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In Defense of God

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The twentieth century has not been good to God. We find no sign of Him in the observable universe. God appears to have been shaved off with Occam's razor. From the cosmological to the subatomic level, there seem to be only quarks, leptons, and void. What can be explained with Him can invariably be explained without Him. Science has displaced religion as a theory of things.

God has lost ground on the moral front as well. The problem of evil remains: Either God can stop evil, harm, suffering, and so forth, or he cannot. If He can, He won't (since He hasn't). So He is partly, perhaps totally, to blame for evil. If He cannot stop it, then greater forces than He must exist — costing Him authority points. Maybe, as people who pray surely suspect, God is equally powerless to do good. The problem of evil suggests that God faces in the extreme what every politician faces to a lesser degree: Goodness and power tend to conflict.

It's hard to imagine the problem of evil occurring — because it's hard to imagine evil occurring — in a universe without nervous systems and the replicating entities that house them. Perhaps the problem of evil is recent in the universe. Maybe this is the Leibnizian best of all possible universes. The problem may be only temporary. Nervous systems may be but one link in an evolutionary chain to silicon or polymer or plasma information systems — and beyond. Or maybe the lights will go out.

In any case, belief in God remains — whether as a safe bet (Pascal), nature-inspired awe (Spinoza and Einstein), an opiate of the people (Marx), a social reflex (Pavlov), the cosmic exaggeration of one's father (Freud), or genes favoring blind obedience to authority (sociobiology). Believers call it faith. Disbelievers call it wishful thinking — swapping emotion for evidence, holding as true what one suspects is false.

In this sense, God is akin to probability. On the one hand, probability is self-evident and its effects are seen everywhere. On the other hand, it is an obvious fiction.

While it seems contrarian, antiscientific, and against the ascent of man to suggest — the will to believe in God may be more rational and scientifically based than 20th-century analyses have so far credited. Science and mathematics — unfolding at an accelerated pace — seethe with data-refuting hypotheses and theories that subsume and overturn one another. Perhaps some recent scientific and mathematical results provide a different perspective on God.

In support of God, I will present two arguments based on recent scientific and mathematical advances — "philosophical" arguments in the classical (rather than the modern classroom) sense. Both arguments speculate from the periphery of science, going beyond science as a ladder goes beyond the relative security of the ground that supports it. Ultimately, they are matters of method — like which competing theory is best supported by new data, or what counts as gross national product. It is not so much that these two arguments are "true" or "false" but, more importantly, how credible, plausible, and persuasive they are.

The first argument, clearing the way for the second, emerges from recent advances in adaptive pattern recognition and brain theory (that is, from neural networks). These advances range from the way that echoes are suppressed automatically in long-distance telephone calls to understanding why it takes the same time to recognize your parents in a photograph when you are five years old as when you are 30 or 60 years old. The second argument emerges from the parallel growth of two bushes, the bush of mathematics and the bush of science — of logic and fact.

Argument 1: Recognition without definition

Pattern recognition precedes pattern definition. Indeed, pattern definition may be unattainable. Can you recognize the opening music to a James Bond film? Probably. Can you define it? Probably not — unless you're the composer, conductor, or have an ear like Mozart's. Yet music is a perfectly well-defined set of parallel notes (equations, actually). The theme is invariant throughout different performances and instrumentations.

Suppose you are sitting with your eyes

closed in a large international airport — LAX or JFK, for example. Dozens of noises and speech signals bombard you. Within several minutes, you may hear many different languages: Arabic, Chinese, Hindi, Japanese, Korean, English, French, German, Italian, Russian, Spanish, and Scandinavian or Slavic languages as well. Try explaining how to discriminate these speech signals from background noise and from each other, and how to classify them. Imagine how hard it must be to program a computer or to build an electrical device that recognizes the same language patterns we recognize (which explains why no such program or device exists today).

Consider how you would teach a child to recognize "Christmas patterns" at shopping malls in December, or "poor neighborhoods" in a city. Try defining "life" or "obscenity." Could you play the violin as Itzakh Perlman plays it simply by asking Perlman questions or reading an instruction manual he might write? Could an accomplished impressionist like Rich Little explain to you (in words — not by example, trial, and feedback) how he mimics celebrities? And could you reproduce or even approximate his performance? Can experts explain in words what they do? And, if they could, could you replicate their expertise?

The point is this: You should not be an atheist or an agnostic because you cannot define God. Be an atheist or agnostic for other reasons — prayers fail, the worst get on top, AIDS spreads, science is enough, whatever — but not for lack of being able to specify what God is. Of course, you should not believe in God for that reason either.

We recognize patterns without being able to articulate exactly what we recognize. Realizing this fact represents a turning point in the recent pursuit of machine intelligence, and foretells intelligent robots, voice-activated computers without keyboards, and all those things promised a generation or two ago by AI researchers. Those computer scientists sought (and many still seek, God bless them) to achieve these difficult objectives by having experts articulate rules of thumb, and encoding those rules in computer programs or "expert systems."

In contrast, the new approach to machine intelligence — using neural networks — simply estimates expert behavior from expert examples. Neural networks recognize patterns without defining them in words.

Talk is cheap. Written text seems more worthy, more respectable, more scientific than talk. But what is text? Just talk. So why does the written word seem more scientific than the spoken (let alone the unspoken) word? At first pass, we can blame it on philosophers and psychologists — although they may be the effect more than the cause of scientific practice.

Arguably, modern philosophers are the strongest advocates of the word's primacy — perhaps because they work in a literary world where symbolic logic is the definitive form of expression. Philosophers have also been heavily influenced by behaviorist psychology (thought = silent speech), although behaviorism has waned in psychology. Symbolic logic and behaviorism make for tough standards.

They also make for debatable values. Consider Harvard philosopher Willard Van Orman Quine, on many counts (including mine) the grand old man of 20th-century philosophy and, not coincidentally, a leading logician. Recently, Quine wrote what he thinks represents the single most important philosophical advance in the past 200 years — "the shift from ideas to words." He correctly sees this as the turning point of modern philosophy, making it more like science and less like religion and metaphysics.

We must not confuse the moon with the finger that points it out — I have never seen a Zen rock garden to compare with the Mojave desert wastelands.

To the adaptive pattern recognition theorist, however, the shift shifts in the wrong direction. Personally, I will always prefer the image of a sunset — captured, say, as a painting or an HDTV image — over the words that describe it.

This "beyond-words" attitude may seem reminiscent of Zen. But just as we must not confuse the moon with the finger that points it out, so an indescribable sense of recognition transcends a particular cultural expression of that sense of recognition. I have never seen a Zen rock garden to compare with the Mojave desert wastelands.

Neural networks. Neural networks generalize learning patterns from numerical samples. These patterns may describe speech, images, muscle contraction rates, economic trends, low-cost work schedules, or anything that a numerical list can describe. The patterns are simply "shown" to the network's input units. The network then behaves as a programmable dynamic system, a swirling set of interlocked differential equations — millions or billions of equations. At first, the swirl may appear and may even be chaotic. Then it quickly equilibrates, as learning unfolds or as the system recognizes or recalls a pattern.

Until neural network methods emerged, we had to estimate functions statistically — by guessing and minimizing the average error of our guesses, a guessing game called "mathematical modeling" (or science). The guess is a candidate function, an equation describing how output depends mathematically on input, and assumes additive "noise." Of course, if we really knew the function's form, we would not need to estimate it. The procedure is question begging in noise. Neural networks use the same input-output data, but remove the guess (letting estimated chips fall where they may).

Statistical estimation exemplifies the silent arrogance of modern science, which heroically assumes that properties we have observed recently on earth and in the solar system apply with equal force to all times and places, to billions of solar systems in each of billions of galaxies, to the labyrinthine infinitude of oscillating universes interconnected through black holes, white holes, worm holes, and the like. Such are the inductive leaps of modern science.

But this pretense of empirical knowledge pales beside that of assuming the functional form — the causal input-output structure — of functions to be estimated. Worse still, the modelers' subjective sense of "tractability," conditioned by graduate training, limits their functional guesses. Most guesses are linear or mildly nonlinear. Unfortunately, these "tractable" functions — including every equation ever written — represent an infinitesimal fraction of the candidate function set. The true possibility space is incomprehensibly bigger, but ignored. One result is periodic scientific upheaval.

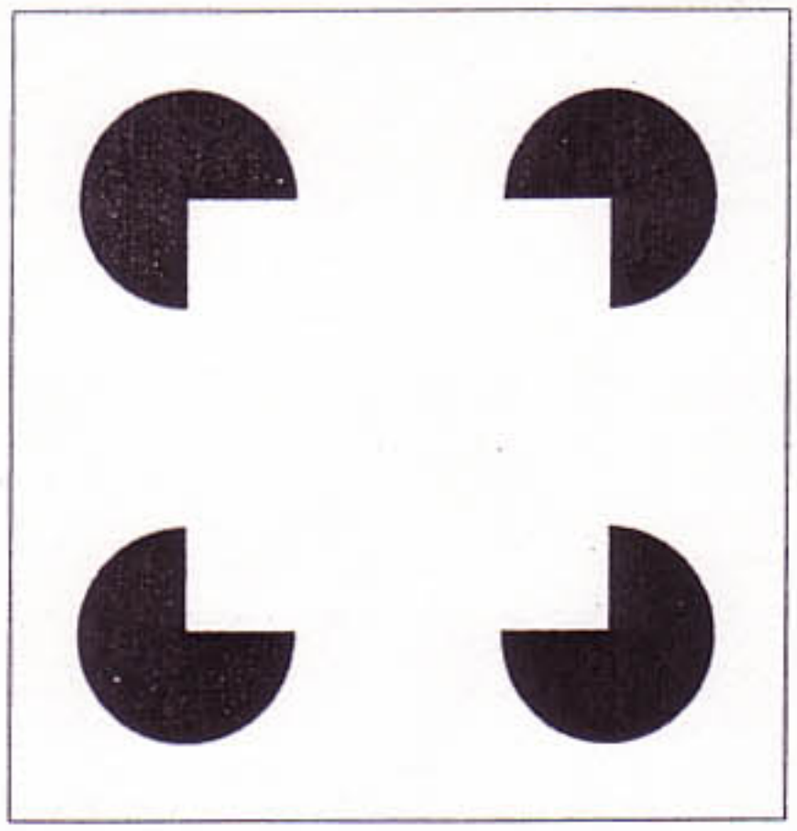
Another result is definition before recognition. If we cannot functionally describe (or, at least, formally circumscribe) something, it isn't really there: Elimination without representation. This is what is said and, as far as it goes, it may

seem reasonable. But what is actually practiced stops far short of this. In practice, the existence criterion is not a possible formal description — it is description "right now," with familiar words or equations: Elimination without articulation. The expert system is this principle's machine intelligence expression. The neural network is its violation.

However, recognition without definition cuts two ways. Neural networks can recognize what does not physically exist. Natural selection may favor such mechanisms to smooth signal processing. For example, consider the fluent neural computation in your brain that recognizes a square where none exists.

The Kanizsa square. With its illusory boundaries and bright interior, the Kanizsa square is a phenomenon in your brain — not a noumenon or Kantian thing-in-itself outside your skin. Might not our inarticulable glimpses of God be similar illusions, imposed by our narrowly evolving minds on the cosmic vastness?

They might be. It's hard to find a selective advantage in glimpsing God. By contrast, blind obedience to authority can stabilize a hierarchy — or firm our stride in hunting parties and war (activities that helped filter out sperm competitors for hundreds of millennia).



The Kanizsa square.

So the question arises: What is left when we subtract blind obedience to authority from glimpses of God? Certainly not institutionalized religion. Perhaps there remains only an evolutionary artifact, a Santayanan "lyric cry in the midst of business."

Our neural chassis evolved in response to environmental and social contingencies. But just as computing machines developed for ballistic modeling test mathematical conjectures and play parlor games, our current neural chassis appreciates music, literature, athletics, and all the other big-brain by-products that waste genetic time. How different the world would sound if composing, performing, and absorbing polyphonic music enhanced gene propagation.

We contemplate and enjoy such big-brain by-products, but we really do nothing with them. They stimulate our surface receptors but give no nourishment in an earthy, hunter-gatherer sense. So it may be with glimpsing God (or gods, if gods are simply superpowerful aliens). A mere "sense of shadow" may be our evolved lot. So far, instead of undermining this sense of shadow, science's empirical march strengthens it — which takes us to our second argument in defense of God.

Argument 2: Observation follows math (but need not)

Mathematics is the language of science by choice. Mathematics is the structure of the universe by observation. It could be otherwise. Logically and probabilistically, it should be otherwise. But it isn't. That's the point.

Logically, mathematical order is but one of infinitely many universal orders. It is the minimum-entropy order because, in principle, we know with certainty its structure in advance. Yet our maximum-entropy techniques of statistical estimation continue to predict and confirm it. At any moment, E may equal mc^{10}; the measured Heisenberg (Cauchy-Schwartz) inequality may reverse; computed sums of independent random variables may not have a bell-shaped Gaussian distribution; and inverse-square laws may fail. But none of these has happened — yet.

The "stationarity" of these laws is only part of the point. More important for empiricists are the continually unfolding observations, in accordance with intricate mathematical consequences of earlier mathematical models — the delayed catch-up of factual matters with logical matters. No logical reason exists why intricate group-theoretical, complex-analytical, and differential-topological consequences of our best microscopic and cosmological physical theories should continue to accurately describe unforeseen (but forthcoming) observations.

Black holes were singularities in Schwarzschild's gravitational equations before being detected at galactic centers. Chaotic dynamic systems are predicted everywhere. And now we are finding them.

This is not an "argument from design" for God — "the-watch-implies-the-watchmaker" notion — based on observations that the universe is mathematically ordered. This is an "argument-from-testability." Order itself proves little. Neural networks, ecosystems, and economies order or organize themselves without intelligent intervention.

A sense of indescribable recognition will pass into conviction — There may be no God but the Mathmaker, and Science is His Prophet.

What matters is the correspondence of new facts with prior mathematical elaborations. Mathematical consequences were unknown at first. Next, theorems were deductively unraveled. Then, supporting observations occurred. Eminently falsifiable hypotheses were tested and not falsified. Instead, they were "confirmed."

This argument is not the tautology that every mathematically describable universe is mathematically describable. A given set of mathematical axioms unravels into a single deductive system of theorems. Strictly speaking, the mathematical system corresponds to exactly one possible set of physical states of affairs. More realistically, it corresponds to a family of nearly substitutable states of affairs when we allow for experimental error, sample-size effects, and fuzzy boundaries. So, a similar bunch of theories can account for the same unfolding observables.

What does all this suggest? Nothing — if tomorrow the tests go awry. Otherwise, with each passing day, the argument ripens — and suggests structure, suggests that we're estimating a blueprint. If this continues for hundreds or thousands of years — if science keeps tracking math — the blueprint hypothesis will ride the asymptote to inductive truth. The Pythagorean, Hahn-Banach, and Sard theorems will still be giving orders. And we will still be taking them. The sense of shadow, of indescribable recognition, will pass into conviction: There may be no God but the Mathmaker, and Science is His Prophet.