Religious Studies (2025), 1–25
doi:10.1017/S0034412525000083

CAMBRIDGE UNIVERSITY PRESS

ORIGINAL ARTICLE

The restaurant at the beginning of the universe: Natural scientists on ultimate reality, science, and religion

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(Received 25 October 2024; revised 22 January 2025; accepted 24 January 2025)

Abstract

This qualitative interview-based study examines metaphysical views of natural scientists (n = 35), focusing on the relationship of self to the universe. We use as a framework the idea of *oneness*, the view that the universe is fundamentally one thing. We examine how scientists situate their positions on religion and ultimate reality engaging with this concept. Our main research questions are: (1) How do natural scientists conceive of ultimate reality? What is their ontological picture of the world/universe? (2) How do natural scientists relate their spiritual, religious, and ethical outlook to their scientific topic(s) of study? Participants hold a sophisticated range of views that are influenced both by religious self-identification and disciplinary field. They regularly turn to philosophy and theology to guide their forays into ultimate reality, including philosophical and theological traditions such as Daoism, Buddhism, Calvinism, Eastern Orthodox Christianity, and ancient philosophy. We found that natural sciences and humanities do not compete, but are complementary when it comes to meaning-making.

Keywords: science and religion; experimental philosophy of religion; oneness; natural sciences; ultimate reality

> 'Let's say you had a restaurant at the beginning of the universe, and you were watching around you. Could you predict that people would pop out of it? I don't think anyone could. So, who knows what's going to happen in the future?' – Bart, astrophysicist.

> 'We are the local embodiment of a Cosmos grown to self-awareness. We have begun to contemplate our origins: starstuff pondering the stars.' – Carl Sagan (1980), 345.

Introduction

Natural scientists investigate the world using a range of methods and approaches, uncovering its deep structural features, origins, building blocks, and interrelations. What is their ontological picture of this world and their own place as human beings within it? Probing the religious beliefs of scientists is one way to investigate this question. A range of studies

shows that, compared to the general population, scientists tend to have lower rates of conventional religious beliefs (Ecklund and Scheitle 2007; Larson and Witham 1998). To take a recent example, among UK scientists 45 per cent say they do not believe in God, compared to 18 per cent of the general UK population. In the same sample, 65 per cent say they do not belong to a religion, compared to 50 per cent of the general population (Ecklund et al. 2018). Lower religious belief in scientists is especially pronounced among natural scientists (Gross and Simmons 2009).

These quantitative measures do not give us a clear insight into what scientists actually believe. For this reason, authors, such as sociologist of religion Elaine Ecklund, have used qualitative measures to investigate scientists' views on religion, ultimate reality, and spirituality. Ecklund (2010) focused on scientists' views on the relationship between science and religion through interviews and found that they are more positively disposed towards religion than commonly portrayed. At the time a conflict model of the relationship between science and religion prevailed, influenced by the significant media presence of the New Atheists and their opponents. Later qualitative work (e.g. Ecklund and Johnson 2021) sheds light on the diversity of atheist scientists' views on spirituality, religious practices, and beliefs, outlining a more nuanced picture. These qualitative studies are US- and UK-centred and explicitly probe whether scientists hold conflict models on the relationship between science and religion.

The present study aims to probe into natural scientists' views of ultimate reality, focusing on the relationship of self to the universe. We use as a framework the idea of *oneness* (Cialdini et al. 1997; Ivanhoe 2017), the view that the universe is fundamentally one thing, and then examine how scientists situate their views on religion and ultimate reality engaging with this idea. Oneness is an implicit assumption of modern science (see Koyré 1957 for a classic study): the universe is vast, ancient, made of the same fundamental building blocks and unified by a small set of laws. Foregrounding this oneness framework provides a useful starting point to probe into scientists' ontological views. For this study, we have the following deliberately broad and open-ended research questions:

1. How do natural scientists conceive of ultimate reality? What is their ontological picture of the world/universe?
2. How do natural scientists relate their spiritual, religious, and ethical outlook to their scientific topic(s) of study?

Ours is a study in experimental philosophy of religion. The aim of this fledging field of study is to answer enduring questions in the philosophy of religion using the methods of experimental science, in this case, qualitative thematic analysis (see section Ontology and ultimate reality for more details). The benefit of this approach is that it allows for answering philosophical questions (and indeed finding new questions to ask) in an open-minded, inquiring fashion.

Using this method, we uncover results that could not be anticipated through conceptual analysis and armchair reflection alone. Philosophers and theologians have pondered the relationship of the natural sciences and ultimate reality. However, in doing so, they have mainly relied on their own preconceptions and frameworks. As sociologist Michael Evans (2016) has uncovered, public debate on science and religion in the US and elsewhere tends to be dominated by vocal extremes, including conservative Christians and New Atheists. While the scholarly literature on science and religion has more moderate voices, they too show biases such as a bias toward integration narratives, perhaps paradoxically because they want to counter the conflict narratives that are salient in public debate (De Cruz 2024). This leaves many positions unexplored. Our study brings to the fore philosophical thoughts of natural scientists who have never formulated their ideas in a public forum. (Indeed,

https://doi.org/10.1017/S0034412525000083 Published online by Cambridge University Press

several of them told us they had never voiced these ideas to anyone before). In this way, we illuminate aspects of what it means to be a natural scientist that are usually hidden from view which can provide insights and inspiration to philosophers and theologians working on the intersection of religion and science.

Method

Participants

We interviewed 35 natural scientists across a range of disciplines (Table 1). We recruited most of them through social media (Bluesky and Twitter/X) and some through snowball sampling. Criteria for inclusion were that they (1) hold a PhD in a natural science discipline and (2) are research-active, for instance, in academia, industry, or a (non-)governmental agency. The majority (89 per cent) are academics. Most of our participants are mid-career, several years out of PhD and typically holding senior positions, such as senior lecturer in the UK or full professor in the US (we only had one postdoc in the sample). Our non-academic participants are active in the private sector, governmental agencies such as NASA, and the public non-profit sector. We aimed for disciplinary, geographic, and gender diversity. In our sample, 12 participants are women. Participants have pseudonyms (mostly self-chosen); they will be referred by these throughout this paper.

Data collection procedure

Each participant was interviewed for approximately one hour via Zoom, a video conferencing platform. We conducted in-depth, open-ended, semi-structured interviews. The four set questions are reproduced below:

1. We'd like to start out by learning a bit about the path that led you to your current profession. You can go back as far as you like, including any childhood memories or interests that are relevant.
2. We are interested in hearing your views on oneness. Oneness is the view that the self is an integrated part of a bigger whole, in other words, that you, as a human, are part of an ecosystem, life on the planet, our solar system, the universe. Oneness can be a particular philosophy, or it can be feelings or experiences of feeling at one with, for instance, humanity, nature, or the universe. Did you ever have experiences that make you feel part of a bigger whole, or do you subscribe to such a philosophy?
3. Let's briefly discuss your overall picture of the world. Do you endorse any religious or spiritual views?
4. Has this interview raised particular reflections or ideas that you'd like to share? Do you have any questions for us?

In addition to our set questions, we asked follow-up questions to help the participants clarify their position. Those questions picked up on things they mentioned in earlier answers, so the interviews were to an important extent participant-led. For example, if a participant said she thought life in the universe is common, we would ask *why* she believed it is common. The audio was transcribed by a research assistant, who was not further involved in the research.

Data analysis procedure

We conducted a thematic analysis of the transcribed interviews using the software package Atlas.ti. Because we wanted to gain a nuanced picture of how scientists think of ultimate reality, we used an emergent data-driven approach. We deliberately did not impose existing

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Table 1. List of participants with their field, geographic location, and religious view

Field	Participant pseudonym	Field	Geographic location	Religious view
Atmospheric science and chemistry				
	Ceer	chemistry/ environmental science	New Zealand	Other
	Clement	paleoclimatology	UK	Agnosticism
	Grimlock	chemistry	Singapore	Agnosticism
	Isaac	nuclear engineering	USA	Atheism
	Jim	climate science	Belgium	Agnosticism
Astrophysics and astronomy				
	Ansgar	astronomy	UK	Theism
	Bart	astrophysics	USA	Theism
	Beverly	astrophysics	Canada	Agnosticism
	Boris	astrophysics	USA	Other
	Cezaro	astrophysics	USA	Agnosticism
	Paul	physics	USA	Theism
	Rebecca	astrophysics	Canada	Atheism
Physics				
	Anna	physics	South Korea	Theism
	Arnold	particle physics	Austria	Agnosticism
	Aristocles	experimental particle physics	UK	Theism
	Carlos	physics	Venezuela	Atheism
	Josh	theoretical physics	USA	Agnosticism
	Mark	econophysics	UK	Theism
	Shaun	physics	USA	Atheism
	Shelley	experimental particle physics	UK	Theism
	Yilin	particle physics	USA	Atheism
Life sciences				
	Alexander	geology	UK	Atheism
	Claire	primatology/ecology	USA	Agnosticism
	Eric	evolutionary biology/ herpetology	Australia	Other
	Funbot	plant biology/mycology	Singapore	Theism
	Gabriel	toxicology	Norway	Other

(*Continued*)

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Table 1. (*Continued.*)

Field	Participant pseudonym	Field	Geographic location	Religious view
	Gunnar	evolutionary biology, ichthyology	Iceland	Atheism
	Gwendolyn	paleo-ecology	USA	Other
	Hayden	geography	Canada	Other
	Lola	evolutionary biology	Germany	Atheism
	Olivia	plant biology	USA	Atheism
	René	ecology	USA	Agnosticism
Robotics and AI				
	Alice	climate science/AI	Belgium	Atheism
	Daniel	information engineering	UK	Atheism
	Julie	computer science	USA	Atheism

frameworks from the science and religion literature, such as Barbour's (2000) or Stenmark's (2004) typology. This would be too top-down for our discovery-focused approach. Moreover, we cannot expect that natural scientists are completely consistent in their views. So, we coded at a much lower level than discussions in science and religion tend to go.

Both authors read through the entire corpus of completed transcripts twice, looking for patterns and finding codable moments (see Boyatzis 1998). This type of analysis requires seeing recurring patterns in the data, for example, noticing that several physicists bring up the ultimate fate of the universe. If those patterns appeared widespread enough, and were not restricted to a few participants, we developed a code for it. We used a phenomenological approach, which is premised on the idea that how individuals experience or interpret a phenomenon can help us to better understand it (Moustakas 1994). Working through ten interviews and conferring with each other, we developed a codebook that contains 22 codes (see S1 for the full codebook).

To test the robustness of this codebook, we independently coded 25.7 per cent of the full sample, calculating Cohen's kappa and percentage of agreement between coders about presence or absence of individual codes. For the scripts independently coded in this way, Cohen's k ranged from 0.72 to 1, and percentage agreement ranged from 86.4 per cent to 100 per cent ($M = 92.4$). We coded the remaining interviews together, discussing borderline cases. Participants received a draft of our analysis and were invited to comment whether their views are accurately represented. This provided an extra check on the soundness of our analysis.

Findings

We organize the findings according to the two major research questions we wanted to answer. The first set of findings aims to answer question (1), i.e., scientists' conceptions of ultimate reality. We begin by reporting theist, atheist, agnostic, and other broad world conceptions. Then, we report their views on ultimate reality, framed by the oneness idea. We next move to specific topics, including the place of humanity in nature and eschatology. We then explore views about how nature behaves and relates to us, including the generativeness of nature and animist views.

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The second set of findings provides answers to our other major research question, (2) the relationship of our participants' spiritual, religious, and ethical outlooks to their scientific topic(s) of study. We discuss religious and spiritual experiences of scientists, how they see science as a worldview, the importance of inspiration from the humanities for their conceptions of the world, the sometimes compartmentalization between scientific and religious views of the world, either in our participants themselves or in their field. We conclude that section with how scientists relate their scientific practice to broader ideas about ethics and meaning of life , including ideas about care and stewardship for the planet.

Varieties of religious views among natural scientists

We relied mainly on self-identification to categorize participants in the following larger categories, which we used for subsequent analysis: theist, atheist, agnostic, and other (Table 1). If no explicit self-identification was provided, we determined religious viewpoint through context.

Theism

Eight out of the 35 participants (22.9 per cent) self-identified as theists. Like with the other religious self-identifications, there is a substantial range and diversity in their views. Consider three physical scientists: Anna, Ansgar, and Shelley, who all explicitly self-identify as Christian but who hold distinct positions.

Anna found it important to have her Christian views in line with orthodox Christian thought, and thus drew inspiration from theology (a theme we will see with other participants too, see below): 'I'm a Christian, and I read theology so that I'm not a crackpot Christian.'

Ansgar described his faith journey in detail. He started from a Christian background, then became an atheist with a strong materialist bent, and finally went back to Christianity: 'I read a lot of philosophy and worked my way backwards and arrived again at some point in Christianity, but that's probably because I was biased, and this is a natural ending point of that.' Since Ansgar's overall picture of the world is one of fields of particles and forces, he tried to find a way to insert Jesus into this picture, 'You can't really be a Christian and abandon that [the incarnation]. There are people who do that, who solve the discrepancy between their religion and their scientific worldview by basically taking Jesus out, and then you're done.' But for him, this is not a live option.

By contrast, Shelley, who self-identifies as Roman Catholic, expressed some unconventional views, especially about the incarnation:

> Either everything is a manifestation, the incarnation of God, or nothing is the incarnation of God. And Jesus, maybe, he was one of the most relevant persons who managed, who opened for us, the image of God in a much deeper and profound and humane way compared to the belief that the Jewish at the time, people running the Temple, but I don't think he was the only one … I don't think that theologically it's impossible that incarnation happened also with fishes or cats. Theologically speaking, we need consciousness for incarnation, but I think God can do whatever he or she – I don't know if he is a man or woman – can do whatever he or she wants.

This range of Christian views goes significantly beyond what we typically see in the science and religion literature.

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Atheism

Among atheists, we also see a range of different views, replicating and further expanding earlier qualitative studies on varieties of atheism in scientists (e.g. Ecklund and Johnson 2021). Twelve of our participants (34.3 per cent) were atheist. Several of them expressed sympathy for a tradition without belonging to it. Lola described herself as a lifelong atheist: 'I was brought up as an atheist. And I've never seen any particular need to revise that view for myself. But I do think that the knowledge that this is the only life-planet system we know of makes the world marvelous to me and creates a feeling of care.' Lola sees religious systems such as Indigenous animistic traditions and Jainism as sharing this feeling of care:

> The religions that I see as being caring of the world are not the conventional western religions of today. Jainism where you sweep in front of you, so you don't harm animals – I'm not that, but I certainly sympathize with the impulse. People like to ridicule it, but … I certainly find that I have become much more gentle over time, in the sense that I'm much less likely to swat a fly or a mosquito.

Julie, a computer scientist who described herself as ethnically Jewish and an atheist, drew on the Jewish tradition of the oneness of God as a guard against trying to become gods ourselves: 'I'm an atheist, and I think God as a concept is an important concept for us to have so as to not think of ourselves as one.' She faulted entrepreneurs in AI with doing this:

> It's also hubris. It's humans playing God, trying to convince ourselves and others that we have created something that now has a will of its own. We have not. And this sort of narrative about machines coming out to get us, this is something that is to the benefit of the commercial entities that are designing this technology. And whatever benefits they reap, these are their benefits, but whatever harms may come from this technology, it's not going to be their fault: the fault is of the machines having taken over.

Carlos, who works in complexity theory, sees a connection between his field and Chinese philosophy (notably Daoism):

> The truth in randomness, which is put in the *I Ching* [*Yi Jing*], Jung connected directly with the randomness associated with the throw of three dice or three coins, whatever you are using, to follow the rules of that kind of game. What is called randomness ends up being a metaphor for wholeness, it is the intervention of the whole, including the mentality of the participant, in local and particular events.

Agnosticism

In line with most contemporary philosophy of religion (e.g. Le Poidevin 2010), we conceive of agnosticism as a distinctive position from atheism. This conceptualization fits well with our findings, as several of the nine agnostics in our sample (25.7 per cent) explicitly said they were not atheists, despite lacking positive belief in the existence of God. They offered various reasons and motivations for why they self-identified as such. For example, Beverly: 'I sometimes say that I am a militant agnostic. I don't know, and [with emphasis] *you don't* [know] *either*. I don't identify as an atheist particularly, but I would also not identify with any particular organized religion.'

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Jim, like several other agnostics, motivated his agnosticism by saying he does not have the data to conclude that there are no gods,

> I'm probably agnostic. I'm not an atheist, because I can't prove that there's no God … And I'm okay with being an agnostic. I'm okay with not knowing whether there's anything deeper because I can't prove it. There's no evidence for it. That's very much my view. I'm not ready to believe a story that's unprovable.

Likewise, Clement draws on proof and observation, 'I'm not a religious man. But again, as an observational scientist, I don't think I have the tools to tell whether there is a God or not. But I don't need one. I can make all this happen without there being an author.'

Arnold, a confident agnostic, yearns for but dares not to hope for something beyond the physical world he studies. He enjoys hiking in nature, especially to nearby Neolithic sites where he feels a close connection with the past. He hopes that there would be something intangible in these places,

> not because I need a new frontier of research, but because it would make the world bigger in a sense. It would be exciting to be in a place where so much more is possible than what we can describe in numbers, so definitely that would be something I would really like to have. But as I said, I don't have any hopes that this is the case, unfortunately. But I know many people who can really believe that this is the case, and I know a lot of people that can at least reasonably entertain that this is the case. While I do not think that it is true, that there is more than what science accounts for, this does not stop me from hoping and wishing it to be true.

Other

This heterogenous category incorporates among others spiritual-but-not-religious people, Buddhists, and a pantheist. This conceptual underdetermination is due to an enduring bias in the science and religion literature, which typically juxtaposes Christian theism and naturalist atheism as the only reasonable options, without due consideration for other traditions (e.g. De Smedt and De Cruz 2023). We categorized six scientists as *other* (17.1 per cent), mainly because they have significant religious practices that do not fall under theism, or because they call themselves this, for example, Eric, 'I guess I'm one of those "spiritual but not religious" people.' We noticed Eric's affinity with Buddhism by the Buddha statue that was visible on the screen as we were interviewing him. Asking more about this connection, he drew a strong parallel between Buddhism and his picture of the world as an evolutionary biologist:

> I've engaged a lot with meditation practices, but also with Buddhist philosophy. I think of Buddhist philosophy as very evolutionary. What are the marks of existence? Interdependence, impermanence; I think of the doctrine of not-self, of *anātman* or *anattā*, as essentially anti-essentialism – that's a funny way of putting it – but as an anti-essentialist doctrine that's basically saying that entities do not have *svabhāva*, which is own-being or sometimes translated as 'essence'.

Gwendolyn is a pantheist:

> Religiously, I consider myself a pantheist. Maybe even a spiritual pantheist. I spent a lot of time in high school kind of recovering from Catholicism and the way that

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> Catholicism made me feel very small and insignificant. I discovered pantheism in college. I realized 'Okay, this is the closest to what I believe in', sort of a general spiritual nature: nature is divine. The cosmos is divine, whether there is any intelligence there.

Some of our participants expressed concern with New Age spirituality, and explicitly distanced themselves from it. Gabriel engages in mindfulness and meditation, and at the time of the interview was studying for a license as a certified mindfulness instructor. He did not want to be associated with 'pseudoscience and things like that'. Hayden was the only participant who expressed any affinity with New Age and other new religious movements. As she put it, 'I read tarot. I'm like a woo-woo type of person.' In addition, she draws on Jewish spirituality without identifying with the tradition: 'Jewish mysticism in particular and this idea from Kabbalah, where part of what you're supposed to do as a good Jew would be to find the sparks of the divine … I'm not Jewish, was not raised that way, and I definitely don't practice Judaism, but it really spoke to me as a philosophy.'

Ontology and ultimate reality

Two of our questions probed participants' views of ultimate reality: the question about oneness (2) and about overall picture of the world (3). When we asked our participants about the oneness of the universe, astrophysicists and physicists in particular expressed wonder at the fact that nature is intelligible, that it can be described using laws which can be put into the language of mathematics. As Boris mused, 'Just the very fact that anything could be generalizable seems to me rather mysterious. That if you have some law itself that's arbitrary, why not have a thousand arbitrary laws? Why not have one for every circumstance? So, why there is any regularity at all?' Or, as Paul put it, 'we recognize that there is an intelligibility through the language of mathematics. No one can explain that fact. We take it as a wonder that we cherish, but then it's an open question, how far does that go?' Grappling with this question, three of our participants (Arnold, Boris, and Paul) mentioned Eugene Wigner's (1960) essay 'The unreasonable effectiveness of mathematics in the natural sciences.'

Five physicists and one atmospheric scientist discussed fields as outlined in quantum field theory in relation to ultimate reality. Arnold explained fields as follows,

> Every field is associated with a particular type of elementary particle. There's an electron field, and each and every electron in the universe is just how this field behaves at that point. So, if the field has a certain excitation at a given point, that is what we describe as an electron. Every electron in the universe is just a localized bump in this field, for the whole past and the whole future. And we have about, depending on how you're counting, about forty of these fields, and everything in the universe are just bumps in these forty fields, which stretch from arbitrary times into the past and into the future, and even space-time itself becomes – when you go beyond the point of what we have relatively well-established in the scientific community – another such field.

For some of our participants, these fields are the most fundamental layer of reality. For example, Shelley said that 'in quantum field theory, matter is not matter; it's basically fields'. Jim went even further: 'We are fields. The thing is that particles are ripples in fields.' Arnold concurred, 'At the moment these fields are the most fundamental entities which we have so far seen and understood. Whether there's anything beyond that point, I have not seen any convincing proposal.'

So, what about our everyday experiences? Jim posited,

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> It's very likely that a lot of things are perceptions of our minds, are kind of hallucinations of our minds which we perceived as true but may not be what we think they are. Matter in a way is only perception because it's the way light interacts with certain ripples in the fields, and when we see a wall, when we hit the wall, we don't hit matter, we hit the forces that kind of repel us from the ripples in the fields. So, the fact that a lot of these things are not the way we discern them I find fascinating, because it may mean that a lot of other things that we are perceiving as certain are not actually the way we think they are.

Some theists, such as Ansgar, attempt to draw these scientific explananda into their broader theistic picture of reality:

> To me, there's an abstract world beyond the material world, and you can call it God or anything like that; it doesn't matter. And the laws of nature are part of that – something of an entity that you might call 'God', who may have created all of this. And then the next question beyond that is, on some level I'm able to connect with that entity because, clearly, I'm able to understand all these abstract laws that determine matter and how matter behaves.

Participants frequently discussed the limits of science, particularly with respect to being able to fit consciousness into their overall picture of reality. Atheists, such as Rebecca, tended to see consciousness as an emergent property, which arises from complex purely material relationships:

> I take a very materialistic view of the universe. I think consciousness arises from the collection of the neurons in our brain and the complexity of those patterns from emergence, from having a high enough density of neurons with energy cycling through them. You see the rise of consciousness as babies come into the world, and you see it decline with Alzheimer's as you start to prune away those connections. So, I don't think there is a soul that's separate from that.

Theists tend to struggle more to fit consciousness into their scientific picture of the world. Paul argued that physics cannot explain consciousness or free will, outlining a position that we might characterize as Cartesian Judaism. Central in his struggle with these questions is the tension between monism and dualism, 'if you had to boil down Judaism to one sentence, most people would say the sentence from Deuteronomy [6:4] that we call the Shema [Yisrael], "Hear O Israel, our Lord, the God, is one"'. Paul went on to explain that science offers a monistic picture of the universe as fundamentally one. After the collapse of medieval geocentrism, 'there was a period of several centuries where all we could do was explore a collection of things without understanding its unity, but now, without noticing, we've restored a new kind of feeling of unity … the study of the universe as a whole system.'. This new unified picture, though, runs into a problem. As Paul put it, 'Physicists don't deal with a self. In fact, questions about the self are really an embarrassment to physical science … Points of view don't fit into physics.' To solve this problem, Paul has late in his career turned to philosophy, particularly to Thomas Nagel (b. 1937). In addition, he also draws on his Jewish faith and the writings by Hans Jonas (1903–1993) and René Descartes (1596–1650).

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> People love to beat up on Descartes and say Descartes's dualism is ridiculous and this notion of *res cogitans* is ridiculous, whatever, and this argument that you'll find both in Nagel and in Jonas is that the greatest thing that Descartes bequeathed to us is the separation out from everything of a physical world because that is the aspect of nature that laws of nature can be applied to. And you had to get the personal out of it to see that there could be law-like behavior, but that we shouldn't discard that insight – that insight was really profound – you could make progress that became science by taking persons out of it and finding the rest of the world. And from that point of view, it's then ridiculous to think that 'Oh, we can just keep using the methods of science and we can explain the personal.'

This Cartesian Judaism also influences how Paul views himself:

> We're not very unified as human beings, but we are at some level. Also, when I die, it's going to be a physical event, but something is going to happen to the personal side of me as well. We have intimations of a kind of unity even at the personal level. Presumably, there is some kind of unity, and if you want to apply the word 'God' to just the personal face of that unity, or say God is the unification of both aspects of that but I think that's where the words and the thoughts point.

When reflecting on ultimate reality, participants frequently mentioned inspiring role models on how scientists can engage with such deeper questions. The most frequently mentioned are Carl Sagan (1934–1996) (Beverly, Mark, Gwendolyn, Claire, and Rebecca) and Albert Einstein (1879–1955) (Jim, Boris, Paul, Aristocles, Shelley, Beverly). Our participants admired Sagan's ability to make physics and astronomy understandable for a broader public. Several of them watched his shows growing up. They quoted, in various forms, Sagan's remarks about humans being a way that the universe can know itself. For example, Mark said 'Carl Sagan in his famous *Cosmos* TV series, wherein one of the episodes he makes this statement where he says that we are a way for the universe to know itself, which I still think is a very beautiful way of phrasing that'. (The actual quote is at the top of this article, Sagan 1980, 345.)

Our participants also appreciated Einstein's broader engagement with existential questions and his use of religious language to express deep philosophical ideas. As Beverly explained, 'There's a quote that I will get wrong, but it's something like "The most amazing fact about the universe is the fact that it's comprehensible." And certainly, there's no reason it should be, but yet, it does seem to be.' (The actual quote is 'The world of our sense experiences is comprehensible. The fact that it is comprehensible is a miracle', Einstein 1954, 292.) Jim, a climate scientist reflecting on the upcoming societal disruption caused by climate change cited a Neinstein, a quote widely but wrongly attributed to Einstein:

> If we've seen how complex societies behave, I think we've been very fortunate in the last hundred years that we're still here in these fairly wealthy conditions. It's what Einstein says: 'I don't know what weapons will be used in the third world war, but I do know what will be used in the fourth world war, and it will be bricks and clubs.' So that's what Einstein said, and I think I very much follow that.

The place of humanity in nature

Having examined scientists' broad ontological conceptions, we now move on to more specific aspects of their worldview, beginning with their philosophical anthropology. What is

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a human being? We coded both participants' discussion of the place of human beings in nature, as well as whether humans fit in a *scala naturae*. The broad picture emerging here is along disciplinary lines: life scientists and atmospheric scientists tend to say that we are just another species, and that there is nothing special about us, even though we have a huge impact on the planet. Here's how the paleoclimatologist Clement conceives of our species:

> You see yourself as a human and a human life being utterly inconsequential to Earth history. But also, we have managed to absolutely change the climate of the Earth with agriculture, and now certainly with fossil fuel burning we've managed to prevent another ice age. So, as individuals and as a species, we are in many ways completely inconsequential to Earth history but have had a massive change on it. It's the same way that photosynthetic algae probably think, if they can think, because again, they are these massive engineers of the carbon cycle.

A specific subcategory of these views we have labelled 'Zhuangzian materialism', a concept that is reminiscent of the ancient Chinese philosopher Zhuangzi (fl. 4th century BCE), who held that nature consists of a myriad of things that keep on transforming into each other. As René describes himself:

> I also see myself as a weird agglomeration of atoms that are organized in biomolecules that were created in a sun, in a supernova, and they come together in me for the next day, week, month, before they vanish from my body and go somewhere else … The food I ate this morning – I had two eggs for breakfast with a piece of toast – and those eggs were in a chicken a few weeks ago, and the chicken got the materials to make those eggs from some corn that was grown by a farmer – maize, "corn," as they call it over here – and that maize is a combination of carbon dioxide and water and a few nutrients from the soil and a bit of sunlight to catalyze photosynthesis. So, those eggs are on the way to becoming me right now, and in another day, they will be assimilated into my body, and they'll go into my mitochondria. They'll go into my various cells around my body where they will stick around until those cells decay and become broken down and excreted, and off they go to do something else.

Ansgar used to share this view, and felt at peace with it during his atheist phase, before he returned to the Christianity of his childhood:

> There was a clear understanding that my atoms were part of the universe, and I knew where they were coming from; I knew where they were going, and my entire being was incorporated in that evolution of the universe. It was very material and very much based on atoms – where are they coming and where are they going. That gave me some confidence and structure.

Among astrophysicists and physicists, the Saganesque picture of humans as a way of the universe to experience itself prevails. Many of them see human consciousness as our defining feature. Take Beverly: 'Asteroids are not building their own telescopes. And so, we are obviously very small and are unlikely to have an effect on the rest of the universe. I think we are still special in what we can do compared to other parts of the universe.'

Shaun held an intermediate position. On the one hand, 'we are not special within the universe. There's nothing about human beings that separates them intrinsically from other aspects of the universe.' However, 'We have capacities that are different from other animals.

https://doi.org/10.1017/S0034412525000083 Published online by Cambridge University Press

We are continually doing experiments and being impressed by the capacities that animals do have. But none of them invented calculus. None of them have podcasts.'

While seeing humans as special correlated more with discipline than with religious belief, intriguingly some theists made explicit links with a religious *scala naturae* view. As Anna put it,

> If you think of the hierarchy in different ways, it's like everything was made such that we will be here. I think there is an expression of a 'crown of creation.' Usually, the crown is very small compared to the person. The person is the universe, and we're the crown, or the jewel on the crown. You could say the crown is the Earth, and we're the jewel.

By contrast, Alice, who explicitly sees the human mind as emerging from physical matter, averred, 'I'm just matter. I'm just running on a meaty computer, and that kind of, the fact that I'm just made of the same stuff as the planet, as all the planets, as the couch that I'm sitting in somehow is a bit humbling.'

Related to the question of humanity were reflections on the afterlife. Most of our participants who brought this up were agnostics (55.6% of agnostics, N = 5). A representative quote is from Grimlock, who, like other agnostics, is torn between the view that death is the end and the hope for some continuation:

> My view fluctuates between two ends. On one end, the logical self says that 'okay, when my time is up, I expire', and that will be up, full stop. This feels rather bleak, and I console myself, it's a bit like going to sleep, and that's it. Although it would be nice, just this notion, I used to be really frightened when I was a child about this notion, we will become a full stop and that's it. I'm not sure how to reconcile that feeling of non-existence. There is an irony because non-existence, there is nothing there, so why are you worried about nothing? … But, hey, maybe I might be lucky and good things happen and, hey, I would like to see good things continue. So those are the two ends about how I feel about things.

Eschatology: question marks about the heat death of the universe

Just like the place of humanity in nature, views about the end of the world constitute a central element of many worldviews. Hence, it is perhaps not unexpected that many of our participants, particularly astrophysicists and physicists, spontaneously brought up thoughts about what the end of the universe will look like. To our surprise, even experts working on this topic in our sample did not think the 'heat death of the universe' (to use an old term) is a done deal. For example, Isaac said,

> The argument on which this is based is something I don't think we really understand well enough at the moment to make such bold predictions. I think there are too many simplifications in these statements that I would not say 'okay, that is settled, this is the fate'. On a certain assumption that is what happens; that is what will happen. But several of the assumptions that are underlying that is something we're still actively working on, so that's the reason why I'm not necessarily convinced that this needs to be the only way.

In a similar vein, Mark cast doubt on very long-term predictions, highlighting the uncertainty that comes with forecasting so far into the future:

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> I would consider forecasts that go trillions of years into the future – I find them entertaining, but I don't give them a lot of credibility … I think the entropy death of the universe, I don't see it coming yet, even though I totally accept that if you take particular models and you take time towards infinity, then, yeah, that's what happens, but that's what happens in those models.

Paul thought reflection on this was whimsical:

> Physicists would say, or cosmologists would say, 'I really hope the universe turns out to not be expanding forever, I really hope it re-collapses.' Why would you have a dog in that fight? Why would you think 'oh, that's great, the universe is going to crash together in fifty billion years', or the opposite thing? I no longer understand why people attach value to that as opposed to a gazillion other things that are going to be more important.

Generativeness: the creative power of nature

Our participants not only discussed what they believed to be basic constituent elements of nature, but also creative and agentive properties of nature, such as its inherent creativity and its responsiveness to our agency, which we report in this and the next section. We coded as 'generativeness' participants talking about nature as intrinsically creative and generating new things, through its sheer vastness, through the power of extinction events, or by organisms shaping their environment, and thus the further conditions of their evolution. The idea that the universe is generative is an ancient idea, which we can find in authors such as Democritos and Lucretius.

Atheists and agnostics discussed this topic most and in depth: 66.7% (N = 8) of atheists, and 66.7% (N = 6) of agnostics talked about nature's generative powers, compared to 25% (N = 2) of theists and one other. This is unsurprising since if you lack a creator god or gods, it makes sense that nature would be capable of generating this richness and complexity on its own. For example, Cezaro studies exoplanets and has a research interest in exobiology. He is convinced there is alien life in the universe and situates that generative power in its age and size:

> When I think of the enormity of the universe, I start thinking about how many civilizations have been in the universe before us and are probably not alive anymore. It makes me think that it could very well be that we are just one of many civilizations that arose recently, but also, there could older civilizations that have already died and become extinct.

Gunnar, echoing many other atheists, also thinks life in the universe is likely common: 'I think just as a sheer numbers game, there's just so much stuff out there, I think there's gotta be life somewhere. Who knows what it looks like or how complicated it is. But I would find it hard to believe that there wouldn't be.'

Claire agreed:

> Statistically speaking – and having grown up listening to Carl Sagan and all those wonderful shows and things – statistically for the processes of evolutionary change to happen only here and not on the whatever trillion number of planets – I don't even know the number – for it to only happen here, 'only' seems limited to me and unlikely.

https://doi.org/10.1017/S0034412525000083 Published online by Cambridge University Press

Animism

Eight of our participants (22.9%) were explicitly animist or admitted to such beliefs while venturing outdoors. By 'animism' we mean a philosophical stance that attributes personhood to non-human entities, including such things as rocks, mountains, and clouds (see De Smedt and De Cruz 2023 for a discussion). There was no correlation between religious credence and animist beliefs. Mark is a theist animist who likes mountain climbing in his spare time. We interviewed him while he was recovering from a minor climbing accident. He phenomenologically senses that mountains respond to him in a way that goes beyond what a non-living thing would do: 'I have a similar hesitation to make a strong distinction between the biological nature and the non-biological. And that very personally expresses itself in the fact that I like to climb. Because climbing a mountain is having a conversation with the mountain.' Asked whether he thought mountains were alive, he replied,

> I would be very comfortable saying that it is a, you might say, presence. A presence is more than just an amount of a tonnage of rock at a certain place. It's a thing that has impact on the people that see it, that live around it, that interact with it. It has a past, it has a future, and it evolves. And it just evolves on timescales that are almost incomprehensibly slow for most of us.

Alice is an atheist animist who feels happiest when she is out in nature, 'I feel like we're supposed to be outdoors enjoying nature and forests and lakes and whatever and rocks, and not sitting in offices behind screens, although it's still what I do a lot of the time.' Being in these surroundings, she feels a strong connection to the landscape, for instance, when she is clearing a climbing route of loose rocks so other climbers or belayers don't get injured.

> I have to say, I felt a bit bad. I'm disturbing this rock that has been lying here for millions of years, and now I'm just throwing it on the ground because it's loose and might kill someone. Yeah, it makes sense to not kill someone, but on the other hand, it feels like I'm invading this million-year-old rock face.

Likewise, the pantheist Gwendolyn anthropomorphizes her environment,

> I'm a terrible anthropomorphizer. I talk to rocks. At the risk of embarrassing myself, I don't think it is any less likely that a rock has a soul than something with a heartbeat. Okay, a plant doesn't have a heartbeat, but – I don't know; I just feel like there is some sort of force that threads through all of creation. It just takes different forms and shapes.

Gefühl: the varieties of religious and spiritual experiences

Having discussed our scientists' worldviews, we now look at how they relate their spiritual, religious, and ethical outlook to their work as scientists. We first probe their spiritual or religious experiences in the context of their work. About 74% of our participants (N = 26) mentioned some religious or spiritual experiences while doing their research. We coded these as *Gefühl*, which is Friedrich Schleiermacher's (2016 [1830]) term for a feeling of relative or absolute dependence on nature or God, a useful way to conceptualize these experiences in the context of our framework. There was no difference in how often theists, atheists, agnostics, or others mentioned these experiences, though their personal reflections on them were clearly colored by their religious positions. To give a flavour of the

https://doi.org/10.1017/S0034412525000083 Published online by Cambridge University Press

richness and diversity of spiritual experiences in our sample, we will here focus on two participants who diverge in disciplinary and religious respects. Bart is a Roman Catholic astrophysicist:

> Nature is a presence to me. It's not just a bunch of sensory facts happening to me; it's not just the environment I'm in. Someone walks into the room; the room is different than before, there's a presence. I started to feel like that about nature. If you know someone is going to be somewhere and you miss the appointment, you're sad. If I miss a meteor shower – and I often do these days as I'm raising a family and everything – I don't get to see all of them, but I'm sad about them. I miss them like I would miss a person.

Bart not only feels this sense of presence as he watches meteor showers or goes hiking (as he wryly observes, 'You go on a backpacking trip, you realize this pretty quickly: nature is not your friend') but also in his research, being part of NANOGrav, the large team that recently found evidence for gravitational waves from supermassive black holes:

> It was in the middle of Covid. And I remember exactly where I was sitting. It was in my attic, with everyone doing remote work. And that was me looking at a graph, but I felt the same sense that this is a presence, that it's for me somehow, or it was relevant to me.

Bart tries to square this sense of nature as a presence with his commitments as a Roman Catholic, in observations reminiscent of medieval Christian mystics who wish to avoid panentheism but formulate positions quite close to it, such as Nicolas of Cusa (1401–1464):

> I don't want to just jump to that either and say 'Oh, that's the answer. That's God.' It's also an experience, and obviously Christianity isn't a faith that would say 'nature is God', so I don't want to just say 'Oh, obviously.' So, to me it's something kind of in-between. It's not quite personal. But it's not just a thing, either.

Lola is an atheist evolutionary biologist. Like Bart, she senses a strong connection to the natural world. She faults genetics with taking out the phenomenological experience of the uniqueness of animals. Over the years, she has developed a spiritual feeling of nature, becoming able, 'to be really deeply interested, to be able to just gaze at the way a droplet of water rolls off the leaf of a nasturtium and to find this beautiful and sort of transfixing'.

Lola has acquired a feeling of deep connectedness with nature. Earlier in her career, she thought mostly in terms of genes, and saw a big separation between the living and the non-living world.

> And now I see the whole thing as an evolving entity, and so I think about rivers, I think about the advent of trees, the first forests, how that changed the flowing of rivers, making them more meandering, often a lot more wandering, more gentle. And then I think about what we've done to rivers and how we've sort of imprisoned them and how rivers keep on having the last laugh … The amount of sand that we're moving around to try and sustain beaches, it's just completely crazy. It's completely mad. It's a shame. I don't know. It's a beautiful, beautiful world.

https://doi.org/10.1017/S0034412525000083 Published online by Cambridge University Press

Lola draws on inspirational figures such as the French oceanographer Jacques-Yves Cousteau (1910–1997) and the Marxist theorist Rosa Luxemburg (1871–1919) 'who was imprisoned in Germany before she was eventually murdered and thrown into the Landwehrkanal … When she was in prison, she would write about the flowers outside her prison cell.' For Lola, being attuned to nature in its richness and diversity is a valuable skill. She explains this in virtue ethical terms:

> It can take people beyond themselves. I would love it to be a skill that can be developed, because I believe it can be developed, because I didn't use to have it, really. And I think that now I have it much more, and I'm sure that could continue to grow and be enhanced.

Science as a worldview

The findings reported in the previous section hint that for many of our participants, science is more than a job – it is imbued with meaningful personal experiences. For some of our participants, science is a comprehensive worldview by which they approach their life: they regard science as a set of dispositions and sometimes virtues, that help them to make sense of, and find meaning in the world.

For example, Daniel is an atheist precisely because of his disciplinary background as an information engineer. 'I'm an engineer. I want to construct solutions to the problems I see. And that's basically the framework for my life, constructing solutions, and I don't see how those alternative frameworks [religious beliefs] would help me.'

For Yilin, the scientific worldview is open and without preconceptions:

> I'm very open to receiving more information or being surprised, or to change my mind. I think that is actually quite a general approach. I don't have a lot of opinions in the sense that there is a lot of things I don't know, and if I don't know, I don't have any preconceived notions of it.

Most of our participants who mention science as a worldview are atheists (N = 9, 75%) and agnostics (N = 5, 55.6%). Only half of other (N = 3), and a minority of theists (N = 3, 37.5%) avow to holding such a view. One such theist is Shelley, who sees the scientific worldview as uncompromising honesty, 'we [scientists] don't have a concept of sinning, of doing something that breaks some rules given by a god like a table of commandment. This is not something that is affecting us, but we have this honesty that affects ourselves.' Shelley also attributes this disposition of honesty to his unorthodox views of the incarnation, sketched above.

Claire (agnostic) admits that she unconsciously uses the tools to study primate patterns of behavior to think about human interactions:

> Seeing what falls out of those patterns, predictions from those patterns as I interact with people … the way of categorizing, the scientific method, the western scientific method component of how I look at problems or hypotheses, testing and building, probably enters into how I maneuver through the world in that sense.

Ceer (other) likewise says 'certainly in the physical world, chemistry was the paradigm through which I interpreted and for me gave great unity'. Olivia (atheist) gives us a detailed insight into how a scientific picture of the world informs her broader outlook, and how she was drawn to this as a child:

https://doi.org/10.1017/S0034412525000083 Published online by Cambridge University Press

> Perhaps one of the reasons I was so strong into the scientific worldview is I was raised going to church every Sunday – nothing crazy, just what seemed like a fairly normal situation – but I never really was sold on it. I was never super comfortable with this. What I wasn't comfortable with was asking to believe in something that I couldn't actually see.

By contrast, the scientific method she learned in school was something that *did* make sense.

> The way I learned science – I was in public schools – was really as a worldview. It's a way to take in information from wherever it is you're seeing, to think critically about it, to develop hypotheses, ways to test those hypotheses, and then based on information and data gathered to expand your understanding. To me, this was a very reasonable, sensible, logical way to approach the universe, and I knew that from a very young age.

The relationship between science and religion: scientists situate themselves in a cultural tradition

Given how natural science constitutes a worldview for several of our participants, one might expect that the humanities would recede to the background. However, this is not the case. Many of our participants unexpectedly discussed theology, philosophy, or other humanities as a direct inspiration for their scientific work: 34.3% (N = 12) of our participants mentioned such influences, and we found them in all disciplines examined, except for robotics and AI. Thus, natural science and humanities do not compete but are complementary when it comes to meaning-making. Here, we discuss two physicists, to show how thoroughgoing this engagement can be.

Mark has a strong affinity with Dutch Calvinism of the sixteenth to seventeenth centuries. He had a religious upbringing, 'We were living in a majority Catholic area in the Netherlands. And you might say the only church was the church at home.' Mark experienced 'a very strong connection to that particular form of Calvinism, the church of all places and all times, which I think is a very beautiful concept'.

Though he values his Calvinist heritage as part of his identity, Mark is explicitly anti-dogmatic: 'If somebody would ask me whether I believe in the existence of a God, I would tend to say "yes." If someone were to then confront me with a whole list of, you might say, standard assumptions from Christianity, I would say "I don't know."' As he went on,

> When we're talking about having a debt to the past, because I know my way in Calvinist theology quite well, in these kinds of conversations [between people of different religious views], what I tend to say is, if I were to take my point of view as literal or as black-and-white as that person does, then this would be the position that I would need to take, and we would have a severe problem … I would say it's fine for me to believe in the existence of God and the existence of a kind of destiny that you're guided towards, but I'm not prepared to take it so literally that I would require anyone else to see it the same way. But at the same time, I can have very strong feelings about it.

Asked about whether he thinks there is a destiny to the universe, he replied, 'I would almost respond to that in John Calvin's way by saying "yes, but I don't know what it is."' He continued,

https://doi.org/10.1017/S0034412525000083 Published online by Cambridge University Press

> If I look at, say, 16th-century Calvinism … then you see this notion of predestination/destination act as a consolation for people who are persecuted. And you might ascribe a sort of guiding force to the universe or, say, the spirit within the universe that I feel very comfortable with. As soon as it turns to an institutional form, then I struggle a bit more, even though I essentially grew up in a Calvinist family, or the way I would put it, a Calvinist diaspora family.

In a similar vein, Aristocles sees himself as part of a long continuous tradition, that goes back all the way to the Chaldean astrologers:

> I like to read old philosophers or old scientists and try to understand what they were thinking, and I can feel the connection. I can feel the continuity. And I can say that now we know these things, or we think we know these things, and we can go back and talk to these people. And if Plato was here, he would come and talk to us. He would definitely – well, maybe not only to us but to other people as well. I feel this continuity, and this is actually what makes me feel that I'm an heir of this intellectual endeavor that continues.

He is also influenced by his Eastern Orthodox faith and upbringing. He sees a strong link between these ancient worldviews and contemporary theories in cosmology: the universe is eternal, unlike the temporal cosmos that came into existence.

> If you ask what physicists believe, they will tell you that the universe is eternal, but then we will tell you that the universe was created in Big Bang, and it looks like there is a contradiction, but there isn't, because clearly the universe that we live in was created – well 'created', I don't know, but developed from an early hot state. In Ancient Greece, there is a difference between the universe and the cosmos … Plato believes that the cosmos was created but that the universe is somehow eternal. And if you think what they believed doesn't make sense, it's not very different from what we believe now, which is clearly that the universe that we live in with atoms, the planets came to be, but the universe as a whole – not the cosmos – the universe as a whole was eternal, just existed, not created, just existed as a state.

Likewise, the Greek church fathers had the idea that 'the universe was forever, and in Aristotle – I think – the universe is forever, and they would say "How did God create the universe if it was forever?," and the creation in this respect was beyond time. And to me that absolutely makes sense.' Aristocles faults western Christianity with its emphasis on temporal creation, which in his view is akin to polytheist religions.

> I'm raised Eastern Orthodox, and I never had a doubt that the universe was created beyond time. In school, we would consider it very naive for somebody to believe that we have somebody like Zeus who created the universe in this way. Nobody would believe it, and none of my teachers at my school believed that, and there is a distinction between having a godlike Zeus and a polytheistic kind of religion [on the one hand] and monotheistic religion [on the other] … Although I have been a Christian, now that I'm abroad, most people are kind of polytheistic. They see God as Zeus somehow, with the old type of religion. I'm always confused about that; I find it very difficult to understand those people.

https://doi.org/10.1017/S0034412525000083 Published online by Cambridge University Press

Moreover, Aristocles expounded:

> People in the west are obsessed with ontology. They only want to see 'What is this and what are its properties?' And most of these people who are obsessed about that don't actually know anything about that. They don't have the training; they haven't actually read anything. To me it looks very strange that somebody has to insist on ontology so much without actually understanding it. … The universe is in God and the God is probably bigger than the universe, which sounds pantheistic, but I don't think it is necessarily so. Panentheism is probably a better idea. To me this view sounds more satisfactory.

Compartmentalization between religion and science

In the previous section, we saw participants who were able to weave their religious, philosophical, and scientific views into an integrative whole. But not all participants see such a harmonious relationship. Nine participants (25.7%), the majority theists and other, compartmentalize their religious views and their work as a scientist. For example, Paul, discussing free will and selves, said,

> As a human being you can't ignore it. You take for granted that you're a self, and then what's the relationship between other selves, and how is that self related to the universe? As a [natural] scientist, we have no clue … there we get into issues I was never comfortable even talking with my physics colleagues about because physicists are proud to ignore this kind of stuff.

At the end of each interview, when we invited further comments or reflections, several participants said they had never discussed the views they just voiced with anyone else. Gwendolyn told us,

> I've never talked about some of these things … in the context of my identity as a scientist. It's something that I'm used to compartmentalizing because I think it's not intuitive, or I think I carry around some of the same stereotypes I think people have, that my colleagues will find this silly or non-scientific.

Natural scientists find themselves in a tricky position, trying to find some connection to other scientists with similar ideas. As Ansgar pointed out,

> There are scientists with really interesting worldviews, and it's sometimes difficult to find them because we don't talk about that at all. I very rarely discuss my Christian roots with colleagues because it feels like you're embarrassing yourself. And when you accidentally find someone who has similar or adjacent views on that, it becomes very interesting, but it's often a tricky balance to strike.

Josh was the only participant who mentioned the broader science and religion context of Indigenous worldviews. He talked about the planned construction of a large telescope on Mauna Kea, a Hawaiian volcano. This Thirty Meter Telescope (TMT) causes a lot of controversy, as the volcano 'has some of the best observing conditions on planet Earth, but, of course, it's also revered by native Hawaiians as a holy place that should not be trampled up'. As Josh explained, many of his colleagues have no problems putting the telescope there despite protests of Indigenous people:

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> The Western physics apparatus does not see the mountain as a being, and that's the whole point of it, that these 'uneducated' or 'superstitious' people think this. But deep down we know the mountain is not a god. 'So, we're not going to do this science, and we're not going to build this because of these people who believe that thing?' There's a rejection of that idea of oneness as even being a thing that we respect in other people.

At this point, among physicists and astrophysicists,

> being a TMT supporter is like, 'Wow, I will not interact with that person because they are a TMT supporter.' But on the flip side of it, it's like, 'Well, I'm not going to interact with that person who's trying to ruin our profession.' So, there's been this conflict and polarization, but I have not seen a move towards a resolution yet.

Stewardship and meaning of life

Reflecting on broader questions of ethics, the meaning of life, and purpose often brought explicit connection between meaning and participants' religious commitments. Some of our religious participants drew on a Christian notion of stewardship and co-creation (see e.g. Eom and Ng 2023 for a theoretical exploration). For example, Funbot does significant public outreach to warn people about climate change and unsustainable consumer patterns. She tries to raise awareness for sustainable forms of ecotourism that might help countries in the global south such as Indonesia to preserve their natural resources. She mused,

> How effective I am, I'm not sure, but I am part of this picture that I'm trying to move the colors so that the colors paint a more beautiful picture rather than a picture that is full of death and extinction and pollution and all that. I'm trying to make it a bit more beautiful.

In these efforts, Funbot is guided by her Christian faith. She outlines a view of humans as co-creators with God,

> As a Christian, God created all of us, so we are part of his creation. I mean God created us last according to the Holy Bible, and he is most happy with us, and yet we make such a big mess of his creation, so it's really asking God's wrath. We are waiting to be whacked.

Agnostic and atheist participants talked about creating meaning, or about the meaning of meaning in the light of their naturalistic picture of the world. For instance, Shaun, who calls himself 'absolutely 100 percent naturalist' said that compared to religious pictures,

> The more promising way forward is to understand how people like you and me can arise out of the emergent collective behavior of particles and forces being governed by the laws of physics as we currently understand them. This is part of being a moral anti-realist and constructivist; it's part of thinking that there is no afterlife: when we die, we're gone. It's part of thinking that meaning and mattering and caring are all things that we construct for ourselves.

Connected to this picture that we make our own meaning is Shaun's commitment to pluralism about meaning:

https://doi.org/10.1017/S0034412525000083 Published online by Cambridge University Press

> The people who tend to write and talk about creating meaning and purpose in your lives tend to be intellectuals, or at least people who tend to be thinking about these things on an everyday, deep basis, and the answers they come up with don't necessarily apply to the majority of human beings. If someone's idea of a successful life is going to a 9 to 5 job, raising a family, and playing video games for the rest of their life, that's fine with me if that's what makes them happy and they're not hurting other people. That would not be my idea of a fulfilling life, but that's okay. I'm 100 percent pluralist when it comes to finding meaning in your life.

By contrast, Alexander questions whether we need meaning:

> When I think of the universe, I think of it as something vast, beautiful, but I'm not necessarily sure there's a purpose or a meaning to the universe. And I must admit that at different parts of my life, that can seem a bit oppressive to me. You think, shouldn't there be meaning? More recently, I feel that the argument that things should have meaning has become quite oppressive. And maybe I'm drawing a ludicrous analogy here, but let's face it, we come from a country where work is meant to provide meaning. Where finding meaning in what we do is used by our capitalist system to extract labor from us. So, I think saying that things must have meaning – right now, I'm in a place where I sort of reject that – and isn't there peace in just saying, no, there is no meaning. We simply exist.

In his role as climate scientist, Jim focuses on his connection with humanity as a driving force for communicating the dangers of climate change. He describes himself as 'someone who is concerned about society, is concerned about the bigger whole. I am concerned about values.' For him, the dangers of climate change lie foremost in societal disruption. He finds communication about climate change that shows polar bears perched on floating pieces of ice misleading, 'because they [the public] thought it was just about polar bears, and it's actually about us'. Jim has taken on this commitment, fighting for the continued survival of human societies.

> I want to stand on a roof and scream at people that we have to do something, we have to stop doing what we're doing, but of course that wouldn't help too much. What I'm trying to do now is I'm trying to teach as good as I can and teach what the problem is. I hope that people understand.

He thinks his continued effort is worthwhile, even as several tipping points are reached, because

> We're facing a threat to the way we're living. And there's no cost of climate change. There's a cost of doing nothing. And that cost is a lot bigger than the cost of taking action on climate change. So, we're not faced with doing nothing and doing business as usual or taking action on climate change and saving the planet. The only two options that we have is kick the can down the road and making the problem a lot bigger and more expensive, or investing now. … I think we should fight for every half degree that we can. We should fight for every little bit that we can do.

Lola also ponders how to take care of the planet:

https://doi.org/10.1017/S0034412525000083 Published online by Cambridge University Press

> I would describe myself as an Earth-ist. And I don't think of that as being religious so much as philosophical, if that's not too grand a way of putting it. But I think about planetary care and about, to some extent, Voltaire in *Candide*: he finishes with how everybody should tend their own garden. There are many ways you can interpret that, but you can also interpret it literally. And the idea that actually looking after the other forms around you as well as you can and encouraging their lives is an act of generosity.

Although she is a pantheist, Gwendolyn aligns herself with an atheist view of making meaning:

> I'm not an atheist, but I've heard atheists say that the absence of a God makes them feel a stronger commitment to each other because the commitment is the reason. You're not doing it for some later reward. You're not doing it so you avoid punishment. You're doing it because it's the right thing to do, because we've decided that. And that's how I feel.

But she also finds meaning in the stewardship towards the extinct animals she studies:

> Woolly mammoths aren't alive, but they're very real to me. They're real to me not just in terms of a sense of wonder that they impart, but they are also real to me in the sense of responsibility that I feel to do right by them. There's a kinship feeling there. I feel like it's inappropriate for me to – let me back up. I feel a responsibility. It's an honor and a privilege to work with these creatures that are no longer with us. I'm finding myself getting choked up just talking about it.

Gwendolyn connects her work with extinct animals to an ethics of care:

> I get a lot of comfort in thinking about the resilience that we've seen in the past, but I also feel a tremendous sense of responsibility. If there had not been a mass extinction event that wiped out the dinosaurs, I would not be here. And I can't repay dinosaur kind for that sacrifice. They weren't consulted. It wasn't consensual. But it makes me feel more of a sense of responsibility to be a good steward and to be a good ancestor now, so I see myself as owing dinosaurs just as much as I owe future generations.

Discussion and concluding remarks

We sought to answer two research questions: (1) How do natural scientists conceive of ultimate reality? What is their ontological picture of the world/universe? (2) How do natural scientists relate their spiritual, religious, and ethical outlook to their scientific topic(s) of study? As we have seen, natural scientists hold a sophisticated range of views that are influenced both by religious self-identification and disciplinary field. We were especially struck by how they regularly turn to philosophy and theology to guide their forays into ultimate reality. As there was a certain hesitance among natural scientists to discuss these topics with colleagues, most of our participants have developed these views largely on their own, with the help of the aforementioned literature.

Interviews were participant-led. Several themes that came back are not topics that are regularly discussed in the science and religion literature, but that nevertheless concern natural scientists: the place of humanity in nature, the ultimate fate of the universe, the

https://doi.org/10.1017/S0034412525000083 Published online by Cambridge University Press

fact that as humans we have a responsibility towards other life on the planet. We also saw how practising astrophysicists are confronted with Indigenous religious views and as a discipline take a colonialist and uninformed stance toward it. For example, some features of the landscape such as volcanoes are seen as persons, a view that is rejected by western science. The study of this interaction is an important lacuna that can be filled in future work in science and religion.

Many natural scientists presented a coherent and sophisticated picture of the world, influenced by various philosophical and religious traditions such as Daoism, Buddhism, Calvinism, Eastern Orthodox Christianity, and ancient philosophy. Several times they brought up ideas that were clearly inspired by philosophy, such as Grimlock's observation that death should not bother him since he will not be around to be worried about it, which is an argument that occurs in Lucretius (2007 [ca 50 CE]), and Jim's Kantian view on human perception. In addition, especially atheist scientists regard science as more than just a job; it is a worldview with which they make sense of reality, reflecting what it means to be human. Regardless of religious affiliation, many of our interviewees feel a strong urge of care and responsibility towards other humans, the organisms they study, and the planet we share.

The literature on religion and science is dominated by a few high-level narratives, which see science and religion as either incompatible or relating in specific ways such as independence and integration. These models do not do justice to the more nuanced picture of both integration and tension that practising scientists unveiled in our interviews. This paper, by giving voice to a wide range of natural scientists who are diverse in discipline, religious view, and geographic location aims to further fill out this picture in all its rich and disparate details.

Supplementary material. The supplementary material for this paper can be found at https://doi.org/10.1017/S0034412525000083.

Acknowledgements. All research methods were approved by Saint Louis University's IRB, #33297. We thank our participants for reflecting on their lived experiences with such depth and thoughtfulness. Moreover, we thank an anonymous reviewer for their very helpful feedback to this paper. A shoutout to Ryan Powers, Helen's RA who ceaselessly toiled to bring the spoken interviews into written format.

Financial support. This article was funded by a grant from Experimental Philosophy of Religion, a Templeton-funded project via Hillsdale College.

References

Barbour I (2000) *When Science Meets Religion: Enemies, Strangers, or Partners?* New York: HarperCollins.

Boyatzis RE (1998) *Transforming Qualitative Information. Thematic Analysis and Code Development*. Thousand Oaks: Sage.

Cialdini RB, Brown SL, Lewis BP, Luc C and Neuberg SL (1997) Reinterpreting the empathy–altruism relationship: When one into one equals oneness. *Journal of Personality and Social Psychology* **73**(3), 481–494.

De Cruz H (2024) The relationship between science and Christianity: Understanding the conflict thesis in lay Christians. In Nagasawa Y and Zarepour MS (eds), *Global Perspectives in the Philosophy of Religion: From Religious Experience to the Afterlife*. Oxford: Oxford University Press, 161–175.

De Smedt J and De Cruz H (2023) Animisms: Practical Indigenous philosophies. In Smith T (ed), *Animism and Philosophy of Religion*. Basingstoke: Palgrave MacMillan, 95–122.

Ecklund EH (2010) *Science Vs. Religion: What Scientists Really Think*. New York: Oxford University Press.

Ecklund EH and Johnson DR (2021) *Varieties of Atheism in Science*. New York: Oxford University Press.

Ecklund EH and Scheitle CP (2007) Religion among academic scientists: Distinctions, disciplines, and demographics. *Social Problems* **54**(2), 289–307.

Ecklund EH, Scheitle CP and Peifer J (2018) The religiosity of academic scientists in the United Kingdom: Assessing the role of discipline and department status. *Journal for the Scientific Study of Religion* **57**(4), 743–757.

Einstein A (1954) Physics and reality. In Bargmann S (trans), *Ideas and Opinions*. New York: Bonanza, 290–323..

Eom K and Ng ST (2023) The potential of religion for promoting sustainability: The role of stewardship. *Topics in Cognitive Science* **15**(3), 480–499.

Evans MS (2016) *Seeking Good Debate: Religion, Science, and Conflict in American Public Life*. Oakland, CA: University of California Press.
Gross N and Simmons S (2009) The religiosity of American college and university professors. *Sociology of Religion* **70**(2), 101–129.
Ivanhoe P (2017) *Oneness: East Asian Conceptions of Virtue, Happiness, and How We are All Connected*. Oxford: Oxford University Press.
Koyré A (1957) *From the Closed World to the Infinite Universe*. Baltimore and London: Johns Hopkins University Press.
Larson EJ and Witham L (1998) Leading scientists still reject God. *Nature* **394**(6691), 313–313.
Le Poidevin R (2010) *Agnosticism: A Very Short Introduction*. Oxford: Oxford University Press.
Lucretius (2007 [Ca 50 BCE]) *The Nature of Things (De Rerum Natura)*, Stallings AE (trans.). London: Penguin.
Moustakas C (1994) *Phenomenological Research Methods*. Thousand Oaks, CA: SAGE.
Sagan C (1980) *Cosmos: A Personal Journey*. New York City: Random House.
Schleiermacher F (2016 [1830]) *Christian Faith*, Tice N, Kelsey CL and Lawler E (eds and trans). Louisville: Westminster John Knox Press.
Stenmark M (2004) *How to Relate Science and Religion. A Multidimensional Model*. Grand Rapids, MI: Eerdmans.
Wigner EP (1960) The unreasonable effectiveness of mathematics in the natural sciences. *Communications on Pure and Applied Mathematics* **13**(1), 1–14.

Cite this article: De Smedt J and De Cruz H (2025) The restaurant at the beginning of the universe: Natural scientists on ultimate reality, science, and religion. *Religious Studies*, 1–25. https://doi.org/10.1017/S0034412525000083