



# Dismissing God<sup>1</sup>

Donald D. Hoffman

Department of Cognitive Science

University of California

Irvine, California 92697

In 1961 the Soviet cosmonaut Yuri Gagarin, while making history as the first person to orbit the earth, also became the first person to discuss theology from space with the famous comment, “I don’t see any god up here.” Nothing was settled, of course, by this observation, and substantive debate between science and religion continues to this day. But Gagarin’s comment raises a wider question. As science advances it probes, with an increasingly powerful array of tools, all aspects of nature from the submicroscopic to the cosmological. As new vistas of nature open to the advances of science, it appears each time that the scientists exploring the new vistas can say, with Gagarin, “I don’t see any god up here.” The unexplored gaps in nature where God might be hiding are rapidly vanishing. Will God suffer the same extinction as species whose habitat vanishes?

Or has neuroscience already dealt the extinction blow? Normal activity of the human cerebral cortex can be altered by transcranial magnetic stimulation (TMS), a magnetic field that can be applied directly and noninvasively outside of the human skull. Michael Persinger of Laurentian University in Canada has found that appropriate application of TMS to the temporal lobes of the brain will cause many people to experience the presence of God. Andrew Newberg of the University of Pennsylvania in Philadelphia, using SPECT to image the brain activity of nuns and monks who meditate to experience oneness with God, found that when the meditation reached its goal, certain regions in the parietal lobe decreased their activity. Is the experience of God simply an artifact of brain activity?

---

<sup>1</sup> A chapter for the book “In the beginning was (no) god - on human existence and other absurdities”, edited by Tobias D. Wabbel

And didn't evolutionary theory deal the extinction blow long ago? God is no longer needed to explain the origin of species. Chance operating with natural selection seems to do just fine.

I will not try here to argue for or against the existence of God. I will simply observe that the three dismissals of God just scouted, despite their psychological appeal, do not survive a sober understanding of the scope and limits of science, the nature of human perception, and the modern theory of chance.

I begin with the nature of human perception, and in particular human visual perception, which will illuminate the scope and limits of science. Most of us think pretheoretically that human vision operates much like a camera. There is an objective physical world out there that exists independently of whether we perceive it or not, and our eyes, like a camera, faithfully record this world. In part this is true. Our eyes do focus an image, as does a camera, and the retinas of our eyes record this image, as does the film or CCD chip of a camera.

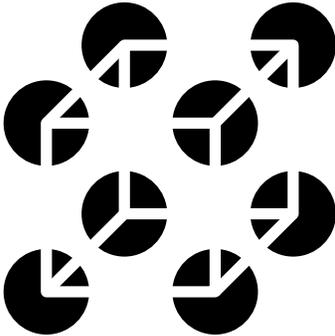
But our eyes are just the first stage of visual processing. Behind the eyes the optic nerves transport filtered versions of the retinal images to the brain's cortex. And here there is a big surprise: Roughly half of the brain's cortex is engaged in vision. About 50 billion neurons, and tens of trillions of synapses, are engaged each time you simply open your eyes and look around. This is far more computational power than is necessary to simply record an image. What is going on?

Research in the cognitive and neural sciences has made clear that our visual systems are not simply passive recorders of objective reality, but instead are active constructors of the visual realities we perceive. Each of us has within us a reality engine, which takes the images at the eyes and constructs three-dimensional worlds of objects, colors, textures, motions, and depth. What we see with each glance is not the world as it is objectively and as it would be even if there were no observers. Instead what we see is entirely our own construction. Our process of construction proceeds so rapidly and confidently that we are misled by our own prowess into thinking that we are not constructing at all, but simply

reporting what is there independent of us. In short, our belief that we see the world as it objectively is, unadorned, is an illusion made possible by the very brilliance and efficiency of our reality creating process.

What we see at any moment is the best theory our visual system can come up with to explain the images at the eyes. The visual system is much like a scientist, in creating theoretical explanations for the evidence at hand. The big difference is that the theory-building process of the scientist is usually conscious, while the theory-building process of our visual systems is for the most part conducted without our conscious awareness.

The visual system does not just create its theories at random, but instead is guided by many rules of visual construction, rules that are the subject of much current investigation by vision researchers. Rules have been uncovered for our constructions of color, depth, motion, objects, shapes, and edges. A visual example of our constructive processes at work is the “subjective Necker cube” first devised in 1977 by psychologists Bradley and Petry:



Perhaps you see a cube floating in front of black disks when you view this figure. If you look for a while you might notice that the cube flips, and that a corner of the cube that was in front suddenly is behind, and vice versa. So you actually construct two different cubes floating in front of the black disks. You might feel that you see the edges of the cubes quite clearly, even where they pass between the black disks. But if you cover up the black disks with your hands, you’ll see that there is no edge between the disks. You

construct the edge you see, just like you construct the two cubes. But you can do even more. Imagine that the black disks are holes in a sheet of paper, and that you are looking through the holes, and behind the paper you see a cube. Notice that now you see the cube not floating in front of the black disks, but sitting behind them. And the edges of the cube, that look ghostly when the cube floats in front, now look solid when the cube is behind. If you keep looking at the cube behind the holes, you'll again see that it can flip, so that you can actually see two different cubes behind. In total, then, you construct four different three-dimensional cubes from this flat drawing, and you construct illusory edges which you make to be either ghostly or solid. That is a lot of construction, and just a hint of what your visual system is doing all the time. Space here does not permit going into more examples, but I have placed some interactive visual demonstrations online, where you can explore for yourself how you create color, motion, and objects. The demonstrations are at this URL:

<http://www.cogsci.uci.edu/~ddhoff/Applets/index.html>

What is true for vision is true for all of our senses, including touch, smell, taste, and hearing. In each of these senses, what we perceive is not reality unadorned, but reality as we construct it according to our own internal set of rules. We are adept creators of all the sensory realities we experience.

Philosophers studying perception distinguish two senses of perceiving: the phenomenal and relational. The phenomenal sense of perceiving refers to our visual experience, the way that things seem to us. If I am dreaming about an elephant, the elephant I am experiencing in the dream is being perceived in the phenomenal sense. The relational sense of perceiving refers to the objective reality that we interact with in an act of perception. For me to perceive something in the relational sense, that thing must exist independent of whether I perceive it or not. Now clearly none of my sensory experiences exist independent of whether I perceive them or not. Therefore objects in the relational sense are not in my sensory experience, but must be inferred from my sensory experience.

The situation, then, is that the world we experience as our perceptual reality is in

fact an elaborate construction on our part. It is something we perceive in the phenomenal sense, not the relational sense. And what we construct is critically dependent on the rules we employ in the reality creation process. Realities that are not licensed by our rules are realities that we are not equipped to experience.

What can we say then about an objective reality that does not depend on our sensory experiences for its existence? Do our sensory experiences give us secure grounds to make inferences about this reality, about the objects we might be perceiving in the relational sense?

One might be tempted to say this is so based on an evolutionary argument: Creatures whose perceptions in the phenomenal sense were too divergent from reality in the relational sense were at a competitive disadvantage, and natural selection has made sure that those of us who have survived have a good match between our phenomenal perceptions and the relational reality.

But this is not a valid argument within the structure of evolutionary theory. What natural selection secures, according to this theory, is survival to reproduction, not perceptual truth. Roaches, like humans, are the result of natural selection. But we have little confidence that roaches have deep insights into objective reality. They don't need such insights in order to survive just fine. The same may be true of us. We have cognitive and perceptual apparatuses that allow us to survive long enough to reproduce, but we have no guarantees on evolutionary grounds that these apparatuses give us deep insight into the nature of objective reality.

Indeed it is highly unlikely that objective reality resembles in any way the worlds of our phenomenal construction. It would be luck beyond belief to find that the human species, of the millions of species on earth, happens to be the one whose phenomenal worlds resemble the relational realm. It is a certain anthropocentrism that would lead us to assert otherwise, the same anthropocentrism that led us to assert that the earth is the center of the universe, about which all else revolves. What may be unique to humans as a species is a perceptual and cognitive apparatus which, for the first time in evolutionary

history, can rise above the assumption, whether tacit or explicit, that our perceptions in some way resemble objective reality.

What view does this give of the scientific enterprise? Science walks on two legs: observation and logic. The success of science has been its care in arranging detailed observations, and its care in the logical interpretation of the results of these observations. But what the study of perception has uncovered is that, no matter how careful our observations are, we will always be limited to observing only what our internal rules of construction allow us to perceive. Even if we extend our senses with telescopes, microscopes, and various high-tech devices, we can never step outside our senses and see reality unadorned. We cannot get perceptual data that is independent of our own rules of perceptual construction. The very rules that enable us to see also blind us to the infinity of other possibilities that do not conform to our rules. Evolution is not done yet. There is no reason to believe that we have arrived at the set of rules of construction that give deep insight into the nature of objective reality. There is every reason to believe that we are simply another species, like spiders and termites, that has developed an idiosyncratic perceptual system to fit the idiosyncrasies of the the niches we happen to inhabit. This is, of course, no denigration of science. Science may be the best our species can do given the limits of its perceptual and cognitive endowments.

What this does make clear is that the ability of science to understand objective reality is limited by the perceptual and cognitive endowments of our species. Those endowments have not evolved, according to neo-Darwinian evolutionary theory, to give us truth, just to give us, as also to the roach, survival to reproduction. We can point to the many successes of science to suggest that our species might be special, that our perceptual apparatus might just give us true insights into the nature of reality independent of our perceptions. But we can also point to these same successes to tell the opposite story. One stunning success of science is the discovery of dark energy and dark matter, which together constitute something like 96% of the energy and matter in the universe. The matter and energy we can perceive is a mere 4% of the total, the light frosting on the cake. We have no current

way to discover any properties of this dark matter and energy. We can only postulate its existence because without it the behavior of the 4% we can see and measure would not make sense. So our best science tells us that there are serious limits to how deeply our perceptual and cognitive endowments allow us to penetrate the nature of objective reality. The same message appears repeated many times elsewhere in science, for instance in the uncertainty principle and the measurement problem of quantum theory.

So the story outlined above, in which science is systematically uncovering all the secrets of nature, and leaving less and less room for God to hide, is not only immodest, but a complete misunderstanding of the scientific enterprise. Science is a species-specific enterprise, which proceeds under the restrictions of the cognitive and perceptual endowments of one species among millions on earth. The most striking results of this enterprise appear to inform that species of some of its own limitations. These results crop up not only in science but also in mathematics, where we have discovered hard limits to our methods of proof: there are unprovable truths.

If science isn't eliminating places where God might hide, hasn't it at least made God unnecessary, replacing the creative role once assigned to God with the creative power of chance? This is a common assumption, but one that fails to understand the modern theory of chance. This theory is modeled by a series of axioms, among them the Kolmogorov axioms of probability theory, and various axioms for stochastic systems. In the case of probability theory, for instance, these axioms define the properties of a probability measure: It must be an additive function on events whose maximum sum is 1, and so on. Any process in nature that can be modeled by these axioms is taken to be a probabilistic process, a work of chance. But this leaves completely open the interpretation of these axioms. Subjectivists claim that the indeterminacies modeled in probability theory simply reflect our own epistemological limitations; objectivists claim that the indeterminacies are not merely in our heads, but in the objective world itself. Neither interpretation precludes a God orchestrating the probabilistic process. All the mathematics can do is describe the essential properties of such a process, regardless of its origin, and without constraining

the nature of its origin.

If modern theories of chance do not preclude the possible agency of God behind random processes, surely at least the recent brain imaging and TMS studies show that God is simply a figment of our brains, not to be taken seriously. But this conclusion is by no means dictated by the neural facts. Every one of our perceptions, not just our perceptions of God, can be correlated with neural activity. Surely it is a mistake to take none of our perceptions seriously. To do so would lead to quick and certain death. We must be careful, then, in sorting through which perceptions to take seriously and which not. And the neural facts don't a priori tell us which way to treat God. If there were no God, and God was simply a figment of our imagination, then we might expect to find the neural correlates of God perception that we do. On the other hand, if there were a God, and God wanted us to perceive God, then one might equally expect to find the neural correlates of God perception that we do. The neural facts are indifferent to the conclusion we should draw here.

This indifference of facts holds more generally. There is no evidence from the sciences or elsewhere that logically compels belief or disbelief in God. It is elementary in the philosophy of science that no matter how much data one collects, there will always be infinitely many theories compatible with that data, and that make contradictory predictions about the outcomes of new experiments. It is because the theories of science are not logically dictated (although surely influenced) by the facts that scientific theory building is such an interesting and nontrivial enterprise. The atheist, then, can marshal an array of evidence that there is no God, and the theist that there is. In neither case can the evidence logically prove the claim. Both choices are, equally, a step of faith.