

Faith, hope, and love in science

An interview with Tom McLeish

Tom McLeish is professor of physics at Durham University in the UK, a Fellow of the Royal Society, and a passionate defender of the God-given harmony between science and Christian faith. Following the publication of his book, *Faith and Wisdom in Science* (Oxford University Press, 2014), Tom was brought to Australia by ISCAST (Christians in Science) for a whirlwind speaking tour. In Melbourne he gave the inaugural annual Allan Day memorial lecture at Ridley College in September.



Tom McLeish (left) and ISCAST President, Alan Gijsbers

In this interview with Chris Mulherin, McLeish challenges some misunderstandings about science, about its relationship with Christian faith, and also about the so-called conflict of science and faith. For him, not only is there no conflict, but Christians are called by God to engage in vigorous scientific investigation of the natural world of God's creation. In fact, for the Christian, science is part of healing creation.

CM: Tom, you're a physicist; I believe you're into weird substances, is that right?

TM: Yes, I am. I am a physicist, but I'm a physicist who enjoys collaborative work with other subjects and always have done that in about 30 years of research. My area is soft matter, what's now called soft matter physics, which is more or less what it says on the tin—it usually is in a tin—soft, gooey stuff: jellies, polymers, pastes ...

So it's physics plus; it's physics working with other disciplines like chemical engineering and increasingly biology. I worked with the polymer (plastics) industry, and with chemists and chemical engineers for many years, on how molten polymers or plastics flow when we spin them out into fibres and textiles or plastic films and the ways that the molecular structure—the tiny building blocks of the plastic matter—give rise to the properties of fluids, the stickiness, the gooeyness, the sliminess.

Things aren't what they seem

CM: Talking about molecular structure, in your lecture at Ridley College, you suggested that the stable, hard sort of surfaces of tables and chairs and buildings and bricks aren't quite what they seem. Is that right?

TM: That's right. I'm fascinated by the way that matter at the small scale— when you dive down a billion times into the scale of atoms and molecules—matter looks very different to how it does to our eyes. One thing that I love about science is that science tells the difference between being familiar with something and understanding it.

For example, we're all familiar with the fact that water boils at 100 °C, and we put our kettles on and it boils and turns into steam. I love asking brand new physics students when they arrive at uni why water suddenly turns into a gas at 100 degrees. Not 99.99, but 100. We're very familiar with it. We think we understand it, but actually the more we think ... I get the students to think about why a type of familiar molecules are moving around a tiny bit faster, why the whole kettle-full should suddenly turn into steam. And it takes about an hour to realise—for us all to realise—that just because we're familiar with it doesn't mean we have any idea about why it happens. That's one example.

Another example is the solidity of matter. We're familiar with the fact that when we sit on these chairs that we're sitting on now we don't fall through. But our understanding of atomic structure tells us that nearly all the mass of an atom is in a tiny little particle called the nucleus, right in the middle. Electrons—they're very much lighter—whizzing around the outside; most of the atom is empty space. My

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old physics teacher used to use an analogy of an atom like a fly in a cathedral. So if we're made of mostly empty space, why when we sit on these chairs don't we fall straight through?

CM: Those are good questions ... tell us about the role of questions in science.

Science is not what we thought it was

TM: I think that the way we teach science or introduce science, sadly, puts a number of people off. We get the impression that science is all about getting the right answers. You know: this is how you succeed in school; you get problems and you work them out and you either get the answers right or wrong, and if you get the answers right you get more marks. But actually, when you're doing science,

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when you're trying to find out things you don't understand, you're trying to make progress in understanding the properties of matter and how it works and its insides, then it's not so much the answers that matter. It's coming up with the creative questions—that's the real challenge. That's the imaginative leap in science: it's formulating the really powerful, interesting questions.

I sometimes have to say to a brand new PhD student who comes to Durham, beginning their career as a research scientist, "I'm sorry, you've been taught that coming up with the answers is the key thing in science, but from now on it's inventing the really creative questions." Like the question, "Why don't we fall through these seats while we sit on them?" And actually, that was a question that was asked by a 13th century polymath called Robert Grosseteste who I'm studying at the moment in the history of science with some of our medievalist colleagues, and that proved to be a very interesting question.

CM: So we're talking about misconceptions of science: one being that science is about just having the answers rather than starting with good questions. What other misconceptions of science are there as people in the street understand it?

TM: I've also been exercised by the fact that science is portrayed in the media as a sort of regime of the expert, and the expert is often wearing a white coat and

carrying a clipboard and is a rather boring, geeky person rather than science being a deeply human activity that we can celebrate and enjoy at all sorts of levels—a natural sort of curiosity into the world.

I think of science as belonging properly in the same basket of human activities that also contains art and dance and story-telling and painting and sculpture and music and song and all those things. They're the special human, creative activities that make us human. I think science belongs there, but what we've done with it more recently is to turn it into something very functional and instrumental—as I say, the prerogative of the highly trained expert—whereas I'd love to see science develop back into something which everyone can enjoy ... so a deep cultural thing.

CM: If science is a human activity like art and the humanities, what happens to the idea of proof and certainty?

TM: We sometimes hear a lot written about scientific proof, but I'm happy to admit, there's no such thing as scientific proof. No science ever proves things; we know things with greater or lesser degree of certainty, but we never know anything for absolute sure. Karl Popper, the philosopher of science, was one of the first people to make this perfectly clear; he thought that we could refute ideas; he thought that we could prove that some ideas in science were wrong. It's easier to do that than the impossibility of proving they're right, because you can do an experiment, and if we had an idea that water might boil at 50 degrees we could do that experiment and we would find that it wouldn't, so that idea would be wrong.

There's no such thing as scientific proof.

It turns out that even proving things are wrong is a little bit more slippery, as I found in my own career when I had a new theory about how polymers flowed that was a bit challenging to the older theory. It's very hard to kill off old theories; they've got ways of being very tenacious. They hold onto the grip of a community that has believed them for a long, long time. But that's one of the reasons why when I say that in order for science to work well, it needs human qualities that perhaps we associate with other activities. I was talking today about how faith with a small 'f' and how hope and even love with a small 'h' and a small 'l', are needed to make science work. A brand new scientific theory, a newly born idea, just like a newly born infant, is ... well, is just that, is newborn, is not fully grown, it's not

robust, it's not strong, it wouldn't be able to stand the street life of the more mature and teenage theories that are knocking around. You have to love a new scientific idea until it grows into a sort of fully formed theory that can stand the test of the scientific street.

Faith, hope, and love in science

CM: Faith, hope, and love in science?

TM: Yes: if you have faith in a theory, you have to love it ...

CM: As you allow it to grow?

TM: Yes, you do. Love it in spite of its faults—and it will have many. Our early theory of how polymers created elastic fluids disagreed with some of the

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experiments in annoying ways. But we felt that we were missing a clue. We thought that polymers moved about in liquids as if they were strings entangled with others and trapped in little pipes. We had faith in the theory and hoped that this very compelling, beautiful idea would turn out to be correct if we could just find the proper way of understanding it. And that turned out to be true, but we had to hang on until we'd ironed out some of the rough

wrinkles that we'd spotted at first.

CM: So there we have a description of the scientist at work—exercising faith, hope and love. What other misconceptions about science would you like to disabuse us of?

TM: I think one of the other misconceptions people have with science is that science is somehow antithetical to or irreconcilable with religious belief—Christian belief, for example. There's a word on the street that often finds its way into the media, that the church has continually repressed science through the ages. Although this idea— that scientific claims are irreconcilable with the existence of God— is purely invented and historically flawed, it doesn't seem to die.

The conflict thesis

CM: But what about Galileo: surely the most famous example of a conflict between science and the church?

TM: What about Galileo? Well, of course, the church was wrong to persecute Galileo by house arrest for teaching that the earth moved around the sun. But the Galileo affair is far more interesting than is usually represented, and actually, when it's presented as the church versus science, it's just a projection of that modern catchphrase back into history. Galileo was, for example, a faithful Catholic and remained so. Many of his supporters were cardinals. His opponents were also cardinals.

The argument around whether the earth or the sun moved in the solar system is far better represented as a scientific argument between people who held different opinions rather than an argument between the church and some secular new logic, because it just wasn't that. Those categories didn't exist at that time. And after all, there was, in the early 17th century, this lovely theory that the sun was in the middle of the solar system. It had a lot of beautiful simplicity and compelling features—just like my theory about polymers—but it was in contradiction with some inconvenient facts. For example, the fact that if you were to look up at the stars from an earth orbiting the sun, with an enormous orbit of millions of miles, every six months the stars would seem to shift from side to side as you were looking at them from different directions (it's an effect called 'parallax'). Well, they just didn't. It didn't seem as though we were rushing around at a thousand miles an hour, as we'd have to be doing if the earth was turning around on its axis.

So, there were all sorts of good scientific reasons for discounting the sun-centred solar system in favour of an earth-centred solar system then, that needed far better observations, better telescopes, and deeper understanding of telescope optics and the distances to the stars, to iron out. That took a century or two or three even. So, again, I think we project a lot of our false, modern, convenient conflicts back on the time of Galileo.

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CM: So you're not so enthusiastic about the idea of science *versus* faith. What about speaking of science *and* faith: as two distinct areas of human endeavour that perhaps don't conflict very much but nevertheless are distinct areas of endeavour?

TM: Well, I think that they're closer than that. I understand the temptation to make them distinct and sort of comfortable. I've thought a lot about the relationships between a Christian worldview of a God that makes us and the world. I'm a believer myself; I've been a Christian since my young adult life. I've had some theological training as well as some scientific training, and I'm also a lay preacher—a lay reader we call it in England—in the Anglican Church. It has always seemed to me to make a lot of sense of a universe full of meaning, full of structure, full of order, that our minds can understand, and it makes sense of Scripture—my experience of things like love and hope. So I think there's been for me a rational way of thinking of Christianity as a good way of understanding why my experience of the world is as it is, my experience of God and of other people. But in terms of the relationship with science, what does science look like if you embrace it with a Christian worldview? Rather than think of it as something just over the horizon that you can somehow sort of be comfortable and compatible with, let's think of it as something entirely within God's purposes. And of course if science is old and creative and deeply human as I think of it for other reasons, then it's also worth thinking about how science arises as it indeed does from a religious worldview. Historically that's a non-controversial point.

Science emerging from faith

All historians will agree that science arose from communities of religious belief. The early modern scientists like Francis Bacon, Boyle, Newton, and so forth had explicit theologies that what they were doing in creating experimental science was in obedience to God's commands to recover lost knowledge of the world through the Fall. This is just one example of how science has emerged from faith historically, but I also wanted to think theologically about science. So if you like, what I want to try and do is to think for myself and others, around what happens if you ask theologically, or within God's purposes, what science is for.

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Now, purpose is an interesting category; modernism doesn't sit well with purpose, but we human beings need purpose: we want to ask what we're here for, what other people are here for, what we should be doing, all the time. So asking what science is for, theologically, has been important to me, and I wanted to ask what happens if we move from thinking about theology and science as a sort of compatibility question, to a theology of science; that's a purpose question, and that's really what egged me on so much that I had to write a book about it.

A theology of science

CM: So what is your theology of science, in a nutshell?

TM: Well, it comes from two types of biblical reading, one in that wonderful corpus of literature, the Old Testament wisdom literature; I think I can trace the early roots of science back to what in the ancient world was called wisdom. After all, we only have to go back a couple of hundred years to a time when science was called not science but natural philosophy: love of wisdom to do with natural things. So, reading wisdom literature opens up the human relationship with the natural world as being something that God calls us to develop and to look on the natural world with the same love and care that he does.

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CM: Wisdom literature; you're talking about the Old Testament ...

TM: In the Old Testament, thank you, yes.

CM: What books are you thinking of?

TM: Proverbs, the Psalms, and supremely, the shining, snowy-mountain peak of wisdom literature that tells us about our relationship with nature is the book of Job.

CM: Not Genesis 1 and 2?

TM: No, no. They come later. There are good creation stories in Genesis 1 and 2, but they're very formal, they're quite difficult, they're not 'Creation 101' if you like. They're important, but their time of writing is not particularly early and they're not particularly fundamental. There are creation stories all through the Bible: last time I counted I got to about thirty before I gave up counting.

The many biblical creation stories

CM: Thirty creation stories?

TM: Creation stories, yes, yes. They're there in the Psalms, in the prophets, in the wisdom literature, in the gospels, in the New Testament letters as well. Most of them are quite small, of just a couple of verses ...

CM: Can you give us an example?

TM: Yes, Psalm 33, for example, has a creation story right in the middle of it; it's connected with Psalm 32. It's moving from an expression of despair that the people of Israel—God's people—are being oppressed, to hope that God will vindicate them and that Israel will be vindicated as God's people in the end. And between the first and the second the psalmist reminds us of God's faithfulness and care by celebrating his creative act in founding the foundations of the earth, in separating the boundaries of the sea from the land, in making the heavens. And that little triplicate—the foundation of the earth, the boundaries of the sea, and stretching out the heavens—comes out over and over again in times where the people of God are feeling worried or oppressed or have 'lost the plot', and then the creation story reminds us of what our plot is: it's to be in creation as God's servant.

Paul does this too, in Romans 8, which is his journey from the possibilities opened up by the gospel: "There's now no condemnation for those who are in Christ Jesus," is the beginning of Romans 8. At the end of that chapter we get to everybody's favourite passage: "There is now nothing that can separate us from the love of God." It's read out at funerals: it was read out at my dad's funeral a couple of years ago. You know how it goes, "Neither pain nor sorrow nor flood nor anything will take me from the love of God." Between those is creation again; it's now creation groaning, as in the pains of childbirth, before new creation, and it talks about the sons and daughters of God coming into the glory of their freedom, and of creation coming into its own freedom, under the care of the children of God. So just in the same way, Paul's doing what the psalmist does:

A theology of science is the story of making friends again with creation.

he's telling a creation story on the journey of a past to the realisation of a future hope.

So, a theology of science for me is with all this rich biblical material throughout Scripture in mind, is the story of making friends again with creation. Again, Paul talks about our job as Christians, as part of the people of God, as the "ministry of reconciliation". You might say that for Paul, being a Christian is about healing broken relationships. I love that for its simplicity. Everyone gets that; you don't have to know deep theology or Old Testament to know that mending broken relationships is something we all need and the world needs badly.

One of those broken relationships is, I think, between people, humans, and the material world. We don't understand it, we don't know about it, we don't treat it very well, we're frightened of the way it treats us (storms, earthquakes, tsunamis, all that stuff) ... We're uncomfortable; we're like fish out of water, even though we're in the water. Why is that?

George Steiner, the great scholar of letters in Switzerland, France, Germany, America, and England, pointed out that art is needed to bridge the gap between humans and the "sheer inhuman otherness of matter." And I think that's what science does as well within this biblical picture: it's a way of 'making friends with nature' under God's command.

CM: So as a Christian scientist do you see your vocation as engaging with God's creation in a healing sort of relationship?

TM: Yes, exactly, I think I would. And it heals in different ways; it's ... well, as I say, broken relationships are characterised by at least three things that go wrong.

It starts with ignorance: if we're not friends, if we've lost a relationship and the chances are we're arguing, we don't know each other very well. Secondly, that ignorance leads to a degree of fear between us. And thirdly, when it gets really bad we can hurt each other. And I think it is a little bit like our relationship with the natural world: it starts with ignorance; we don't know how nature works. We had no idea where the storm's come from or why the lightning strikes ... a long time ago. We know more about that now. We don't know how matter manages to be stable and yet change from one substance into another. That was what was responsible for the Greeks a long time ago, thinking about the idea of atoms—

change yet under constraints. But we do learn these things, so starting by replacing ignorance with knowledge is the first stage of healing a broken relationship.

Replacing fear with wisdom is another stage, and a little bit of history of science does some good here. I was fascinated by an ancient saint we have in the northeast of England—Durham cathedral has the remains of a wonderful 7th and 8th century scholar called Bede, the 'Venerable Bede' we call him. Some people might know him well from being the author of the first post-Roman British history book, *The Ecclesiastical History of the English-Speaking People*. Many people won't know that he wrote a wonderful science book as well, and a mathematics book. A science book called *De natura rerum—On the Nature of Things*. And he



prefaces this book as a deeply committed pastor and Christian scholar by saying that the reason he's writing a book about nature for his students is so that when they become pastors themselves they should help people not be frightened when storms come or winds blow or lightning strikes; that it's not because there are demons or wicked spirits inside nature or behind the trees trying to jump out and get them: it's just the way nature works, that's the way God made it; it needs to be that way. So it understanding of nature saps the fear that we can have of it.

The Venerable Bede (d. 735)

And then in the third stage, of course, we need to learn how to avoid the harm nature can do to us and, as is becoming increasingly clear, avoid the harm that we can do to nature.

CM: That was my next question: climate change. Where does climate change fit in for the Christian involved in anything to do with climate science ... healing ... damage to creation ... ?

TM: Well, I think you've answered it: the whole thinking leads there directly. One thing is clear: humans do have a responsibility for stewarding nature, which means we really do have the power—biblically we have the power—to steward it for ill or for good. I've heard some people say, for example, even some Christians say that it's obvious that humans couldn't change the climate. Actually, biblically, it's clear we could. We could damage the earth; that's why we're asked to be good stewards.

Then you look at the data; you have to do good science. You see, one of the reasons I find it sort of frustrating to set up science and religion in opposition to each other is because I think that science is what you do when God tells you to find out, to look after, and to heal our relationship with nature. It's actually part of religious belief; it's not in any sense opposed to it. Science is the toolkit God gives us to respond to his command to look after nature. So, you do the science and you measure, and you find out this complicated and difficult stuff.

I should say, whenever the Bible talks about our relationship with the natural world, the context is nearly always pain. There's a clue in there. Think of Job: suffering. Think of Genesis and then the briars and thorns and the pain of childbirth. Think of Paul in Romans: think of the groaning of all creation. This is all painful stuff. It's difficult and not straightforward, but hard work involved in healing—as all healing is hard work—is what we can expect.

And then there's a responsibility of advising politics, nations, industry, in how we could and should change our behaviour in order to care for creation and prevent harmful outcomes. So climate science, if you articulated it, falls right in the centre of this theology *of* science.

The conflict with the New Atheism

CM: Your views are sophisticated views about the relationship between science and faith, or a theology of science. Out in the street, and particularly in the public

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press, there's a war going on. What is going on with the battle between the New Atheists and faith?

TM: Well, the press loves conflict, and conflict leads to publicity. For some reason humans have an unhealthy fascination with conflict, so it's very convenient to promote a conflict myth.

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I think a lot of it's personal, but as I said, I find that historically and philosophically and personally and practically there is no conflict between a life of faith and science. Far from it. Science historically, philosophically, personally and functionally can flow and should flow from faith. But you know, keeping alive a conflict narrative is a personal agenda for some people; I'd like to defuse that conflict, because I think it does huge damage in fact to science because it makes dehumanising claims about science, and I think that's damaging.

CM: There's another side of the conflict myth too, isn't there, from the Christian point of view? That is to say, there are some Christians who think we are in fundamental conflict with science.

Young-earth creationism

TM: Yes, you can create a conflict with science. For example, if you think that by extracting just one of the 20 or 30 Bible creation stories—for example the one in Genesis 1—if you think that that's a shortcut to the outcome of responding obediently to God's command to do science and tells us, in modern, post-enlightenment language, that the universe was made in six days, then of course that conflicts with science. But it conflicts completely unnecessarily with science.

Six-day creation—the belief in a literal six-days—also conflicts with the history of thousands of years of biblical interpretation: the ancient Jews and Hebrews never believed that. It is a largely modern social phenomenon and doesn't have anything to do with authentic, orthodox Christianity through the

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ages. It's perversely pushing the Bible into being literature that it never was, and it's trying to make a lazy shortcut from God's command to do difficult and careful science into thinking that he's given us the answers in the back of the book—or in this case of course in the front of the book.

But no, it's unnecessary, it's damaging and it's doing a huge amount of damage to the church and to everybody—it's confusing children. I think we've got to gently and lovingly, for the sake of the church, for the sake of the gospel, I think we've got to stop it.

CM: We've talked about the conflict from the Christian point of view and also from the New Atheist point of view. What's the future of the conversation?

TM: Well, I think it's exciting, because if we get the conversation right we could replace this lazy and dull and infertile conflict narrative in the media, not just in the

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church, but in society at large, with a much more fruitful one. So the theological story of science can help fuel a much healthier narrative for what science is for publicly: science is not just modern, geeky, technical, and out of reach of most people. Quite to the contrary, it can remind us that science is a bit like music in the sense that you know, we might not all be concert pianists, but we all know what music we enjoy and love. Maybe we just listen to it, maybe we strum a guitar in our bedrooms, but there's always a rung on the ladder of music that we enjoy and helps build our lives as people and build relationships with others.

Science, like music, can play a part in doing this; it too ought to have many rungs on its ladder of enjoyment. It can also help us with these urgent public questions such as around climate change. We never seem to be able to have proper adult conversations about these scientifically informed difficult questions in the public sphere. Have you noticed? We just throw arguments at each other; we stay in our trenches. Now, why is that? It's like children scrapping in the playground. We're never moved from our positions by considering careful arguments from other people's evidence and data. I think that the church as sort of light in society, aided by a proper biblical understanding or a theology of science, could be wonderfully

supportive of a healthy, creative, fruitful dialogue around these difficult scientific subjects in society.

And I think, finally, science could be therapeutic; I mean, it's about the healing of a relationship with nature. Everybody could do with a bit of healing, a bit of therapy, and being playful and delightful about science and enjoying that in education, but also in the public sphere and in the private sphere, I think there are people who have difficult hurts and pains ... Some people find that art therapy, or music therapy can help. I think there's somewhere lurking there to be discovered, something that we might call "science therapy", that could be fun and actually really help some people who are hurt.

CM: Well, there's a challenge: science therapy... Now, you've just written a book, haven't you?

TM: Yes, that's right. It actually came out last year. It's called *Faith and Wisdom in Science* and it's published by Oxford University Press. I wrote it because I wanted to swim in the ocean of ideas that you swim in when you drop the head-on conflict narrative between faith and science and you say, "Well, just suppose you take the view that science is something entirely within God's kingdom," and you start asking what it's for. You start looking at the Bible in terms of our relationship with nature; you look at the history of scientific thought and you explore the relationship between science and the other humanities. So I wanted to bring all that together and ask whether it's possible to reframe science in a much longer, much more human story that sits entirely within the Bible story of creation, fall, redemption, and the future hope of new creation.

CM: Thank you very much Tom for your time.

TM: It's been a real pleasure, thank you very much.

The book Faith and Wisdom in Science is available from Oxford University Press at www.j.mp/McLeishBook.