion of a God who has absolute authority, the "What is Truth?" question has increasingly been answered with "Whatever". According to some commentators, we are now living the "Post-Truth" era, where Truth has finally been freed from the Straitjacket of Authority and can now become anything that we would like it to be. "Truth doesn't liberate people. People have liberated Truth!"

This, in turn, has inevitably led to a radical re-evaluation of the basic concepts of morality. Think about for a moment. In a post-truth world, Nietzsche's perspective makes perfect sense and, viewed through his lens, colonialism, domestic violence, slavery, and police brutality are neither right nor wrong. They are simply examples of the strong dominating the weak, neither better nor worse than a lion killing a zebra.

Isn't it remarkable, therefore, that we hear so much these days about… colonialism, domestic violence, slavery and police brutality? If we were strict atheists, these phenomena shouldn't bother us; we should see them simply as part of the rich tapestry of the great, unfeeling Cosmos. But, in fact, they bother us a lot and we feel deeply, viscerally, that the planet would be better if they were gone.

What has happened? I will tell you. We have successfully developed a kind of self-induced schizophrenia, in which one part of our brain declares that moral outrage has no absolute foundation, while another part knows that outrage is <u>exactly</u> the right response and refuses to be silenced.

Is this a satisfactory state of affairs? I am sure that it is not. A brain struggling to maintain contradictory positions for an extended period is going to be stressed and strained. Something to avoid, I'd say.

The waning commitment to Objective Truth has had another disturbing effect during the past couple of decades: a growing number of people have radically re-evaluated science itself. Of course, given that the primary goal of science is to seek Objective Truth, the birth and growth of a movement which is both anti-truth and anti-science is hardly surprising. But it is nonetheless very frightening. The rejection of evidence-based arguments, the embrace of emotion over reason, the slavish adherence to whatever was tweeted this afternoon, is a recipe for disaster. And, of course, science-skeptical voters tend to elect science-skeptical politicians who encourage and foster further skepticism. As Francis Collins said in his Templeton Prize acceptance speech, "All thinking persons should raise the alarm about this!"

As a Christian, it is particularly distressing for me to see that many of those who have turned their backs on science are fellow Christians. This adds a new dimension to the problem because these are people who know and love the Lord, but who have been convinced that the systematic study of His creation is not a worthy endeavour. Whether their judgement is directed primarily at the scientific enterprise itself, or the scientists who pursue it, I cannot say. But I would plead with them, as a fellow believer, not to judge us so harshly. We are fellow Truth-seekers in a universe that amazes us with its design and structure.

The RAND Corporation is an American non-profit think-tank that has coined the memorable phrase "Truth Decay" to describe exactly these vexing problems. They define Truth Decay as "the diminishing role of facts and data in American public life" but I think that it's a problem which has spread far outside the borders of the US. They list four trends that characterise Truth Decay:

1. increasing disagreement about facts, and analytical interpretations of facts and data
2. a blurring of the line between opinion and fact
3. the increasing relative volume, and resulting influence, of opinion and personal experience over fact
4. declining trust in respected sources of facts.

I read recently that, in the hurly-burly of American politics, truth now comes in two varieties: Democratic and Republican. This is a terrible situation and, to quote the late Senator Moynihan, "everyone is entitled to his own opinions, but not to his own facts."

How can we fight Truth Decay? Well, I have a strong feeling that regular brushing and flossing will have little impact. But perhaps we should first ask a more basic question: Does it really matter? Isn't a world where we attach equal significance to your truth, my truth, and scientific truth, truly egalitarian and democratic? Wouldn't the perfect society look just like that? Is it such a terrible thing?

Yes! It's a disaster. If you tell me that Newton was a fraud and gravity is a hoax dreamed up to control people, and we decide to do the Bondi-to-Bronte coastal walk, and you start walking toward the edge of a cliff, and I remain silent because I don't want to offend your delicate sensibilities, have we really achieved the perfect society?

OK, that's a silly example, but some of the advocates of the anti-science movement have claimed that COVID-19 is a scam, that COVID is spread by the 5G mobile phone networks, and that Bill Gates plans to use the COVID-19 vaccine to implant monitoring chips into billions of people.

What effects do such claims have?

Well, they make some people laugh but, to those who hear and believe, they discourage mask-wearing and physical distancing, encourage contempt for civil authority, reduce the likely effectiveness of nationwide vaccination programs and have even led to death threats directed at Bill Gates.

I have always had a personal aversion to the Heisenberg Uncertainly Principle, because it sets limits on what I can know. But, I just have to learn to live with it. If I were foolish enough to remove the Uncertainly Principle from the equations of quantum mechanics, my research group's software would produce garbage and only a fool would use it. And, of course, that would slow our progress toward designing safer cars, creating less toxic batteries, and finding cures for horrible diseases.

Replacing Objective Truth with the latest cultural fashion accessory runs the real risk of creating suffering, either mine or someone else's. If I do that in the name of personal freedom, I show a callous disregard for my fellow human being. If I do it because I have put my faith in the unsubstantiated claims of another person, I am ripe for exploitation.

A world where the objective plays second fiddle to the subjective, where experts are side-lined so that we can learn from celebrities, where the truth is replaced with a tangled web of lies, is a world in which demagogues reign, the powerful enslave the weak, and human dignity is crushed.

The Luminaries of the Enlightenment would have been dismayed and horrified by the trajectory of their daring experiment.

The young man who enjoyed "The Hitchhiker's Guide" was also a big fan of science and had an ambitious agenda. Stephen Hawking once said, "My goal is simple. It is a complete understanding of the universe, why it is as it is and why it exists at all." And, although I was not as eloquent or bold as Hawking, that more or less summed up my vision, too.

I loved maths, and physics, and chemistry and the attraction that I felt to them was irresistible because I loved their no-nonsense rules. Maths poses tricky puzzles and it is great fun to solve them. Like an Agatha Christie mystery, one has a collection of facts and the task is to find the solution, ideally before anyone else does.

I collected mathematical theorems like gemstones, suspecting that each one would come in handy one day. These were truths that were immoveable, unchanging, immortal. There is a pristine beauty in a mathematical equation which describes some aspect of our universe. For me, nothing could compare with that beauty. I was addicted to it.

But, not long after my Galactic Hitchhiking days, the unexpected death of my Dad plunged me into a pit where I was led to ask much deeper, more profound questions. And, although it took more than a year, when I emerged from the pit, I had found some much deeper, more profound answers. Socrates used to teach his students that one should follow the evidence, wherever it leads. Like many thousands before me, I embarked upon the Socratic expedition with some apprehension, but the journey led to my becoming a joy-filled follower of Jesus.

Those gems which I had found so entrancing were not there by accident, or of their own accord. They were the handiwork of a Master Jeweller and their beauty was simply a reflection of His character. I had been rejoicing in small-t truths; now I could glimpse the large-t Truth. It was like being born a second time, but this time I felt that I inhabited a universe where things make sense. I was part of a creation which reflected its Creator. The Creator was rational and so was His creation. And Francis Bacon's observation that God had written two books became very real and very encouraging. Collecting gems had been fun, but now it had a context, a meaning and a purpose. My truths had finally found their framework.

What does Jesus say to those of us who are drawn by the siren calls of the post-truth era? He told a story about a young man who left the security of his home, squandered his inheritance in a distant land, realised the poverty of his situation, had a dramatic change of heart, returned home with his tail between his legs, and discovered that his father still welcomed him with open arms. This famous parable gets to the nub of the matter.

If we deny that truth is precious, and walk away from it, we will squander an immeasurably rich moral and scientific inheritance. We may be tempted to visit that distant land but we will find it full of thorns and thistles, not milk and honey. It is a hostile place and humans are ill-suited to its climate. Instead, we should turn back and return to the land of our innocent youth, where Truth is venerated and the hemispheres of our strained brains can relax and re-unite. And when we do, we will find that a warm welcome awaits.

For the wonderful news is this: Truth is immortal. We can hide from it, we can hide others from it, we can hold it in contempt, we can spit at it and even nail it to a cross, but our puny efforts to destroy it damage only ourselves. If, instead, we embrace Truth, it will indeed set us free and lead us on the path to renewal, reconciliation and rest.

A few days ago, I was listening to an interview with the singer-songwriter, Colin Buchanan. He said several memorable things but one in particular was, "small-t truth pushes in the same direction as large-T Truth". That resonates strongly with me and I hope, after this long lecture, that you will understand why.

To be a scientist and a Christian are not two separate choices that I have made. No schizophrenia is required: they are two sides of the same coin, two manifestations of worship, and perfectly coherent.

John Polkinghorne is a theoretical physicist and an Anglican priest and he has written, "I'm a very passionate believer in the unity of knowledge. There is one world of reality — one world of our experience that we're seeking to describe."

I couldn't have put it better.