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gram to try to work out an account of the psychology of the sort of deity whose existence it depends on, including all its higher-order preferences, but we cannot assume in advance that this research program will succeed. And there is a salient difference between the two cases. We do understand how a research program in human psychology with moral realist ideas in its hardcore might progress or degenerate. It is, however, difficult to imagine how a research program in divine psychology that would deliver the goods Carson needs could ever be anything more than sheer speculation.

Nature, Design and Science: The Status of Design in Natural Science by Del Ratzsch, State University of New York Press, 2001, x + 220, \$40.00.

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This book aims, not to address the question of whether the natural world is designed, but rather whether science is in principle able to accommodate the concept of supernatural design.

Ratzsch develops the definition of design and relates it to anthropology and the search for extra-terrestrial intelligence, before analysing the concept of supernatural design. He then investigates where the true boundaries of scientific legitimacy lie. He concludes that standard attempts to rule out design in principle fail and that there might be potential scientific pay-offs in allowing the possibility of supernatural design.

Ratzsch takes design to be the result of deliberate agent activity intentionally aimed at generating particular patterns. Pattern is to be understood in terms of structures that have special affinities to cognition. Design results in artefacts that can usually be recognised because they exhibit 'counterflow,' marks of agent activity, features which mindless natural processes would not produce. Ratzsch argues that science is quite capable of recognising artefacts. For example, the search for extra-terrestrial intelligence (SETI) is the search for energy artefacts. Thus science could legitimately investigate the theory that aliens intentionally produced life on earth.

Ratzsch then investigates supernatural design. He notes that a supernatural being could intentionally produce artefacts identical to those produced by finite, natural agents. Additionally, supernatural beings could act in ways that break natural laws. They could affect quantum probabilities, as well as create things from nothing, including natural laws, constants and primordial initial conditions. A complicating factor is that if an agent creates an element of nature itself then there is no possibility of comparison with what nature does unaffected by intentional agency. Supernatural creation may therefore not show the primary marks of agent activity and counterflow usually associated with the artefacts of finite agency and so may be harder to identify.

Ratzsch argues that complexity and improbability alone are not strong evidence of design (a random set of craters on the Moon might be highly complex and improbable but not suggest design). However, complexity

that generates or supports valuable outcomes or patterns can be strong evidence of design (an extreme example of the latter would be the pattern of craters on the Moon spelling out John 3:16). Actively functioning, self-maintaining, complex structures and systems, such as are found in living organisms, intuitively suggest design, show striking patterns and are linked to things we value such as life, health and consciousness. They therefore offer some evidence of design. Ratzsch explicitly avoids the question of how we might assess the strength of this evidence.

Turning to the question of the boundaries of scientific legitimacy, Ratzsch points out how recent philosophy of science emphasises that science is not a purely empirical procedure. It also relies on human perception and understanding and non-empirical values like simplicity. Bans on supernatural design therefore can not be based on naive, empiricist conceptions of science.

Ratzsch argues that naturalistic definitions of science can not be arbitrary. If science seeks the truth about reality then some reason is needed to restrict it to merely natural explanations. Assuming that such a restricted science is true comes close to assuming philosophical naturalism. Ratzsch thinks that methodological naturalism stems from a fear that the supernatural will undermine scientific method and from the supposed success of naturalistic theories.

Ratzsch proposes that science must be sensitive to empirical findings. Furthermore, scientists must assume that empirical findings reveal underlying features of nature. Scientists do not need to be able to control every factor, but if they were unable to recognise or predict the operation of extraneous factors then they would face serious problems. Extraneous factors could hide the underlying principles of nature and scientists could shield any theory from empirical falsification by appeal to hidden variables. Ratzsch then claims that if there is a justification for excluding the supernatural from science then it must be that it undermines the necessary assumptions scientific method must make.

Ratzsch reviews some cases for prohibiting appeal to the supernatural. The prohibition cannot rest on definition, since there is no completely satisfactory formal definition of science available. He responds to complaints that supernatural design theory is not falsifiable by noting that there are difficulties with the criterion of falsification and that, conceivably, counter-evidence could falsify such theories. Another objection to the supernatural is that it cannot be controlled, yet many natural phenomena cannot be controlled but can still be scientifically studied. Intelligent design can still be recognised without being controlled (Ratzsch gives the example of an alien, titanium cube found on Mars). Supernatural design need not be hidden or unidentifiable, and so may admit of scientific study. Another frequent objection to design theories is that they are hyperflexible, that is, they are compatible with almost any data. Here Ratzsch points out that various high-level scientific theories, such as evolution and Newtonian physics, are compatible with various data. A related objection is that supernatural design has no real predictive power. Ratzsch responds in three ways. First, we are often not in a good position to predict the actions of agents but we may still recognise agent activity. Second, the idea that there is one creator

who works to a principle of uniformity of design might lead to predictions of, for example, a single basic DNA Dictionary in the Cosmos. Third, the predictions of supernaturally linked theories can be as precise as one likes.

Many complain that supernatural design theories invoke a 'God of the gaps', that such gap arguments are destructive of scientific procedure and that their track record is dismal. Ratzsch responds that many design arguments did not involve gaps in natural causation and that there are respectable scientific projects searching for things nature cannot do, such as SETI. Furthermore, some gaps may be considered closed merely because of an arbitrary prohibition on design explanations. Even if all gaps have been legitimately closed so far, this could not establish the claim that gaps will never be found. Even if it is a sensible rule of thumb to assume no gaps, this should not be allowed to override a solid, empirical case for natural impossibility.

Next Ratzsch responds to objections based on God's infinitude. He notes that there is no absolute bar on infinite values in science, such as infinite age. Further, every theory plausibly makes claims, not only about what will happen, but also about what would happen and thus goes far beyond mere data. In responding to claims that miraculous events undermine science he argues that miracles need present no particular problem, so long as they can be recognised.

Some claim that design theories have had their chance historically and have failed. Ratzsch notes that this would not generate an absolute prohibition. Not all design theories can be said to have failed. Darwinian evolution may have undermined some gap theories of design but not theories claiming that fundamental natural laws or initial conditions are designed. Furthermore, the detailed historical work necessary to justify the historical claim is often left undone.

Ratzsch argues that design in nature must ultimately be explained by direct agent activity. If life displays design-like patterns then saying that natural laws and processes produced them would not remove the need for explanation. We should still seek for an explanation of why nature produces design-like patterns. Natural processes may generate design-like patterns but this does not show that undesigned things produce design-like patterns, for natural processes may be designed. Features like cosmic fine-tuning, the comprehensibility of nature, and the complexity of organisms invite design explanations and the burden of proof is on those who would prohibit them.

Some respond to such claims by asking what explains the supernatural designer. Ratzsch responds that it is not necessary to be able to explain the designer to be able to justifiably offer a design explanation. If a perfect cube of pure titanium was found on Mars then it would invite an explanation in terms of design, even if we had no idea where the designer came from, or how they had manufactured the cube.

Ratzsch believes that, were design theories to offer significant scientific benefits, most scientists would cheerfully jettison prohibitions on design concepts, just as they abandoned prohibitions on action at a distance when offered the benefits of Newtonian gravitational theory, and accepted indeterministic laws when confronted with the success of quantum mechanics.

He suggests that design might operate at a comparable level to the principle of the uniformity of nature; this principle is metaphysically rooted, non-negotiable, normative, systematically protected, immune to empirical challenge, non-predictive and unlimitedly flexible. It is thus 'guilty' of virtually the entire catalogue of charges against the idea of supernatural design, yet it is essential to science. Historically, the idea of creation and design justified key presuppositions, such as the uniformity of nature and the universality of Natural Law, the comprehensibility of nature and the use of criteria like simplicity and beauty in theory evaluation. Design also helped generate the machine model of nature and stimulated various researchers. Design thus offers to integrate many of the essential presuppositions, justifications and motivations of science, and might spur one to continue to look for pattern underlying apparent randomness and be willing to abandon demonstrably failing research programmes assuming naturalistic causes.

The main argument that science need not exclude supernatural design seems persuasive. However, the focus on legitimacy in principle is a little unsatisfying. There is little evaluation of design in comparison to naturalistic theories. Ratzsch thinks he has, among other things shown the permissibility of 'God-of-the-gaps'-style theories, but he has done little to make them scientifically attractive in the current context. An attraction of a naturalistic theory of biological origins is that it offers a unified, elegant account. Accounts of biological origins in terms of supernatural intervention also include natural process and microevolution and so are, in this respect, more complex and less elegant and attractive. In addition, evolutionary accounts offer some helpful perspectives on apparently flawed designs in nature such as the appendix of the human digestive system or the lumbar region, both prone to dysfunction. Such structures look more like variations on animal precursors than good designs produced from scratch. Ratzsch does not much explore how design theorists might deal with such apparent bad designs and competing theories, let alone offer a theodicy for natural evil. At most he briefly appeals to human ignorance. Unfortunately, in the scientific context, with explanation and understanding at a premium, and competing theories of origins available, reliance on ignorance is disadvantageous. Ratzsch argues cogently that science could in principle accommodate the idea of supernatural design, but questions of fact go unanswered.