# further information

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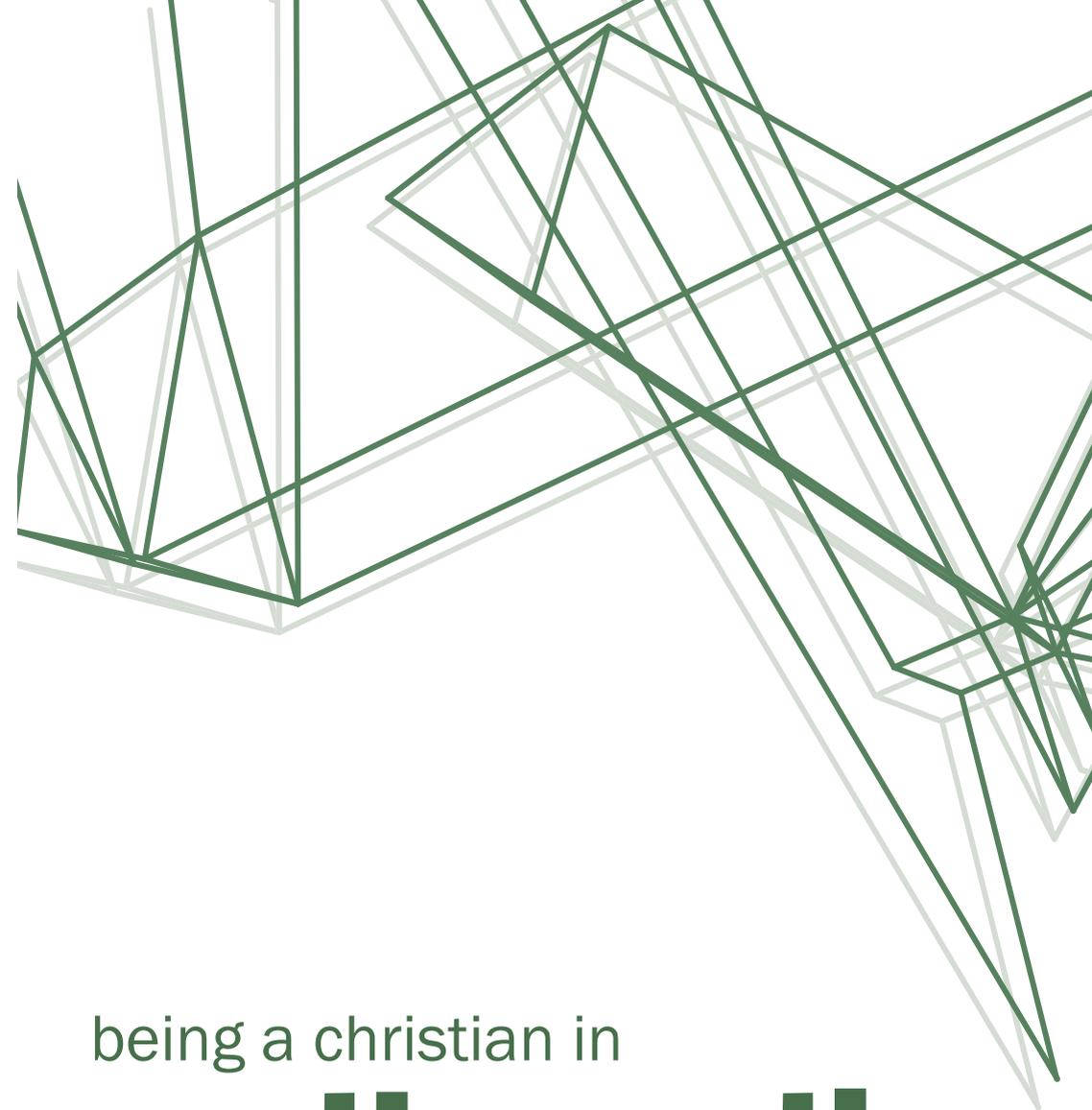
CHRISTIANS · IN · SCIENCE

being a christian in

# mathematics

CHRISTIANS · IN · SCIENCE

# studying mathematics as a christian

Jesus Christ is Lord of all (Acts 10:36), not least mathematics. How then are we to realise this in our work as mathematicians? This leaflet aims to encourage you in your calling as a mathematician and to provide some advice on dealing with common challenges associated with being a Christian in mathematics.

## about the authors

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Originally from the county of Dorset, in the south of England, Paul is a DPhil (PhD) student in the mathematics department at the University of Oxford. Working in the field of mathematical biology, his research concerns the mathematical modelling of the human retina in health and disease. Having come to faith at the age of twelve, his time at university has been both an encouragement and a challenge, as he began to recognise the relevance of Jesus Christ to all of life (even mathematics!). He is a member of St. Ebbe's Church, Oxford.

**Samuel Cohen**

Sam studied mathematics and finance in Adelaide (Australia), completing his PhD in mathematics in 2011. He is now an Associate Professor in Mathematical Finance at Oxford and, not feeling truly like a pure or an applied mathematician, works on problems in the intersection of analytical probability theory, stochastic control, and statistics, often motivated by finance. Sam grew up in a Christian family, and has known Jesus as Lord as long as he can remember. He is married to Juli, has three children, and attends St Ebbe's Church.

## mathematics as a calling

God calls Christians not just from the world, but to the world, to serve Him in our everyday lives. In part, it is through our work that we obey the creation mandate to fill and subdue the world (Gen 1:28); continuing, in some sense, God's act of creation. To quote Huldrych Zwingli, 'there is nothing in the universe so like God as the worker'. This truth applies to all forms of work, including mathematics.

In the biblical narrative, as Adam stood in the newly created Eden, God brought before him each of the animals He had made, to see what Adam would name them (Gen 2:19-20). This act of naming involved both discovery of the form and type of the creature, and creativity in choosing a name fitting with this discovery. As mathematicians, we continue to employ our creativity, as we seek out, determine and describe the rational structure of the abstract and physical realms.

> **'At its heart, mathematics is about finding patterns and connections.'**

recent portrait of mathematician Sir Andrew Wiles (of Fermat's Last Theorem fame) casts him in a cool blue light, chosen to convey the artist's impression of mathematics as an 'austere discipline'. Many feel that maths is a cold, cerebral and passionless pursuit. Yet, as those within the mathematics community know, this couldn't be further from the truth. Indeed, when asked why it is that they study the subject, many great mathematicians simply answer 'because it's fun!' There is great pleasure to be had, both in the object of study and in the act of doing mathematics.

At its heart, mathematics is about finding patterns and connections. This holds true for both pure and applied mathematics, though in different ways. Roughly speaking, 'pure' mathematicians seek to work out formally consistent abstract systems, each based on a set of axioms, while 'applied' mathematicians construct and analyse models, in an effort to determine the patterns inherent in the physical world. In each case, we move from the particular to the general, looking for overarching principles that encapsulate each example. The simpler and less contrived our theorems or models, the better. It is on those occasions that a particularly simple rule or model captures a complex system that our result is said to be elegant or beautiful. This aesthetic sense, this desire for beauty, is a major driving force for the mathematician.

It is perhaps not surprising that the pursuit of beauty should play such an important role in the mathematical enterprise. When God created the world he declared it to be 'good' (Gen 1). Therefore, even after the fall, we should expect the universe, by God's grace, to be beautiful. We can have a similar expectation of abstract mathematical

truths, which were conceived by God long before any human mind sought to grasp them. It is as we pursue mathematical truths and marvel at their beauty, that we, as mathematicians, serve and worship God.

In this section we examine some of the existential, epistemological and moral challenges faced by Christians in mathematics.

> 'It is as we pursue mathematical truths and marvel at their beauty, that we, as mathematicians, serve and worship God.'

# mathematics and ch ristianity – common challenges

## What is the Point?

Even though we might enjoy doing mathematics, its value is often unclear to us. This is, in part, a challenge faced by all 'secular' vocations. If, at any given moment, each member of the human race is *"advancing either to heaven or to hell"* (Learning in War-Time, C.S. Lewis), how can we spend our time on something as seemingly trivial as mathematics? Would not our days be better spent as full time missionaries, evangelists or church workers?

The answer lies in our nature and in our calling (see the previous section). It is in our nature to seek to understand the world around us and *"God makes no appetite in vain"* (LWT, Lewis). Christianity doesn't replace our old working life with a new one, but rather exploits it for God's purposes, such that all work becomes spiritual when done 'as for the Lord' (Col 3:23). Therefore,

the precise role of our work in God's plan may not become apparent until much later; our task being to proceed with humility, trusting that our work has a true and eternal value (1 Cor 3:10-15, Col 3:23-24). We should also remember that we are called not just as individuals, but as a community (Eph 2:11-22). No one is called to do everything; rather, each member has a different role to play in the body of Christ (1 Cor 12:12-31).

Although the role played by mathematicians in God's plan may not always be clear, the practical usefulness of the subject is apparent. Mathematics provides a highly rigorous way to understand reality, and is the only way we know to access pure mathematical truths. In applied mathematics, mathematical modelling works in tandem with experiment, guiding empirical studies and answering questions that could not be answered by experiment alone, due often to the intrinsic nonlinearity of a system. Mathematics also provides theoretical underpinnings and tools in many other areas of science, as is clearly seen in theoretical physics and chemistry.

> 'It is in our nature to seek to understand the world around us and "God makes no appetite in vain" ...'

## What has Maths to do with the Messiah?

For Christians working in the physical and life sciences, the challenge faced in relating their faith and their studies lies in overcoming the popular perception that they are in conflict. However, for many mathematicians, the problem is that there seems to be no point of contact between the two. If Jesus interrupted his Sermon on the Mount to give a masterclass in quadratic equations, then this has been lost in the mists of time. Mathematics is so abstract and far removed from the ordinary spheres of life that it is hard to see how our faith could impact upon our studies or vice versa.

> 'Christian theism ... provides a compelling explanation for the link that exists between the human mind and the external world.'

Perhaps the best place to start is by asking the deceptively simple question, 'why is maths so effective in describing the world?' (see Wigner, 1960). It is easy, in the 21st century, to take it for granted that physical laws can be described mathematically, but it is not a *priori* obvious that this should be the case.

Many thinkers have tried, and failed, to solve this problem. For empiricists,

such as David Hume, all knowledge is derived from sense experience. Since causation cannot be observed by the senses, only a succession of events, the laws of cause and effect, if they exist, are fundamentally unknowable or simply illusory. For rationalists, such as Immanuel Kant, the order we see in the world is mind imposed, rather than being representative of the way the world actually is. Thus, whilst natural laws may be universally true, they are nothing more than structures of thought within the human mind.

Each of the above approaches starts with a fundamental phenomenon, either experience or innate ideas, and attempts to build a body of knowledge upon it, in a manner reminiscent of Babel (Gen 11), via autonomous human reason. As such, each is doomed to failure. Instead, we must begin with revelation. Christian theism, with its doctrines of creation out of nothing (*ex nihilo*) and of man in God's image (*imago dei*), provides a compelling explanation for the link that exists between the human mind and the external world (Gen 1:1, 26-27, Jn 1:1-3). If the universe was created and is upheld by a faithful, law-giving God, then we may expect it to behave in a regular, law-like manner. Furthermore, if we have been created in the likeness of God, then our minds image the mind of the one who created the universe, sharing, to some degree, its rationality. Therefore, we may anticipate that the laws of nature will be rationally intelligible to us, which is the essence of our mathematical formulations.

Lastly, since God created the universe freely, these laws are contingent, that

is, they could have taken other forms. Consequently, we must examine the world, to determine which of all the mathematically possible laws God chose to use.

'[N]o knowledge is possible apart from God, without whom we can do nothing...'

## Of Vectors and Virtues

As Christians, we should seek to cultivate all biblical virtues, but two that are perhaps especially relevant to mathematicians are those of humility and honesty. As noted above, we should humbly accept and be content with not knowing in this life how our work will contribute to God's plan for history. It is also important that we maintain an epistemic humility, recognising that there are other types of truth e.g. scientific, historical, ethical and aesthetic, each with alternative, but equally valid modes of reasoning, and that no knowledge is possible apart from God, without whom we can do nothing (Jn 15:5). Secondly, we are called to worship God in spirit and in truth (Jn 4:23). Therefore, we should be careful to accurately represent our results, not exaggerating their significance and taking credit only where it is due.

## The Arithmetic of Apologetics

Finally, as Abraham Kuyper put it, "there is not a square inch in the whole domain of our human existence over which Christ ... does not cry: 'Mine!'". Therefore, it is important to have Christians in mathematics, witnessing to that community, and defending the church against the 'great cataract of nonsense' (Lewis, 1939) that might otherwise overwhelm it.

Soli Deo gloira! (Glory to God alone!)