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Introduction

*We know what trembles in the scales,
What has to be accomplished.*

Anna Akhmatova, poet

6 MAY 2016, LOCHGILPHEAD TO LAMLASH

I'm a few days into a three-week cycle ride from Fort William, Scotland, home to Devon, England, via the Lake District and the west coast of Wales. Various friends, my brothers and one of my daughters will join me for different parts of the ride, or for the days spent climbing mountains. This day my friend Josh Lewis is with me. Ben Nevis is already behind us, Scafell Pike and Snowdon are to come. That evening, I write:

Definitely the best day's cycling I've ever had! Incredible scenery, beautiful weather . . . 90km of wonderful terrain and 900 metres of ascent . . .

The first 20km from Lochgilphead to Tarbert were magical, a quiet road heading south down the Kintyre peninsula with the loch on our left – oystercatchers in zigzag flight – and gentle hills and woodland . . . on our right. The sea was still. Strong scent of salt-water and seaweed in the fresh air . . .

After coffee, we took a road that was quite simply beautiful – moorland and woodland on either side and a wonderful view of the Arran hills directly ahead. I heard a cuckoo in the woods, the first I've heard for years.

That was just one day in three wonderful weeks. The west of Scotland, the west of Wales and the west of England have a lot in common,

and I saw it all: stone bridges over bright rivers; rolling hills and ancient, granite mountains; high, lonely moorlands where the wind whistles in your ears; lovely coastlines and beautiful estuaries; hillsides of sheep and drystone walls; forests and woods, both deciduous and evergreen . . . not to mention the welcoming, generous-hearted people. The west is another country, I thought, as I turned the pedals through those hundreds of miles.

My book *How to Run a Government*, based on my experience of working with governments around the world, had been published the year before and well received; people trying to run governments had clearly found it helpful. A thought came to me as I rode: maybe the case made in that book applied equally to the planning of this long cycle ride. My friends Peter and Phil Morrish and I had planned every detail, including ensuring that almost all of the 1,200-kilometre ride was on back roads with minimal traffic and through the kind of scenery I've just described. It was the way I'd chosen to celebrate becoming sixty.

Everything was set for a departure in early September 2015, two months before the landmark birthday, when I was diagnosed with a rare form of skin cancer. Two operations followed in quick succession and then, in September, radiotherapy replaced the cycle ride. By Christmas I was through the worst – just a question of regular check-ups from then on – and getting back to normal life with, perhaps, an even greater determination to accomplish things that mattered to me.

Just as so often happens in government or business, a crisis had knocked me off course; and just as in government, a vision, clear goals, a good plan and what Sir David Brailsford calls 'sheer bloody-mindedness' can ensure you get up again and accomplish the ambition anyway. From January onwards, I worked to get fit to do the ride in 2016 instead. On May Day we set off. And so it was that, on the long cycle ride south, the seeds of a future book about accomplishment for everyone began to germinate.

I remembered too that a decade or so earlier, while I was teaching a class at the Higher School of Economics in Moscow on how to get things done in government, the students were sceptical. A Brit dropping into Moscow to argue that government could be different and better cut little ice. Politely, the students were saying, 'Good try, Michael, and thanks for making the effort but – at least in Russia – don't

hold your breath.’ With good reason, given their history, Russians in general are wearily cynical about government. They don’t have much time for politicians or bureaucrats, though they make an exception for Viktor Chernomyrdin, who resigned – after six years as prime minister in the 1990s – commenting only that ‘We tried to do better, but everything turned out as usual.’¹

The students changed the subject to their own achievements, saying, ‘We love the process you describe. We can apply it to ourselves and what we want to do. We can adapt it and use it to accomplish our own goals in life.’ They were right. I started to discover that so much of what I read, in diverse fields and throughout history, showed that there really is a pattern to accomplishment.

By the end of the cycle ride, I felt a deep love for the country I’d seen from my bike. A month after I got home came the Brexit referendum, and Britain descended into a political stalemate which lacked generosity of spirit and undermined our individual and collective sense of confidence. My patriotism didn’t falter, but it felt more desperate. The gap between vision and reality seemed vast.

Now that this book is written and Britain has moved on, if only into another (much bigger) crisis, I hope that many individuals and organizations will find that what I have written assists them in setting and fulfilling their own bold, aspirational goals, and that those goals collectively will ensure we come through the Covid-19 crisis, and the climate crisis still to come, strong and determined to be an innovative, diverse, inclusive, vibrant, fair and generous country.

And, as the final chapter argues, we need to create a future for ourselves, and for all of life on earth, which both affirms humanity and establishes for it a humble, creative and sustainable way of life on this fragile and beautiful planet. That challenge was becoming apparent before the Covid-19 pandemic; now there can be no doubt. In Anna Akhmatova’s words, written in 1942, at the height of a previous global crisis:

We know what trembles in the scales,
What has to be accomplished.²

Later in the decade in which those immortal words were written, Emil Zátopek became probably the most famous sports star in the world.

At the London Olympics in 1948, the young Czech won gold in the 10,000 metres and silver a few days later in the 5,000 metres, but his impact went far beyond his medals. As the Iron Curtain descended across Europe and the world froze, Zátopek charmed everyone on both sides of the great divide with his warmth, generosity and good nature. He symbolized the Olympic Spirit. The 1948 Games had captured his imagination. 'It was a liberation of the spirit to be there in London,' he commented, 'after those dark days of the war . . . the revival of the Olympics was as if the sun had come out.'

Four years later, at the Helsinki Olympics, Zátopek's performance on the track was even better. This time he won gold in both the 5,000 and 10,000 metres. Then, on the last day of the Games, he entered a marathon for the first time in his life and won gold in that too . . . in a world-record time. By then the Cold War had the planet firmly in its grip – the Korean War was at its height – but Zátopek again personified the Olympic Spirit. The Soviet Union had insisted on separate Olympic villages – one for athletes from the Soviet Bloc countries and one for the rest. But Australian 10,000 metres runner Les Perry, desperate to meet the hero of the London Games, sneaked into the Soviet village and found Zátopek training. True to form, Zátopek welcomed him. 'You honour me. Join me. We will run together.' They ran twenty laps, deep in conversation.

Zátopek had set whole new standards of performance. No other long-distance runner could match him for speed or endurance. How did he do it? The answer was clear. Working largely alone, he had revolutionized training for long-distance running. The conventional approach was to run long distances slowly to build up endurance, and then do some occasional sprinting as preparation for a fast finish in a tactical race. For Zátopek this made no sense. 'Why should I practise running slow?' he asked. 'I already know how to run slow. I want to learn to run fast.'³

He began to train by running long distances fast. How fast? At the limits of what was possible. When training in running shoes seemed too easy, he ran in army boots; when running on the track seemed straightforward, he ran through unkempt woodland; when 10,000 metres became normal, he ran 20,000 metres. Always push yourself to the limits. As he put it, 'When you can't keep going, go faster.'⁴

Zátopek's athletic achievements could not be bettered as a starting point for a book on accomplishment because few people in history have accomplished more in their chosen field. But there is more to it than that. I begin with Zátopek because he illustrates two other important aspects of the case I want to make.

The first is captured in that classic line of his about conventional training methods. I wrote this book on the assumption that, in terms of accomplishment, people don't need or want to read about how to do easy things. In Zátopek's terms, everyone already knows 'how to run slow'. This book is for people who want to read about, and perhaps attempt, challenging, ambitious, daunting things, to 'learn to run fast'.

The second is this: achieving great things is not just about what you do, it's about the way you do it. What makes Zátopek legendary is not just what he accomplished as an athlete, but also the courage and generosity of spirit with which he conducted himself as a human being. In 1952, when the Czechoslovak team was about to set off for Helsinki, Zátopek discovered that a teammate, Stanislav Jungwirth (a 1,500-metre runner), had been left out of the team. His father was a political prisoner, so the Communist Party took the view that Jungwirth should not be allowed to travel beyond the Iron Curtain. Zátopek, the only superstar in the team, made a stand: if Jungwirth didn't travel, neither would he. Even Jungwirth thought this was a reckless gesture; Zátopek was risking his career and his family. But it worked; Jungwirth travelled. In exploring accomplishment, this book builds on Zátopek's example: it examines not just how significant things are achieved, but also the ethical issues involved in achieving them.

By doing so, the book aims to challenge the resignation which is all too common in the modern world. People who constantly fall short of their aspirations too often give up. They become bitter and cynical. They resign themselves to merely getting through the day. In *The Road to Wigan Pier*, written in the 1930s, George Orwell captures exactly this state of mind in his graphic description of Mr and Mrs Brooker, the owners of the boarding house where he lodges. Mrs Brooker is chronically sick and lies in a bed in the living room all day, complaining. Mr Brooker does all the work, including cleaning the lodgers' rooms, cooking the meals and running the tripe shop

which fronts onto the street. He hates having to do ‘bloody women’s work’ and does everything with extreme bad grace. ‘I never saw anyone who could peel potatoes with quite such an air of brooding resentment,’ Orwell comments. To make matters worse, the tripe shop is failing. Mrs Brooker can’t understand why – ‘Such beautiful tripe it is too.’ Orwell explains: the Brookers, he says, were incapable of understanding ‘that last year’s dead blue-bottles supine in the shop window are not good for trade’.⁵

The context may have changed since the 1930s, but the sense of resignation Orwell describes is all too recognizable. We’ve all met the Brookers. If a better, more practical understanding of what it takes to accomplish things could result in fewer people feeling like them, that would be wonderful. To make this case, there are highlighted stories – each one an *Accomplishment in Practice* – throughout this book from many, varied fields of endeavour – art, science, business, elite sport and public service. They vary from the grand and epic, affecting many millions, to the purely personal, and they range over time and place, from the small Yorkshire town of Selby in the seventeenth century, to Mozambique and Canada in the twenty-first. Each one takes its place in the book to illustrate a specific theme, but is also a complete, inspiring story in itself. At the end of each one, its lessons for accomplishment are summarized. There is inevitably some repetition across these lessons, but that is the point.

Diverse though these stories are, the consistent message is that certain features of accomplishment are universal. It might not quite be a science but there are definite patterns. In selecting stories of accomplishment, I have exercised ethical judgement. According to the dictionary definition, the word ‘accomplishment’ is morally neutral (*Chambers Dictionary*: ‘completion: an achievement’), but in this book I use it only to describe achievements I consider to be broadly positive or good. Of course, opinions might differ.

In giving examples from my own life – a growing obsession with cycling, training for and running a half-marathon, and how I responded to a cancer diagnosis in 2015 – I make absolutely no claim to anything remotely exceptional. In our cycle club in North Devon, there is a woman, Peggy Crome – who has won gold and silver medals at the World Triathlon Championship in the 75–79 age category – who not

long ago cycled from John O’Groats to Penzance with her fourteen-year-old granddaughter. Now that really *is* exceptional.

The reason for the personal stories of accomplishment, then, is not that the achievements are special – on the contrary. It is merely that they showed me that applying what I had learned about accomplishment in general worked for me in practice. The theory stood up in my own real world. Incidentally, I do not claim that the approach to accomplishment set out in these pages is the *only* way to succeed, of course not. I simply claim that if this approach is followed, the accomplishment of ambitious and challenging goals is within everyone’s grasp.

The book is in two sections: the first is about getting ready to accomplish something; the second about actually accomplishing it, while the final chapter is a reflection on what might become of accomplishment in the decades ahead. My intention in that chapter has been to pose some challenges to us all and to inspire us to face those challenges, knowing that we can succeed.

The fundamental purpose then is to inspire people to strive to change the world for the better, through both their personal lives and their work. The biggest gap in many lives and organizations is the gap between aspiration and achievement, between promise and delivery, between hopes and dreams on the one hand and often brutal daily reality on the other. Perhaps, just perhaps, the ideas in this book could help narrow that gap. They have worked in governments, in business, in elite sport, in science and in art; they have worked for individuals and for vast organizations and everything in between, so this is not a purely pious hope.

Whatever it is that you aspire to do – run a marathon, paint a masterpiece, reveal a scientific truth, build a business, govern successfully, transform a school or a hospital, or simply make your garden beautiful – remember there is a pattern to accomplishment. For all the challenges surrounding us, the extraordinary range of accomplishment in the world is breathtaking, and surely there not just to be celebrated but to be learned from.

As the world around us sometimes seems to be unravelling, we have failed to notice that, collectively, we’ve learned what it takes to

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accomplish ambitious and challenging things. This book sets out to codify that learning. All that remains is to get on and apply it. That doesn't make accomplishment easy – difficult things are difficult – but it takes all the excuses off the table. Of course, in the end, books and ideas alone never get things done. If there is one single lesson in this book, it is that without willpower and the motivation to take something on and stick at it, through thick and thin, nothing significant is ever accomplished.

Can we remove the barriers to accomplishment? In place of despondency, unlock possibility? In place of resignation, accomplishment? In place of the Brookers, Zátonek? If we can, there is every reason to be optimistic about the future of humanity.

PART I

Getting Ready

I

Bold Ambition

*A colleague once said to me if your goals don't scare you,
they're not big enough.*

Chelsea Warr, sport performance expert

ASPIRE, BE BOLD

The biggest, boldest goals are not always evidence-based or set by experts. Evidence, by definition, is about the past – it is important, it can and should inform, but on its own can be a limiting factor. After all, if you are contemplating something no one has ever done before, then there can be no hard evidence. Meanwhile, the experts, while indispensable and sometimes the heroes of the story, often know too much about what might go wrong, so tend to err on the side of caution. At other times, as the saying goes, faith can move mountains where expertise cannot. In this secular age, this point is often missed, as the first *Accomplishment in Practice* illustrates.

Mary Fisher's faith leads to an outrageous aspiration

Selby, South Yorkshire might seem an unlikely place to look for an example of not just bold but outrageous aspiration. But that is where Mary Fisher worked as an unknown servant to an unremarkable family. She was in her late twenties, living a wholly ordinary life, when a charismatic itinerant preacher

came by and everything changed. Her encounter with George Fox transformed the meaning and purpose of Mary Fisher's life.

Fox was the founder of Quakerism, one of the many religious sects that had sprung up in the ideological ferment of the English Civil War. From the late 1640s, he wandered the country preaching what he fervently believed was a new and profound understanding of religion – that God and the way to live your life could not be found through following the rules and dogmas laid down in church by a minister, vicar or priest; rather, each person had to look within themselves. There was, he maintained, 'that of God' in everyone; there was an inner Divine Light, and finding this within, following it in daily life and seeking it out in everyone you met, were the keys to a good life on earth and the path to salvation.

From the vantage point of the early twenty-first century, it is easy to miss the revolutionary nature of this doctrine. First of all, it meant that to be truly religious required obedience to neither a Church nor a creed – each individual had to find that Divine Light within. Second, it meant that the formalities of a religious service were not required. Instead, Fox's followers congregated in silent meetings of worship in which anyone moved by the spirit – women as well as men – could preach. This was truly the priesthood of all believers.

As if the turning over of organized religion were not enough, there were also radical social implications. If there really was 'that of God' in everyone, why should people of greater wealth or status be treated differently or better? Why should a poor man 'doff his cap' to his master? And, furthermore, why should anyone in court swear an oath on the Bible to tell the truth? Surely if they were guided by the inner Divine Light, they would always tell the truth, whether in court or not. At a practical level, why pay tithes, a tax for the Church? More radically still, if there really is 'that of God' in everyone, then surely killing someone in war is to kill something of God. Hence Fox and his early followers developed their peace testimony which denied 'all outward wars and strife and fightings with outward weapons for any end or under any pretence whatsoever'.¹ Here then

was a philosophy far too radical, not just for the monarchy which had been overthrown in 1649, but also for the Protectorate recently established by the Lord Protector, Oliver Cromwell.

For precisely the reasons the authorities could not tolerate it, Quakerism changed everything for Mary Fisher. Inspired by George Fox, she ceased to be a mere servant girl and became a human being infused with the Divine Light. She must have felt the feeling Rufus Jones has described: 'The whole momentous issue of life [the early Quakers] insisted, is settled by personal obedience to the inward Divine revelation. The wisdom of God is within reach of the feeblest human spirit.'²

Conveying this message of liberation became her life's work. She left service and, following Fox's example, began travelling and preaching. Soon she spoke up in church in Selby, saying to the minister, 'Thou art but . . . a deluder of people with thy lyes.'³ This resulted in her prompt imprisonment in York Castle.

Released over a year later, she was immediately on the road again. She was stoned by students in Cambridge, which she had described as 'a cage of unclean birds'. The mayor of Cambridge ordered Fisher and her partner on the road, Elizabeth Williams, to be stripped to the waist and 'whipped at the market cross till the blood ran down their bodies'.⁴ The students watched the spectacle with 'levity'.

She took George Fox's most famous statement literally: she would 'walk cheerfully over the world, answering that of God in everyone'.⁵ In 1655, perhaps thinking that she might break out of her parochial cycle of protestation and imprisonment, or perhaps that there were already enough Quakers in England taking forth the message, she decided to try her luck abroad. With Ann Austin, another Quaker woman, she embarked via Barbados for Boston.

Just a quarter of a century earlier, the godly Massachusetts Bay Colony had been established as 'a City on a hill . . . with the eyes of all people . . . upon us', in the words of its most famous founder, John Winthrop.⁶ No doubt, from afar the fledgling Puritan colony appeared to promise fertile ground for the Quaker missionaries.

They could not have been more wrong. When their ship, the *Swallow*, docked in Boston harbour in July 1656, the two women were forbidden to disembark. Their packing cases were searched and more than a hundred ‘corrupt, heretical’ books were confiscated and burned publicly in the marketplace. The women were marched from the ship to the jail. The window of their cell was boarded up and a fine of £5 – a substantial sum – imposed on anyone who so much as spoke to them. There they were left to starve.

Thankfully for Fisher and Austin, they were rescued by a well-respected elder statesman of the colony who paid the £5 fine and then negotiated between the prisoners and the authorities. The captain of the *Swallow* was persuaded, under duress, to transport the Quakers – who had spent five weeks in America, all of the time behind bars – back to Barbados and from there home.

There is no sign that Fisher was satisfied with what they had achieved. In fact, her failure in America prompted a still more outrageous aspiration: she made the extraordinary decision to go and explain her Quaker faith to the Ottoman emperor Sultan Mehmed IV. Now, that really *would* be an accomplishment.

Mehmed IV was the absolute ruler of one of the superpowers of the day and the leader of Islam. He reigned as sultan for over forty years. At its height his empire stretched from the far end of the Black Sea in the east to the borders of Austria in the west, and from the borders of present-day Poland in the north to the interior of Egypt in the south. His eventual defeat at the gates of Vienna in 1683 was a turning point in European history.

But in 1657 that lay in the future. Having been sultan since the age of six, he was not yet twenty and was beginning to assert himself against his powerful advisers. He loved his magnificent gardens, and was the first sultan to devote an entire garden at the Topkapi Palace to tulips, a flower the Ottomans had long admired.⁷

Meanwhile, Fisher set off for the Mediterranean with five companions, eventually reaching Smyrna on the Aegean coast

of Turkey. There, the English consul, Thomas Bendish, fearing embarrassment among his Muslim hosts, chose to dupe the Quakers rather than assist them. While promising to help, in fact he bundled them onto a ship heading back to Venice.⁸ But when the ship was caught in a storm, Fisher and her companions were forced to land on the island of Zante. For Fisher this seemed like divine intervention. She left her companions on Zante and made her way alone, mainly over land, through Greece and Thrace to Adrianople, where the sultan was encamped.

Incredibly, she persuaded the Grand Vizier, the sultan's chief adviser, to allow her into the presence of the young sultan. There she passed on her message from 'the most High God' and explained her belief in the inner Divine Light. The sultan listened with care and, when she had finished, calmly and empathetically commented that he believed in the truth of what she had said. 'I have borne my testimony to the [sultan] unto whom I was sent,' she wrote home, 'and he was very noble to me . . . he received the words of the truth without contradiction, they do dread the word of God many of them.'⁹

Though the sultan offered her an escort of soldiers for her onward journey to Constantinople, Fisher preferred to walk alone. From there she boarded a ship home, where the cycle of her preaching and imprisonment began again. She lived out the rest of a long life mainly in London, but ended her remarkable days in Charleston, South Carolina, where she helped to found a Quaker community.

Not everyone has the religious zeal Mary Fisher displayed (and few perhaps would want to), but she exemplifies the depth of motivation necessary to achieve ambitious and challenging – indeed, in her case, almost unthinkable – things.

1. Be fearless in pursuit of the goal.
2. Don't necessarily rely on the advice of the officials on the ground; they often have their own interests at heart.
3. It's not just about the evidence; profound integrity and deeply held belief go a long way.

You might not previously have heard of Mary Fisher or her astonishing meeting with Sultan Mehmet, but perhaps a similar faith and belief, albeit in a secular context, underpinned a much more famous goal set by US President John F. Kennedy in May 1961. Just a few months into his presidency, he urged Congress to support an effort to put a man on the moon by the end of the decade. No lack of ambition there. No one knew how it could be done; no one had even orbited the earth until that year . . .

Except that the reality wasn't that at all. Kennedy's speech came just six weeks after the Russian Yuri Gagarin had become the first man in space. In response, Kennedy did indeed set the goal in Congress, but it was advanced with hesitation and received by legislators with a distinct lack of enthusiasm. Kennedy himself detected their scepticism as he spoke and, in a very rare case of ad-libbing during a formal address to Congress, he added to his prepared speech:

There is no sense in agreeing or desiring that the United States take an affirmative position in outer space, unless we are prepared to do the work and bear the burdens . . . If we are not we should decide today and this year.¹⁰

Hardly a ringing endorsement of his bold goal, just a request that members of Congress give it some thought, preferably sooner rather than later.

He reaffirmed his personal commitment in a speech at Rice University in Texas later that year, adding that 'We choose to go to the moon in this decade and do the other things, not because they are easy but because they are hard . . .'¹¹ In his budgets he prioritized the necessary expenditure, and he continued to make the case until his untimely death but, though it was implied, Kennedy never explicitly stated that the Americans would beat the Russians to the moon.

In fact, the specific commitment to deliver this precise ambition by the end of the decade came in a speech from Lyndon Baines Johnson in 1966, and it turns out that the real hero of the hour was not Kennedy's successor as president, but a little-known speechwriter called Bob Hardesty. One evening, Johnson asked him to draft a speech, to be delivered the following noon, on the subject of the space programme. When he saw the draft the next morning, LBJ didn't like

it – there was nothing in it that would lead the news. Hardesty had only a few short hours to produce a redraft. He made a few calls to people in NASA to find out how the space programme was coming along.

While Kennedy's aspiration had often been repeated since 1961, the Americans had continued to avoid making any commitment to getting a man on the moon *before* the Soviet Union. In fact, only recently, the Soviets had landed the first unmanned spacecraft on the lunar surface and NASA's head, James Webb, had speculated in public that maybe 'Russia will be [on the moon] before 1969'.¹² On the basis of his calls, though, Hardesty thought America could do better; and, after all, the president had demanded a news lead. He wrote into the draft speech the killer line: 'We intend to land the *first* man on the surface of the Moon and we intend to do it in this decade.'

There wasn't time for Johnson's senior aides to look at the redrafted speech. After all, this had been intended as a routine, modest speech, not one of those scene-setting grand affairs that presidents like to deliver from time to time. Hardesty assumed that if the aides missed the new, bold and precise commitment, the president himself would strike it out. Johnson didn't. He loved it and delivered it word for word.

No sooner had the president uttered the line than Hardesty's phone started ringing. NASA's furious top official berated him for throwing the space programme into chaos. But the deed was done. As the news roared around the world, making front pages across the globe, Hardesty thought he might find himself looking for a new job. Johnson was notoriously brutal with officials who erred. But while officials and aides were flummoxed and angry, the president was a happy man. 'That speech you wrote for me,' he said to Hardesty when, by chance, he ran into him that evening in the White House, 'Now that's what I call a news lead.'¹³

As in Mary Fisher's case, this is an example of not relying on the experts. It was Hardesty's ignorance and instinct that led him to write that goal into the speech, and it was Johnson's desire for glory that made him deliver the fateful line. Between them, they had a galvanizing effect on NASA. Once the Space Agency got over the shock, it began to imagine the possibility of success. Ultimately, the scientists and experts delivered, while Johnson's personal commitment throughout meant

that the necessary resources flowed their way. Little more than three years later, on 20 July 1969, Neil Armstrong took that giant leap for mankind. I somehow doubt he had even heard of Bob Hardesty or knew that he owed the lowly speechwriter a huge debt of gratitude.

Be bold! Listen to the experts and check out the evidence, but don't let them put you off.

CURIOSITY DOESN'T KILL CATS

But how do you decide what it is that you want to do? What kind of ambitious and challenging goal you want to set? Scientists wrestle with this all the time.

Jane Mellor stays at the cutting edge by learning constantly from experimentation (hers and others)

Professor Jane Mellor is a world-renowned biochemist at Queen's College, Oxford. She studies 'how gene expression works'. If you're not sure exactly what gene expression is, she explains: 'It is the process that brings the characteristics of an organism or cell to life. In humans, changes to gene expression are linked with many modern diseases – obesity, cardiovascular diseases and diabetes, for example. Gene expression can be influenced by the environment, particularly lifestyle choices, and this makes it a fascinating area to study.' In conversation, the overwhelming impression Mellor conveys is a limitless passion for her research, a deep knowledge and understanding of her field and an immense clarity of thought.

Curiosity, then, is very much the starting point for her and for science. How does a scientist such as herself explain how she goes about setting goals? She says there are two different approaches in her world. The first is where you have 'a very clear question' and 'a very clear end point'.

Questions such as how to solve climate change or improve roads. These kinds of question are often set by the bodies that fund research. Jane Mellor, though, takes the second approach: exploratory science, sometimes called fundamental science. ‘I just want to understand how a process works . . . in my case, it’s how genes are expressed. By the nature of the research, I don’t know where I am going to end up, and that’s a big challenge.’

In a way, is her goal the understanding itself, rather than a specific output? ‘Yes, that’s right.’ She has always wanted to know how gene expression works and has devoted her career to it ‘ever since I was . . . an undergraduate’.

That’s her goal, but how does she pursue it? And how does she convince people that it’s a good idea, an idea worth funding? She says you have to convince people not just of the intrinsic merits of the new knowledge, but also of the potential ‘economic impact of being able to spin out companies from what you discover that you’d never have predicted’. She mentions Oxford Biodynamics as an example of such a company. ‘I suspect most scientists have to be prepared for the unexpected and, when the unexpected happens, to embrace it and use it . . . most funding bodies will accept that as long as the research is published and it has impact.’

In practical terms, how does she go about it? To put it bluntly, what does she do all day? (It’s a question I use all the time.) There is some ‘boring admin’ to attend to, she says, but what really matters is that – and this is beautiful – ‘I go into the lab with an open mind every day.’ That is curiosity in a nutshell. She continues, ‘I don’t have a list of chores to do, I spend a lot of time talking to my colleagues, talking to people in the lab, discussing the data they’re getting.’

She holds weekly meetings at which her graduate students will present their recent work. The rest of the group will comment, test, question and explore. ‘That’s really critical for how the science process works.’ She reflects for a moment, adding hesitantly that ‘a lot of my day is not well defined’. Of

course, that could all become terribly vague and unfocused but, done well, it ensures that you become the master of a beguiling paradox: you consciously look for things you are not looking for.

I remark that the intelligence agencies need the same qualities. I mention the story about the CIA missing the Iranian Revolution altogether because they dismissed the importance of religion. She says the same kind of error sometimes occurs among scientists. ‘We actually have a lot of dogma in our fields, a lot of set ideas about the way things work.’ And if you challenge the dogma, ‘you are going to make a lot of people unhappy . . . you are challenging their preconceptions’. Maybe this is the human condition. If so, then finding both the people willing to challenge the received wisdom, and the ways to do it effectively, become critical ingredients of accomplishment.

Rigour and curiosity are both important, along with the willingness to challenge others and constantly question yourself, Mellor argues. Sometimes that leads you to go back and re-examine the raw data of a previous set of experiments. Maybe then ‘you’ll find something that you weren’t looking for originally . . . things in the data that you weren’t able to see at the time because your mind was channelled by preconception. It’s this free, open thinking and it is very hard to do.’

Surely that demands keeping good records? Absolutely, she says. ‘I have a massive cage in the basement of this department full of lab books going back to when I first started.’ You need a good memory, she adds, to remember where to look. ‘It’s now becoming electronic,’ she continues with no enthusiasm, ‘which actually makes it harder.’ (How nice, I think, to meet a top scientist who isn’t a total tech-obsessive.)

That’s how she learns from colleagues at Oxford, but what about the rest of the world? Cambridge, Stanford, Harvard, Singapore, Tsinghua? How does she keep track of all that is going on in her world?

‘This is where the scientific conference is so important . . . people underestimate the importance of talking to your colleagues, some of whom will be collaborators, but some of

whom will be competitors.’ Both are important. You need to know what the rest of the field is thinking, researching and learning, which requires collaboration, but you also need to compete because funding is limited, and you always want to be first.

You make progress in these ways, and you learn all the time, but what happens when you run into problems with your experiments? How do you solve them? There are no easy answers, she says. You talk through the results, you check that the experiment was conducted properly, you try to reproduce the result. And you worry away at it. It may be that there’s a factor influencing the outcome that wouldn’t obviously occur to you, such as the time of day you conducted the experiment. That’s why you go into the lab every day with an open mind.

And do modern scientists face the same kind of disbelief that Galileo faced (see p. 207)? It’s an acute problem, Mellor says, because ‘ironically it’s your peers who, to a large extent, dictate what you are able to do, because we’re so robust now on research funding’.

So, when you challenge the field or publish something controversial, what’s that like? ‘It’s horrible. That happened to me back in 2003. I wrote a couple of high-profile publications which were saying something very new, and many of my colleagues hated this idea. I was inundated with semi-abusive emails asking me to retract; the science couldn’t possibly be right.’ She didn’t retract, but ‘I was so scared that I was wrong that I moved into something else . . . [but] I now know that the result was absolutely right and it has been reproduced, in a different context, by other people.’ Forward momentum in a vital field was set back. Her idea was rejected because ‘it didn’t fit the dogma’.

You need courage as well as the facts in science. Accomplishment across the board requires both.

In fact, in preparing for the interview Mellor had reflected on the characteristics of a good scientist. First on her list was: ‘Be brave . . . don’t fear failure.’ James Dyson (see p. 147),