Religious Studies (2026), **62**, 586–602
doi:10.1017/S0034412525101236

CAMBRIDGE UNIVERSITY PRESS

ORIGINAL ARTICLE

On astrotheology as natural theology

Erkki V. R. Kojonen

Faculty of Theology, University of Helsinki, Helsinki, Finland
Email: rope.kojonen@helsinki.fi

(Received 19 June 2025; revised 30 September 2025; accepted 1 October 2025; first published online 29 October 2025)

Abstract

Astrotheology, the theological engagement with astrobiology and the possibility of extraterrestrial life, has primarily focused on the compatibility of scientific and religious beliefs. However, this article argues that probability and risk assessments play a larger role in the discussion than is commonly recognised, and there is need to learn from the rigour with which natural theological arguments have been evaluated. For instance, the relative urgency and style of astrotheological discourse is affected by ideas of what sort of life is likely to be out there, if any. In this article, I analyse astrotheological risk assessments from the framework of decision theory, using the discussion over Pascal's Wager as a comparison case. Arguments over the fittingness of creating other life forms are analysed through a comparison with fine-tuning design arguments. I argue that while theological engagement with astrobiology remains important, the justification of probability and risk assessments depends on disputed philosophical and theological assumptions. Examining the compatibility of theological systems and ideas about extraterrestrial life is important. However, fostering doubt about these probabilities is also a service that theology can do for astrobiological debates.

Keywords: astrotheology; science and religion; Pascal's wager; extraterrestrial life; natural theology

Introduction

What might be the religious impact of discovering life outside the Earth, and how important is it for theologians to think about the possible nature of extraterrestrials? The most recent interest in extraterrestrials has been fuelled by the discovery of exoplanets, with nearly 6000 confirmed planets discovered outside our solar system at the time of this writing. On generous estimates, there could be billions of habitable planets in our galaxy alone (Wilkinson 2016). However, discussion of extraterrestrial life actually far predates recent trends, and some earlier estimates of life's prevalence were more optimistic. From early modern times until the 1800s and 1900s, it was commonly believed that the Moon and many planets in our solar system also harbour life – a belief which was then contradicted by advances in astronomical knowledge (Dick 2013, 134–135; Playford, Bullivant & Siefert 2024, 44–45).

Nevertheless, excitement about extraterrestrial life is in the air, and can also be seen in the writings of contemporary theologians who engage with astrobiology. This genre of theology, usually termed 'astrotheology' or 'exotheology', has focused mainly on questions over the compatibility of religious belief and extraterrestrial life. Accordingly, many theologians explicitly rule out making any probabilistic judgment about whether such life exists,

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https://doi.org/10.1017/S0034412525101236 Published online by Cambridge University Press

or what sort of living beings there might be. This, it is believed, is more the domain of the empirical sciences than of theology. For instance, Davison states that 'detection might come in a decade, centuries hence, or perhaps never' (Davison 2023, 10) and argues that Christian theology is compatible with all of these alternatives. Meanwhile, Peters points out that 'no one can predict with precision exactly what is coming' (Peters 2014, 453). Indeed, several substantial works on astrotheology conclude there is good reason to believe we may be alone, or at least that encountering other civilisations is unlikely (e.g. Losch 2016; Wilkinson 2013). It is commonly argued that there is value in considering the possibility of extraterrestrial life, whether such life forms exist or not. It might, for example, be a helpful thought experiment that aids in understanding theological claims, or it might facilitate apologetic engagement with contemporary culture (Playford, Bullivant & Siefert 2024, 1–2, 4–5).

Nevertheless, I will argue that probability and risk assessment are essential for astrotheology. For instance, the belief that we are at least likely to encounter extraterrestrial life commonly motivates both scientific and theological discussion, explaining why resources should be devoted to the question. Peters and Davison themselves imply that there is a substantial chance that humanity will eventually encounter extraterrestrial life. Davison (2023, 8) thus points to the 'desire to help the human community (and specifically, the Christian community) to be more ready to receive, process, and respond to any future signs of life elsewhere'. Peters (2014, 453) notes that theologians should 'prepare the public for the eventuality of extraterrestrial contact'. Astrotheologians indeed often see this as an 'eventuality', although the precise reasoning varies. The most common argument in this context is simply the vastness of the cosmos. For instance, according to O'Meara (2012, 7), 'more and more planets in other solar systems are being discovered; their numbers give this theme an importance, an excitement. We are at the edge of understanding the universe in a new way'. Parkyn (2021) similarly argues that the probability of intelligent extraterrestrial life functions as a helpful corrective to anthropocentric theology. Without the exotheological perspective, he argues, Christianity has 'remained theologically geocentric, lagging behind twenty-first century scientific advances' (Parkyn 2021, 8). Many also see theological reasons for believing in extraterrestrials. For instance, creating a plurality of lifeforms is often seen as better reflecting the infinite goodness of God.[1]

There are both pragmatic and epistemic justifications for astrotheology. Practical reasons, particularly those related to the cultural significance of the theme, can motivate theological discussion regardless of whether encountering extraterrestrial life is likely to occur or not. But the relative importance of the topic and the recommended solutions will still be impacted by probabilistic risk assessments. For instance, on the overall motivations of astrotheology, what precisely are the risks and benefits of creating theological space for the existence of extraterrestrials? And does our present scientific and religious knowledge give any grounds for beliefs about what sort of extraterrestrials we might encounter? For instance, should belief in God's goodness really increase our confidence that extraterrestrial life is out there?

Although astrotheologians already discuss such issues, there is need for a more precise analysis of the motivations and probabilistic underpinnings of astrotheological ideas. In this article, I will argue that astrotheological discourse can gain further precision through comparison with longstanding discussions concerning the existence of God in philosophical natural theology.

I will argue this using two comparison cases. The first compares astrotheology and Pascal's wager. I argue that astrotheological risk assessments can be better conceptualised through decision theory, as has been done concerning Pascal's wager. Both defences of, and objections to, Pascal's wager also apply mutatis mutandis to this 'astrotheological wager' and illuminate the pragmatic case for doing astroteology. I argue that a pragmatic

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justification of astrotheology requires balancing risks, giving most attention to possibilities that have high probability and/or high risks and rewards. While the existence of extraterrestrial life remains speculative, theological solutions that do not require substantial and risky theological alterations should be preferred.

Having established the decision-theoretic framework and the relevance of the probability of extraterrestrial life, I then assess related theological assumptions about precisely what God would or would not do. At this point, I focus on a second comparison case, the discussion of life-permitting fine-tuning of the universe. Using comparisons with natural theology, I analyse reasons why assumptions about what God would and would not do are challenging, and why arguments based merely on 'fittingness' are quite weak. I will argue that astrotheological probability judgments are comparatively more challenging than the assumptions required by the fine-tuning argument. We can construct multiple plausible models of what God might create and how God might act in the universe, which creates problems for astrotheological inferences. Arguments like the principle of plenitude do not provide substantial grounds for believing that God likely created extraterrestrial life forms.

Ultimately, I conclude that theological engagement with the idea of extraterrestrial life has value regardless of whether we believe that there is any likelihood of humanity ever encountering such life. However, part of the value of astrotheology lies precisely in fostering awareness of contentious philosophical and theological assumptions underlying risk assessments and probability estimates about such life.

The astrotheological wager

Mathematician Blaise Pascal (d. 1662) is known in philosophy of religion for his *Pensées*, a collection of fragmented thoughts left behind by Pascal and published posthumously in 1670. One section of the work develops the argument that has since become known as Pascal's Wager. Pascal's work assumes that our intellect does not force us to believe or disbelieve in the existence of God: 'There is enough light for those who only desire to see, and enough obscurity for those who have a contrary disposition' (*Pensées* VIII, 430). However, in the game of life, we must play, and so we must choose either to believe or disbelieve in God. Because the intellect does not force us to either option, we must consider the benefits as well:

> God is, or He is not. But to which side shall we incline? Reason can decide nothing here. There is an infinite chaos which separated us. [...] Yes; but you must wager. It is not optional. You are embarked. Which will you choose then? Let us see. Since you must choose, let us see which interests you least. You have two things to lose, the true and the good; and two things to stake, your reason and your will, your knowledge and your happiness; and your nature has two things to shun, error and misery. Your reason is no more shocked in choosing one rather than the other since you must of necessity choose. This is one point settled. But your happiness? Let us weigh the gain and the loss in wagering that God is. Let us estimate these two chances. If you gain, you gain all; if you lose, you lose nothing. Wager, then, without hesitation that He is. (*Pensées* III: 233)

Because Pascal presents it as a wager that contrasts the benefits and risks involved, it has become customary to discuss the wager through the framework of decision theory. The alternatives can then be mapped out in a decision matrix, as can be seen in Table 1 (Hájek 2024; McClennen 1994).

As this table shows, Pascal argues that even if God does not exist, believers would still live happier lives than nonbelievers. If that is correct, then wagering for God's existence is

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Table 1. Pascal's wager

	God exists	*God does not exist*
Wager for God	Gain all	Gain in earthly life
	(Best)	(Second best)
Wager against God	Misery	Earthly life
	(Worst)	(Third best)

Source: Adapted from Hájek (2024).

always the winning option. In other words, wagering for God *superdominates*, as both of the options on this row are better than the alternatives.

From early on, many objections have been raised against Pascal's Wager, and I will consider two that are also relevant to the Astrotheological Wager.

First, one might challenge the given estimates of risks and benefits. For example, given a more inclusivist understanding of salvation, one might expect God to allow salvation for sincere nonbelievers as well. Or one might question Pascal's judgment that believers also have it better in this life, even if God does not exist. Perhaps at least some believers really do lose something in comparison to nonbelievers, if God does not exist. If so, 'wagering' on God also has its own risks, which the nonbeliever avoids. The Apostle Paul's statement, amidst experiences of persecution, is sometimes quoted as a case in point: 'If only for this life we have hope in Christ, we are of all people most to be pitied' (NIV 15:19). In addition to persecution, Paul also alludes here to the spiritual danger of misrepresenting what God has done (Rota 2016, chapters 3–4).

Arguments about risks associated with believing are meant to challenge the idea that wagering for God superdominates, meaning that both options on the top row are better than the options on the bottom row. In that case, wagering for God would be better even if no God exists. If, on the other hand, nonbelievers have it somewhat better in this life, the decision theoretic calculation would need to balance the potentially infinite gains and infinite losses of the 'God exists' column with the finite gains and finite losses of the 'God does not exist' column (Hájek 2024). The objections to infinity and the precise methods of calculation are not relevant for my purposes here; instead, my purpose is to illustrate the general nature of the argument. In the case of astrotheology, both the gains and losses are finite. The concepts of superdominance and balancing potential risks and gains are of interest for astrotheological discussion, however.

The second common objection to Pascal's wager is based on religious diversity. Pascal's argument assumes the context of Catholic Christianity, but critics have argued that there is a potentially infinite number of alternative ideas about God. If so, there should be more columns in the table, representing different religions. And this, then, would make wagering for the specifically Christian God arbitrary or even dangerous, supposing that another religious view is correct. For instance, J. L. Mackie (1982, 203) argues that 'the church within which alone salvation is to be found is not necessarily the Church of Rome, but perhaps that of the Anabaptists or the Mormons or the Muslim Sunnis or the worshippers of Kali or of Odin'. Given the existence of many conflicting ideas about the deity, Mackie argues that the wager alone does not give reason to choose one over the other.

However, as defenders of the Wager have pointed out, Pascal never intended the Wager to stand absolutely alone (e.g. Jordan 1994; Pasternack 2012; Rota 2016). Instead, Pascal does argue for the truth of Christian belief elsewhere in the *Pensées.* To the questioner asking, 'Is there no means of seeing the faces of the cards?' Pascal replies: 'Yes. Scripture and the rest,

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Table 2. The astrotheological wager

	Extraterrestrial life is encountered	*Extraterrestrial life is not encountered*
Prepare theologically for extraterrestrials	Rejoice in God's creative goodness	Better engagement with contemporary culture
	(Best)	(Second best)
Refrain from theological accommodation	Existential and religious crisis	Disengagement with contemporary culture
	(Worst)	(Third best)

etc.' (*Pensées* III: 233). He believes rational arguments are insufficient on their own, as belief is also a matter of the passions, not merely the intellect. However, many interpreters have argued that reasons and evidence remain central in narrowing down the 'live options' to be considered in the Wager. For instance, Rota contends that the 'many gods' objection can be dismissed, if '(a) Christianity is considerably more credible than any other religion and (b) the truth of Christianity is more probable than not' (Rota 2016, 68). The upshot is that the qualitative and probabilistic evaluation of each section of the decision table is required for a convincing wager.

Similarly, both types of evaluation are needed to assess the importance of astrotheology, as can be seen from the second decision table (see Table 2).

As the table illustrates, many astrotheologians argue that theological engagement with the idea of extraterrestrial life offers cultural benefits, regardless of whether extraterrestrial life is ever discovered or not.

For instance, astrotheology responds to culturally prevalent critiques of theological truth claims. Many people have historically seen the existence of life in outer space as both probable and contradictory to Christian beliefs. Already Thomas Paine (d. 1809) famously argued that 'To believe that God created a plurality of worlds [...] renders the Christian system of faith at once little and ridiculous' (Crowe 2008, 224). More recently, Roland Puccetti claimed that the discovery of life on other planets would provide strong evidence against many religious claims, particularly given that 'the principal sacred writings of Christianity, Judaism, and Islam are absolutely silent' on such matters (Puccetti 1969, 135–137). Arguments for the compatibility of classical Christian theology with the existence of extraterrestrial life address this perceived tension (e.g., Davison 2023).

Moreover, even if extraterrestrial life is never discovered, thought experiments about what alien life might be like can help illustrate facets of our human life, as they often do in science fiction. As Davison says, discussion of astrobiology can offer 'fresh angles on familiar topics' (Davison 2023, 367; similarly, Playford, Bullivant & Siefert 2024, 1–2, 4–5).

In contrast, it is argued that if extraterrestrial life is encountered, then a lack of preparation might result in a much more severe religious and existential crisis. Thus, astrotheological work which prepared theology to accommodate the existence of extraterrestrial life is thought to provide more appealing results. There, an astrotheological framework *superdominates* over alternative theologies that struggle to accommodate the existence of extraterrestrial life. This means that both options in the top row are better than those on the bottom row.

However, as with Pascal's wager, much depends on whether one agrees with this assessment of the relevant possible decisions, risks, and benefits. I will illustrate these through the dissenting perspective of the Catholic theologian Benjamin Wiker. He argues:

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> I am as prepared for the arrival of extraterrestrials as I am for that of elves, and for the same reason: All evidence points to their nonexistence, and yet it remains a very, very remote possibility – so remote that to change our central doctrines to accommodate either possibility would be folly (Wiker 2002).[2]

In terms of the comparison with Pascal's wager, Wiker's discussion corresponds to the two objections I have discussed. Wiker's mention of changing 'central doctrines' is an argument against the superdominance of wagering for the existence of alien life. Wiker argues that theological accommodation of extraterrestrials entails substantial intellectual risks, as it (to his mind) involves accepting the idea that Earth life is not specially created, and changing the doctrines of redemption and incarnation to make room for the salvation of extraterrestrials. For Wiker (2002), theological attempts to accommodate extraterrestrials have historically ended up relativising the doctrine of the Incarnation: 'Christians bent on saving Christianity from irrelevance cheerfully hacked away at the embarrassing particularity of the Incarnation until the doctrine itself became largely irrelevant'. Thus, understood, the risks of not being prepared for an unlikely possibility need to be balanced against the risks created by pre-emptively accommodating theology to the existence of aliens.[3]

Wiker's mention of elves can be understood as an argument for increasing the number of columns in the decision table. In addition to extraterrestrials, numerous other logically possible scenarios could also create an existential crisis for humanity. For instance, if we were to discover that elves, fairies, goblins, satyrs, vampires, and similar non-human intelligent creatures have been living among us the whole time, this would fundamentally shatter the modern worldview and might also provoke a religious crisis. Yet relatively little is written to accommodate theology with fairies, or to argue that, based on God's infinite goodness, the creation of fairies and elves would be theologically expected.[4] In terms of the Wager, the argument would be that there is no more reason to accommodate theology to the existence of aliens than there is to prepare for encountering elves.

Wiker's objections illustrate ways in which the astrotheological wager, in my illustrative formulation, may not yet be compelling. Instead, a more precise analysis of alternatives is required. And at this point, responses similar to those used with Pascal's Wager may also be helpful for the astrotheologian. Regarding the objection to *superdominance*, we might distinguish between a traditionalist and progressive form of astrotheology as different ways of responding to the criticism. A traditionalist astrotheology would argue that the existence of alien life requires no changes or at least no significant changes in existing Christian doctrine. For instance, it might be argued that Christian theology already traditionally asserts that God is an infinite Creator, and that any life outside the Earth would reflect God's infinite goodness (e.g. Davison 2023). Traditionalist astrotheologians could thus argue that preparing for the existence of aliens does not entail risks due to 'changes to central doctrines'.

In contrast, a progressive astrotheology would admit that theological changes are needed, but claim that such changes are beneficial rather than detrimental to theology. I have already quoted Parkyn's (2021, 8) assessment that engagement with astrobiology helps theology move beyond geocentric ideas. Even the concept of multiple Incarnations, Parkyn argues, provides a greater cosmic vision of God's actions in the world. Playford (2025, 150) makes a similar comparison between *incorporating aliens* into one's theology and *incorporating theology* into a greater cosmic perspective. The latter is clearly more ambitious and would entail risks due to the greater extent of theological changes, but it also has potential for a grander cosmic vision. For Playford, such a theological move would occur only after

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Table 3. A traditionalist perspective on the astrotheological wager

	Extraterrestrial life is encountered	*Extraterrestrial life is not encountered*
Traditionalist theology	Be prepared and retain the traditional commitments	Retain traditional commitments
	(Best)	(Second best)
Progressive theology	Be prepared, but lose traditional commitments	Give up traditional commitments without benefits
	(Third best)	(Worst)

the discovery of compatible extraterrestrial religious ideas, rather than pre-emptively. This brings the perspective closer to traditionalism.

Theological positions are not necessarily reducible to a neat traditionalist-progressive axis. Nevertheless, this already illustrates how a decision matrix might need to take into more detailed theological ideas about risks and benefits. As a simplified example, from a traditionalist perspective, one might conceptualise the alternatives in the way depicted in Table 3.

The table illustrates that if theological changes are seen as a significant cost, then a traditionalist theology that accommodates the existence of aliens would be preferred. Yet even in such a case, choosing the third-best alternative might be better, depending on the probabilities associated with each section. Suppose the likelihood of discovering extraterrestrial life is remote. In that case, this means that the associated risks and benefits also have a very low probability, which would further mitigate against the progressive options. However, if we judge that the progressive perspective is much better in accommodating the existence of extraterrestrial life, and if the existence of extraterrestrial life is highly likely, this might still lead us to favour the progressive option, despite the risks created by theological changes. My point here is not to provide a detailed calculation, but to illustrate how changes in assumptions lead to changes in the decision-theoretic landscape.

I move on from the superdominance issue to Wiker's second critique, concerning the likelihood of aliens' existence. Akin to the 'many gods' objection, this objection argues that accommodating theology to aliens is no more beneficial than accommodating it to other improbable logical possibilities.

In my judgment, Wiker is correct that there are many merely logically possible scenarios which would entail high risks. It seems that more than the mere logical possibility of a high risk would be required to motivate costly, large-scale actions to mitigate that risk. After all, acting for no reason might also have costs, and unnecessary changes to a theological framework can have unforeseen consequences. However, small-scale action might be justified already by very low-probability risks. As an analogy, consider the idea that interdimensional lizard people are currently ruling over humanity. Although there seems to be no reason to believe in such a hypothesis, and much evidence against it, Dentith (2022, 8) nevertheless argues that some resources can be used to investigate such claims:

> Whilst we might want to say that interdimensional lizard people are fantastical *because they go beyond our understanding of how we think the world should work*, they are still worth investigating (at least by someone) in order to work out whether they really are counter to our *current* understanding of the world. After all, wouldn't it be interesting if it turned out upon investigation that interdimensional lizard people really were in charge of global politics? Indeed, if it turned out there was something

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> to such a claim, we would probably agree with Icke that something ought to be done about it!

For Dentith, there are benefits to investigating even outlandish conspiracy theories, as sometimes, conspiracies do indeed exist. Despite the low probability of the hypothesis, it is beneficial that some people take the time to investigate the claims of conspiracy theorists, as long as they employ sound reasoning methods. Similarly, one might argue that theological speculation on how extraterrestrial life might fit into God's plans for creation has relatively little cost, even if there is only a low probability that humanity will ever encounter aliens. Nevertheless, Wiker's point seems cogent in that the number of resources to be wagered on such an investigation should also depend on the probability of the hypothesis being true. Building one's entire worldview around any merely logically possible conspiracy theory would entail too great a cost, given the lack of evidence. Similarly, as discussed, large-scale theological changes would be better motivated if the existence of extraterrestrial life is not a mere logical possibility, but highly likely.

In the case of Pascal's wager, the response to worries about the number of columns has been to argue that some ideas of God are more plausible than others. This then allows focusing on the Christian God, rather than all possible religious ideas. Similarly, one might argue that the existence of extraterrestrials is a more plausible possibility than the existence of elves or interdimensional lizard people. This would increase the relative importance of theological engagement and accommodation of astrobiology, when compared to other logically possible ideas. Thus, such probability estimates are in fact necessary for astrotheology, and there is good reason to clarify their epistemic basis.

It is also relevant here that multiple types of extraterrestrial life are logically possible, and the type of life that exists also impacts the kind of theological solutions required. For example, McIntosh and McNabb (2021, 14) propose the following five scenarios:

> S1. ETI is so remote or undetectable that any interaction is (nomologically) impossible.
>
> S2. ETI is so remote as to be physically inaccessible, but communication is possible.
>
> S3. Physical interaction with ETI is possible; ETI is peaceable.
>
> S4. Physical interaction with ETI is possible; ETI is hostile but not an existential threat.
>
> S5. Physical interaction with ETI is possible; ETI is hostile and an existential threat.[5]

As McIntosh and McNabb argue, none of these scenarios creates insurmountable theological difficulties, although the final two are more difficult. They mostly relate to issues already familiar from our experience on Earth, such as the problem of evil and the problem of religious diversity (Baker-Hytch 2018; McIntosh and McNabb 2021). However, the scenarios illustrate how different scenarios about the type of extraterrestrial life that exists would potentially alter its theological impact and the decision-theoretic calculation of risks and benefits. Similarly, Playford, Bullivant & Siefert (2024, 26) point out that theological implications would be vastly different, if aliens came not only in peace (as suggested by S3) but also "'in the name of the Father, and of the Son, and of the Holy Spirit", with fresh theological insights, a set of scriptures to complement our own, and so on'.

Moving beyond mere logical possibilities is vital for the 'astrotheological wager', as it is for Pascal's Wager. Similar to Pascal's Wager, there are ways of trying to map out the

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probabilistic landscape, showing how some options might be more plausible than others. Scientifically, perhaps our knowledge of Earth life might narrow the possibilities. Theological frameworks might also guide what sort of life we would expect to be out there. Supposing that theology should focus more on preparing us for likely possibilities than for unlikely ones, it makes sense to develop these estimates further. In the following sections, I will argue that a comparison with natural theology can also help us critically assess astrotheological probabilistic arguments.

The relevance of probabilities

As noted, many astrotheologians are reticent about making precise estimates of just how likely life is in the universe. This is seen as a scientific matter that is not necessarily determined by theology. Supposing that God's act of creation was free, God may have created life on other worlds, or God may not have. It may thus seem quite risky for theologians to take a stance on empirical issues, such as proclaiming that there is little possibility of finding life on other worlds, only for that to be proven wrong by discoveries tomorrow. This has parallels with discussions of 'God of the gaps' arguments, which seem to make religious faith depend on risky empirical claims liable to be falsified by future scientific discoveries.[6]

Nevertheless, engagement with empirical claims is also part of the theological task when such claims intersect with theology. As Peters (2014, 451) puts it, 'The theologian has no quarrel with solid scientific research, to be sure; but, when extrascientific or ideological commitments smuggle their way into scientific thinking, then the theologian needs to blow the whistle and call foul.'

In this section, I will therefore consider the interplay of scientific, philosophical and theological reasons in determining the probability of the existence of extraterrestrial life, and how this affects the 'astrotheological wager'.

Scientifically, the existence of extraterrestrial life remains an open question. For instance, many of the variables in the Drake equation, a classic method for estimating the prevalence of intelligent life in the galaxy, remain highly uncertain. We could, in principle, give the equation values that make intelligent life either unique or highly common in our galaxy (Losch and Krebs 2015, 232; Vainio 2018, 87–88).

Given that the origin of life has not been replicated in laboratory experiments, no precise probability can be given for the proportion of planets that evolve life.[7] There are some, such as Eugene Koonin (2007), who believe the origin of life was a lucky accident to the degree that only a multiverse would see its emergence even once. Meanwhile, others believe we live in a universe where life's emergence is written into the laws of nature and is thus guaranteed to occur (e.g. De Duve 2011). Likewise, opinions differ on the degree to which the evolutionary 'tape of life' would follow the same course on other planets, although convergence seems to point to some directionality in the process (McGhee 2011). The precise requirements for a life-permitting planet also remain debated – although water and carbon are highly suitable for organic chemistry as we know it (Denton 1998; Ward and Brownlee 2000).[8]

Due to the difficulty of tracing the processes that might have caused life to emerge, probabilistic estimates have, in practice, been heavily influenced by philosophical assumptions (Fry 1995). Most prominently, according to the astrobiological Copernican principle, it is assumed that Earth-life is most likely not special in any way (Fry 2000; Kukla 2009; Dunér 2021). In any statistical distribution, it is more likely that any randomly selected data point (such as the Earth) represents a median case, rather than an outlier. Thus, it is assumed that if the conditions were favourable for life's emergence on Earth, it is likely that similar conditions also existed on other planets. It is then reasoned that, given the vast number of

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star systems, there are likely to be other habitable planets, and many of those planets are also likely to support life.

As a statistical argument, this rests on flimsy grounds, given that we have only one data point, Earth, and that we are merely assuming the data point is not exceptional. The assumption that our place in the probability distribution is random is not theologically neutral, however. It could be that our place in the universe is part of God's design, rather than a statistically random result of the laws of nature. In that case, there is no guarantee that the Earth is not special. This is part of the reason why Wiker (2002) insists theologians should dissent from the argument.[9]

Philosophical assumptions also play a role in explanations of the origin of life. For example, Iris Fry argues that scientists reject the chance hypothesis – and are right to do so – partly because it would be a science stopper. 'Chance' is not a scientifically tractable explanation. Therefore, an explanation that at least combines chance and regularity, or shows how life is an inevitable consequence of physics and chemistry, would be far preferable. But turning to theology, might not God have had other options, such as a miraculous creation? This appears to be an inevitable conclusion based on the traditional doctrines of omnipotence and creation *ex nihilo*. In that case, it would seem difficult to predict a priori that God would choose to originate life through natural processes, rather than through miraculous 'special divine action'.

The so-called general problem of creation, or 'why would God create anything at all', has remained a topic of theological discussion since antiquity (e.g. Kretzmann 1990; Mullins 2024, 69–97). Likewise, there is also a variety of models of divine action, or how we might expect God to act in the world (e.g. Abraham 2018). In questions of extraterrestrial life, it also seems we can construct opposite models of what it would be fitting for God to do. This creates problems for theological arguments prevalent in the astrotheology discourse, as I will argue in the next section.

Predicting divine action

The difficulty of predicting what God would do has long been recognised in the discussion of natural theology (the attempt to present evidence supporting belief in the existence of God). There are multiple models of how arguments for God's existence are supposed to work. On probabilistic models, a theistic 'inference to the best explanation' depends mainly on how God's character is understood, and what sort of action is thought to be best explained as the result of divine action or the divine character. This makes probabilistic arguments an apt comparison case for astrotheological arguments, in which considerations of actions 'fitting' with God's character are likewise important. I will thus focus my analysis on probabilistic natural theology, using design arguments as a case study.[10]

Some critics argue that the problem of predicting divine action defeats design arguments for God's existence. For instance, Sober (2003, 38) argues that 'the more our hypotheses of intelligent designers depart from the human case, the more in the dark we are as to what the ground rules are for inferring intelligent design'. Since we know that human beings can create machine-like artefacts to fulfil specific purposes, finding such artefacts provides good evidence of human designers. However, Sober argues that we have no similar background knowledge about what sort of objects God might create, and this causes difficulties for design arguments. Similarly, Narveson (2003, 99) claims that 'bodiless minded super-creators are a category that is way, way out of control', and this makes theism unexplanatory.[11]

The foremost defenders of fine-tuning design arguments acknowledge the difficulty and argue that exact predictions are not required to explain the order of the universe. For instance, Barnes (2020, 1225; 1250–1251) argues that it is sufficient for the fine-tuning

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argument to claim merely that 'the likelihood that a life-permitting universe exists on theism is not vanishingly small'. While it is difficult to predict precisely what God would do a priori, creating a universe with life does fit God's character and capacities. Moreover, it is generally possible for agent-based explanations to 'trail the data', without losing all explanatory power (Kojonen 2021, 62–63). In the case of fine-tuning, it is not argued that the theological explanation would suffice to predict the data of fine-tuning *a priori*. But it still suffices to explain the data without being *ad hoc* once this data is discovered, proponents of the fine-tuning argument claim (Collins 2018).

Thus understood, the fine-tuning arguments require only a general-level idea of what sort of universe God might create. In contrast, astrotheological arguments require quite specific assumptions, which create difficulties, since it seems possible to argue either way. Historically, many have indeed believed that it would be fitting for God to create life on other planets. However, others have argued equally passionately that the creation of life on one planet is sufficient. If one side is not clearly superior, then this provides grounds to be sceptical of theological arguments for the existence of extraterrestrial life.

Theologians who argue the probable existence of other lifeforms most commonly appeal to an understanding of God's creative goodness, coupled with the principle of plenitude. As Andrew Davison (2023, 81) puts it, if 'the cosmos is for the communication and display of divine excellences' and life is particularly good at doing so, then this 'is seen to entail (or at least suggest) multiplicity and diversity, and therefore to undergird an expectation that life would be widespread and, perhaps, diversely realized'. Talk of 'entailment' is quite strong, although Davison allows that the strength of the argument from divine goodness may not reach quite that level. The existence of more life forms would, on this understanding, add value to the universe and give an additional purpose to all the stars that are out there. This can then support the conclusion that God has most likely populated the universe beyond Earth with many other lifeforms.

One might also argue that it is more fitting for God to create life through law-like processes, rather than through miracles (Simmons 2025; McMullin 2009). For example, related to evolution, many have argued that there is beauty in creation through an orderly process, and in nature's ordering, which allows for self-organisation.[12] Likewise, many say that there is something epistemically or theologically unsound about 'God of the gaps' arguments (cf. Kojonen 2016). If so, perhaps we would not expect God to create a universe where gaps in natural processes are real. On such assumptions, it is theologically more likely that God has written life and its evolution into the laws of nature, rather than through special intervention into cosmic history. This would lead to the expectation that life is quite common in the universe, given that the laws of nature producing planets and allowing for life are the same everywhere.

This positive outlook could be developed even more optimistically than is usually done. Consider the Christian idea that love is central to the creation's purpose. In that case, as Wilkinson (2013, 104–105) points out, 'the Christian understanding would seek to suggest that it is part of the nature of intelligence created by God to continue to reach out to other intelligent life in compassion and generosity'. For Wilkinson, this premise holds importance in his discussion of the Fermi paradox – Wilkinson rejects the 'zoo hypothesis' because it does not align with his understanding of created intelligence. However, if we conclude that God has likely created other intelligent life forms, then this premise might ground the belief that God has also built in some way for us to encounter them eventually. Robin Collins (2018, 2024) has recently argued that cosmic fine-tuning extends beyond merely allowing the existence of complex life and also has facets that make scientific discovery possible. Perhaps an optimistic astrotheologian might argue that we will also find fine-tuning

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that makes some kind of 'warp travel' possible, even though faster-than-light travel and communication appear impossible based on our current scientific knowledge.[13]

Thus, we can formulate theological assumptions about the goodness of God, divine action in the world, and the nature of created intelligence that would lead to an optimistic evaluation of the prevalence of intelligent life in the cosmos. There might be grounds to be sceptical of our capacity to evaluate God's reasoning (cf. Hendricks 2023). But assuming that we can do so to some extent, in each case, it does seem that we can also construct reasoning for why God had no necessity in actualising the optimistic scenario.

Regarding the principle of plenitude, theologians discussing astrobiology also provide counterarguments. For example, although Aquinas saw the variety of creatures as a consequence of the principle of plenitude, he believed that life on Earth already provides sufficient plenitude (Davison 2023, 83). Yes, adding always one more creature might add value to the cosmos, but God has no obligation to create the 'best possible world', given that this may be impossible in the first place (Vainio 2018, 84). Davison (2023, 85) argues that for Aquinas, what is crucial for plenitude is the variety in types of beings, rather than the number of creatures as such. However, supposing that the evolution of life is written into the laws of nature, then life on other planets might also have great similarities with Earth life. Moreover, life on Earth, over its millions of years, already displays a great amount of variety and may attain to yet more in the eschaton. Might this not be sufficient plenitude? Also, for an omnipotent Creator, considerations of wastefulness in creating planets without life do not seem to enter into the picture. As Wiker (2002) puts the point, 'while the vastness of the universe rightly humbles us, its size means nothing to God, an immaterial intelligence. Since He has no size, it is all the same to Him whether He makes the universe as big as a pin or a pin as big as the universe'.

The more sceptical theologian might also argue that the evidence is already against the most optimistic interpretations of plenitude. For instance, the existence of other intelligent humanoid species on Earth, such as elves, dwarves, and lizard people, would also have fit well with the principle of plenitude. However, it seems such life forms do not exist. Likewise, if predictions were based solely on the principle of plenitude, we would have predicted that our solar system should also be full of life, as was commonly assumed from early modern times until the 1960s. This was then disproven only by the more detailed missions to Mars and other planets (Dick 2013, 134–135). Likewise, we know that not all other classes of stars have orbiting planets (Dick 2013, 165). All this implies that predictions based on the principle of plenitude are not reliable. The principle seems suitable for explaining the theological compatibility of God's goodness and the existence of a plenitude of lifeforms, but not for predicting the number and type of beings God has actually created.

How then might one sceptically respond to arguments for the superiority of creating life through natural processes, discoverable through scientific means? Here, too, it seems that divine freedom would allow alternatives. As Alvin Plantinga (1997) argues,

> The claim that God has directly created life [...] may be a science stopper; it does not follow that God did not directly create life [...] we have no guarantee that God has done everything by way of employing secondary causes, or in such a way as to encourage further scientific inquiry, or for our convenience as scientists, or for the benefit of the National Science Foundation.[14]

It is indeed possible to formulate a model on which it is more fitting for God to create through secondary causes. However, much depends on the type of metaphor that we believe best characterises divine action in the world. If creation is like a machine, then any intervention by God would seem to indicate a fault in the design. However, if the world is more

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like a kingdom, a temple, or a musical instrument, as posited by many Church fathers, then divine action within the world seems to be within expectation (cf. Dembski 2002, 328; Murray 2006). In that case, divine action could have miraculous elements, in addition to God's action through laws (Kojonen 2024, 2016). Those sceptical of the sufficiency of fine-tuning for the origin of life might also argue that if the origin of life had indeed been easy, then scientists would have discovered its mechanisms already.[15]

On the plausibility that we might gain contact with intelligent life, due to God's desire for us to connect with others, it is clear that many of God's purposes for creation will only be fulfilled in the eschaton. For example, our connections to other humans remain incomplete in this life. Pascal's statement, 'the eternal silence of these infinite spaces frightens me', is often quoted in theological discussions of whether we are alone in the universe (e.g. Losch and Krebs 2015, 230). However, in context (Pensées 205–206), Pascal was writing about the limited length of human life and our limited viewpoints:

> When I consider the short duration of my life, swallowed up in the eternity before and after, the little space which I fill, and even can see, engulfed in the infinite immensity of spaces of which I am ignorant, and which know me not, I am frightened, and am astonished at being here rather than there; for there is no reason why here rather than there, why now rather than then. Who has put me here? By whose order and direction have this place and time been allotted to me? Memoria hospitis unius diei prætereuntis. … The eternal silence of these infinite spaces frightens me. (Pascal 1958, 61)

Pascal shows that in this life, our perspective and connections even to other humans remain incomplete on this side of the eschaton. Given that incompleteness remains a feature of human life, it also seems plausible that connections with other possible intelligent species would be incomplete or absent during this stage of existence, even despite the value of love. Moreover, as Wilkinson (2013, 104–105) argues based on the Fermi Paradox, the absence of contact with aliens to date may indicate that no such civilisation exists in our vicinity.

Thus, given that one can plausibly argue in both directions, it seems difficult to make firm theological predictions about whether extraterrestrial life will be found. From a theological standpoint, we can also question the persuasiveness of some scientific arguments for the prevalence of extraterrestrial life when those arguments are based on philosophical assumptions about the mediocrity of the Earth or the necessity of a natural origin of life.

Not being able to rule out the existence or non-existence of extraterrestrial life theologically or empirically is also a valuable result. Empirically, too, the existence of extraterrestrials seems more plausible than ideas like the existence of interdimensional lizard people – although it is hard to say precisely how much more plausible. However, the situation might change with future discoveries. Finding some kind of life in space, or discovering further evidence that evolution follows predetermined lines (Kojonen 2021), could tip the balance in favour of the more positive astrotheological hypothesis. Astrotheology must trail the evidence, just as natural theology has done.

Conclusions

In this article, I have examined the task of astrotheology – the theological engagement with astrobiology and the possibility of extraterrestrial life – in comparison to debates over Pascal's Wager and fine-tuning design arguments. I have argued that probability judgments regarding the types of extraterrestrial life that might exist, as well as risk assessment, are essential for astrotheology. Astrotheological discussion should thus move beyond the mere exploration of the compatibility of extraterrestrial life and religious faith, into modelling

https://doi.org/10.1017/S0034412525101236 Published online by Cambridge University Press

theological and scientific likelihoods of various scenarios. There is also a need to critically evaluate how philosophical and theological assumptions influence our beliefs about extraterrestrial life. Ultimately, it seems theological models can accommodate both the discovery and non-discovery of extraterrestrials. Without further empirical discoveries, mere reference to the vastness of the cosmos appears insufficient to ground any certainty in what might be out there. Thus, perhaps paradoxically, fostering doubt may be one of the greatest benefits of religious engagement with astrobiological discourse.

Acknowledgements. The author thanks participants of the Helsinki Analytic Theology Workshop 2025 and anonymous reviewers for valuable feedback on a previous version of this article.

Notes

1. To give some further examples of astrotheological estimates, Thigpen says that his goal 'is not to make claims about the likelihood of ET's existence or the possibility of making contact with it' (Thigpen 2022, 19), he nevertheless concludes by arguing that in all likelihood aliens have already visited Earth, although some experiences of extraterrestrials are likely to be demonic in origin (Thigpen 2022, 331–352). On the negative side, Wilkinson (2013) concludes that while the existence of life outside Earth is theologically possible, we are likely the only intelligent civilisation in the Milky Way galaxy. This article focuses on Christian discussion of astrobiology, but similar points could be made regarding discussion in other religious contexts. Regarding Islamic discussion, see particularly Determann (2020) and Determann and Malik (2024). For discussion in the context of other religious traditions, see Playford, Bullivant & Siefert (2024, 28–40).

2. Wiker's Intelligent Design movement colleague Jay Richards (2010, 302) has similarly argued that before examining 'such arcane possibilities' as the compatibility of Darwinism and theism, we should first ask the prior question of whether Darwinian evolutionary theory is even true. I would agree that the urgency of harmonising a particular scientific theory with Christian belief depends partly on how likely we believe the theory is to be true. However, there are also other reasons to believe such investigation (whether in the case of extraterrestrial life or evolution) is important, such as social reasons (the influence of the beliefs in question) or doctrinal reasons (e.g. understanding which claims really have central importance for the Christian doctrines of creation or salvation). Such theological work can prepare for unseen future discoveries, rather than merely always trailing behind what the science of the day seems to be saying.

3. This calculation is similar to the arguments used by evolutionary biologist Ernst Mayr against the SETI programme. Mayr (1995) argued that the existence and detection of intelligent life in the Universe has an extremely low probability. From this perspective, the massive resources required by SETI would be better spent elsewhere. However, in the case of astrotheology, the risk pointed out by Wiker does not concern economic costs (as these are quite low in theology), but intellectual and spiritual risks.

4. However, Thigpen (2022, 331–352) believes that much of the same arguments used for extraterrestrial life would apply to the discovery of fairies and goblins. He also argues that some experiences of alien encounters may be explained by such hidden terrestrial non-human life forms.

5. Tyler McIntosh and McNabb (2021) discuss the nature of ETI in relation to Christian theology, with particular attention to the problem of evil. They delineate five different scenarios, starting from scenarios with very little tension with Christianity, ending with scenarios that would require a new theodicy. They argue that Christianity has resources to accommodate even the worst examples, and the compatibility is even illustrated by existing scientific stories from *Independence Day* to *Ender's Game*. They do not argue that any of these possibilities is more likely than the other based on Christian theological premises.

6. However, others might posit that as long as faith is not made to depend on a particular empirical claim, there can also be benefits to making probabilistic arguments for theological claims. See further Kojonen (2016).

7. For current discussion of various competing hypotheses on the origin of life, see particularly Smoukov, Seckbach & Gordon ed. (2023).

8. On the debates, for example, Dick (2013, 166) argues that the discovery of extremophiles, organisms which can survive in extreme circumstances on Earth, provides evidence against the strict requirements posited in 'Rare Earth' – style arguments (Ward and Brownlee 2000). However, extremophiles are highly complex life forms in comparison to the hypothetical common ancestor, but simple in comparison to intelligent life. This means that they provide little evidence for life's ability to originate and evolve into more complex forms outside highly specific circumstances.

9. Earth having special significance would also not necessarily entail that no other planets have similar significance. As Wilkinson (2013, 146) points out, 'humanity may be unique in its relationship to God. However,

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uniqueness does not imply exclusiveness'. Perhaps every intelligent civilisation could have its own special significance.

10. The literature on natural theology is vast, and many argue for theism based on deductive, rather than probabilistic grounds. Such arguments are particularly associated with classical theism (see e.g. Bishop 2021). On probabilistic forms of natural theology, see Kojonen (2017a). However, distinguishing between deductive and inductive arguments is not as easy as is commonly assumed (Shanahan 2022).

11. Many theists also see epistemic distance between God and humanity as useful for disarming atheistic arguments such as the problem of evil. If we cannot reliably predict that a good God would not allow the existence of evil, then the evidential force of the problem decreases (Bishop 2021). However, work is then needed to show the compatibility of sceptical theism with natural theology (e.g. Hendricks 2023).

12. For an evolutionary view of creation, see Kojonen (2021). The fittingness of evolutionary processes for creation is most often discussed in the context of evolutionary theodicy. See e.g. Murray (2011), chapter 6; Howard-Snyder (2017); Peels (2018); Kojonen (2022).

13. For example, Thigpen (2022, 21) argues that 'we cannot simply rule out the possibility of interstellar travel as long as our knowledge of fundamental cosmology and physics is so limited'. It seems that the astrotheological optimist must be a pessimist regarding the completeness of current scientific understanding.

14. On the related discussion over methodological naturalism, see further (Donahue 2024; Kojonen 2017b).

15. Proponents of Intelligent Design have prominently argued for this type of miraculous or non-natural origin of life. See particularly Meyer (2009); for critique, see (Venema 2010, 2011).

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Cite this article: Kojonen EVR (2026) On astrotheology as natural theology. *Religious Studies* **62**, 586–602. https://doi.org/10.1017/S0034412525101236

https://doi.org/10.1017/S0034412525101236 Published online by Cambridge University Press