

MIDNIGHT CURIOSITY

The Midnight Paradoxes

Fifty problems that have never been solved, told slowly

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Every chapter says who found the problem, when, and what the best answers are. Where a paradox is considered solved, this book says so. Where it is not, this book says that too, and does not hand you a tidy ending that the literature does not have.

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CHAPTER 1

The Liar



A man in Miletus writes eight words on a wax tablet and hands it to a student. The words say: this sentence is false. The student reads it once, then again, and finds he cannot put it down in his mind the way he can put down a tablet in his hand. If the sentence is true, then what it says is so, and what it says is that it is false. So it is false. But if it is false, then what it says fails to hold, and what it says is that it is false, so it is not false. It is true. The student is not confused about the words. He understands every one of them. He is stuck on what they do.

There is no crime scene here, no locked room, no falling body. Just a sentence, sitting on a tablet or a page or, later, a screen, doing nothing but pointing at itself and calling itself a liar. The room around it does not matter. It could be a lecture hall in Ionia or a kitchen table centuries later with the tablet replaced by a napkin. The sentence works the same way in the dark as it does at noon.

Here is the bite of it, stated as plainly as it can be stated. Take the sentence "this sentence is false." Suppose it is true. Then things are as it says, so it is false. Suppose instead it is false. Then things are not as it says, but what it says is that it is false, so that is exactly how things are. It is true. Either assumption forces its opposite. The sentence will not sit still long enough to be one thing. You can say it out loud to a friend tomorrow in one breath: a sentence that says of itself that it is false cannot be true and cannot be false, and yet it seems it must be one or the other.

The attribution that gets repeated most often is wrong, or at least loose. Many people, if they know the paradox at all, know it as the Cretan's puzzle: Epimenides of Crete, said to have declared that all

Cretans are liars, himself being a Cretan. That version is older and it does have a bite, but not quite this one. If Epimenides says all Cretans always lie, and he is a Cretan, the worst that follows is that not every Cretan statement is false, that at least one Cretan sometime tells the truth, which not so paradoxical once you accept that "all" needn't mean "always, every single one." The Cretan version can be defused by noticing it makes a general claim about a group rather than a direct claim about itself. It has an escape hatch. The sentence "this sentence is false" has no such hatch. It refers to nothing but itself, and it does not generalise, it points.

The credit for that sharper form belongs to Eubulides of Miletus, a philosopher of the fourth century BC, a member of the Megarian school, and by most accounts a rival of Aristotle, fond of posing exactly this kind of puzzle to unsettle confident talkers. What he was doing, as far as the record shows, was not building a formal system or worrying about the foundations of logic in the way a modern reader might expect. He was doing what philosophers of his circle did: testing the edges of ordinary language and ordinary claims to truth, seeing where the seams show. The Liar was one of several such puzzles he is credited with, alongside riddles about heaps and horns, each one a small mechanism built to jam on its own materials. He almost certainly did not think he was opening a problem that would still be open twenty four centuries later. He was likely enjoying an afternoon of making someone else's certainty wobble.

The wobble did not go away. It slept, mostly, through the long middle centuries, resurfacing here and there in medieval logic under names like the "insolubilia," problems that resisted solution by the

tools at hand. It woke up fully in the twentieth century, when logicians building rigorous foundations for mathematics found that the Liar was not a charming ancient joke but a real fault line running through any language powerful enough to talk about its own sentences.

The first serious modern answer came from Alfred Tarski, a Polish logician, who in 1933 proposed that the trouble comes from a language trying to contain its own truth predicate. Tarski's fix, worked out formally in that year and published in expanded form not long after, was to forbid it. Build a hierarchy of languages instead. The object language talks about the world. A separate meta language, sitting one level up, is the only place where you are allowed to say that a sentence of the object language is true or false. No sentence can apply the word "true" to itself, because the word "true" for a given language never lives inside that language. It lives one floor up. Under Tarski's scheme, "this sentence is false" simply cannot be formed, because "this sentence" would have to reach for a truth predicate that its own level does not possess. The strength of this answer is its rigor: it gives mathematics a stable, working notion of truth good enough to build logic and much of modern computer science on. Its weakness is that ordinary language does not obey it. English speakers say "true" and "false" about English sentences all the time, including about the very sentence they are speaking, and the language does not fall apart when they do so, except in these deliberately built cases. Tarski's hierarchy solves the problem for formal languages built to his specification. It leaves the natural language version standing exactly where it stood.

A second answer, worked out by the American logician Saul Kripke in 1975, tried to stay closer to how language actually behaves. Kripke's idea was to let truth be built up gradually, starting from sentences that are clearly grounded, like "snow is white," and only afterward permitting sentences to speak about the truth of already settled sentences. Sentences that never bottom out in something grounded, like the Liar, simply never get a truth value assigned to them at all. They are not true and not false. They fall into what Kripke called a truth value gap. This is a more elegant fit for a single, ungoverned language, and it is taken seriously by logicians and philosophers today, more so than a fresh hierarchy. But it has a well known weak point, one that was recognised almost as soon as gap theories were proposed. Consider the strengthened Liar: "this sentence is not true." If the plain Liar falls into the gap, then it is, among other things, not true. But that is exactly what the strengthened sentence claims about itself. So the strengthened version turns out true by the very mechanism meant to let it escape into the gap. The gap closes on itself. No version of the gap solution proposed so far has fully escaped this move; it can always be reformulated one level further out.

Other responses exist. Paraconsistent logicians have proposed simply allowing some sentences to be both true and false at once, accepting the contradiction rather than resolving it, and building a logic sturdy enough not to explode when it holds one. This view, associated with logicians such as Graham Priest, remains a minority position, interesting and carefully worked out, but not the consensus.

So where the problem actually stands: Tarski's hierarchy is settled and trusted, but only as an account of formal languages, not of English or any language people actually speak. Kripke's theory is the leading account for natural language, respected and widely taught, but it does not fully survive the strengthened version of the sentence that started this. What would have to be true for the paradox to close for good is some account of self reference and truth, for a language as flexible as the one you are reading now, that cannot itself be pushed one step further out and made to bite again. No one has produced one yet.

END OF SAMPLE

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