WHEN IS CERTAINTY JUSTIFIABLE?

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We believe many propositions, that is, factual statements. When can we be certain of the truth of a proposition? Many of our scientific beliefs have been tested to the highest standards, and many of our everyday beliefs seem to be undeniable. But certainty still looks like a step too far. It is the next door neighbour of dogmatism.

We shall call a proposition certain, if we cannot currently doubt it. Even if it is certain, we might one day deny it. We might find new evidence, or a new way of thinking, that we cannot yet imagine. The ideas of three philosophers will help us to explore the relationship between certainty and the possibility of denial.

Quine and Popper

Our first two philosophers are Willard Van Orman Quine (1908 – 2000) and Karl Popper (1902 – 1994). They both thought that there was no such thing as a proposition which we could never come to deny.

In his paper "Two Dogmas of Empiricism", Quine argued that our many pieces of knowledge are woven together in a single fabric. At the edge of the fabric, we have observations: for example, the observation that plant leaves are green. Moving into the fabric, we have theories which explain some of these observations. We have theories about how plants extract energy from sunlight, and the role of chlorophyll, and why tissues with chlorophyll in them look green. We can move further into the fabric, towards its centre. We have propositions about molecules, the bonds within them, and chemical reactions, which explain how chlorophyll does its job. Further in, our knowledge of elementary particles and fundamental forces explains why chemical bonds and reactions work in the ways that they do. Now we are deep into the equations of physics, very near the centre of the fabric. We need to explain why the equations fit together, and why they have the solutions that they in fact have. We find the answers to those questions in mathematics, which sits in the middle of the fabric, along with logic.

We sometimes get evidence that clashes with propositions in the fabric. Suppose we saw a lot of leaves that were not green, but purple. We would create exceptions to the rule that leaves were green. But suppose we kept on finding leaves that were purple, on lots of species of plants. Then it would not be enough simply to say that there were exceptions. We would have to change our theories of how plants worked, in order to accommodate what we had found. That is not a surprise. But what is a surprise is how far Quine would take this. We might find that we could not explain how plants got their energy, using the chemical that gave the purple colour. We could tackle that by changing our general theories of how chemical reactions worked. That would be drastic. It would have knock-on effects in other areas. But we might still decide to do it, if that gave us a fabric of knowledge which was a better fit with our observations overall.

Quine would even contemplate changes to the laws of logic, at the centre of our fabric, if that was the best option. He would not do that to accommodate purple leaves, but he does suggest that playing around with the laws of logic might be worth doing to simplify quantum mechanics. If we contemplate going that far, nothing is safe. Some propositions, like our laws of logic, would be at very low risk of getting changed. But nothing would be immune.

Analytic and Synthetic Propositions

There is a traditional distinction between two types of proposition, analytic and synthetic, which would create major difficulties for Quine's proposal to put mathematics and logic in the firing line. Analytic propositions are true by virtue of meanings. One classic example is "If anyone is a bachelor, he is unmarried". Analytic propositions only show us how our definitions fit together. They tell us nothing about the real world: the example would be true, even if there were no bachelors anywhere in the world. Correspondingly, no facts about the world could show them up as false. Synthetic propositions, on the other hand, tell us about the world. "Ice floats in water" is an example. We have to observe ice, in icebergs or in our drinks, to see whether this is true. If lumps of ice sank, it would be false.

There are two obvious ways to categorize mathematical propositions. The first way is to treat them as analytic. We define numbers, geometric shapes, and so on, in certain ways. Then the propositions of mathematics follow from the definitions. The second way is to follow Immanuel Kant (1724 – 1804), and to regard the propositions as synthetic, but as unavoidable: we can only make sense of the world, if we see it as complying with our mathematics. Either way would make it very hard to agree with Quine. Analytic propositions cannot be false. And on Kant's view, we cannot conceive a world in which they are false.*

Quine, however, saw himself as safe from this difficulty. He rejected the distinction between analytic and synthetic propositions. As we move towards the centre of the fabric, propositions get safer and safer from rejection. But there is no secure wall around the centre, which would make any proposition within the wall analytic and completely safe. His views also do not leave any room for a barrier to our coming to look at the world in a radically new way. Such a new way could allow us to conceive the world, even after we had rejected propositions that followed from our current way of making sense of the world.

Popper also put everything in danger. He said that even the most brilliant, well-tested, successful theory might be brought crashing down tomorrow, if evidence that contradicted it turned up. Of course, it makes sense to rely on our successful

* {In Kant's day, Euclid's geometrical axioms (where parallel lines never meet) were accepted as the only logically possible geometry and therefore certainly true for the universe, believed by Kant to be known to us *a priori*. In the 19th century however, mathematicians invented several equally logically coherent but *non*-Euclidian geometries, opening the possibility that one of these might actually apply to this universe. In 1915, Einstein did adopt one of these new forms for his theory of gravity; it was confirmed by observations made during a solar eclipse in 1919. [Ed]}

theories, in order to build bridges and cure diseases. And they might never run into trouble. But we can never know that they won't one day run into trouble. As with Quine, no proposition is completely safe from being denied at some time in the future.

Popper also exposed mathematics to this risk, although in a different way from Quine. He said that a proposition like "2 + 2 = 4" could be taken in two senses. If we take it as a piece of abstract mathematics, in isolation from the world, we cannot deny it. But if we apply it to the world, it might turn out not to work. It does not work for the addition of velocities, for example. If you move north, at 0.2 times the speed of light, relative to the Earth, and I move north, at 0.2 times the speed of light, relative to you, I do not move at 0.4 times the speed of light relative to the Earth. Relativity dictates that I only move at 0.385 times the speed of light.

On mathematics, Quine's analysis is stronger than Popper's. Quine explains the range of options that we have, to amend our fabric in one place or another. When Einstein introduced relativity theory, he did not change mathematics; he changed the physical description of the world. Changing mathematics, in the sense of denying some formula because it does not work in the world, really is a last resort. We first look for ways to re-describe the world, so that we can find an excuse not to apply the formula.

Wittgenstein

Our third philosopher is Ludwig Wittgenstein (1889 – 1951). The book that concerns us here is called *On Certainty*. We shall make use of a central idea in the book, but we do not pretend to represent his own views precisely.

Wittgenstein distinguishes between propositions that we can doubt, and propositions that are certain. We can doubt that the lines that led to human beings and to chimpanzees branched something like six million years ago. We can ask whether it might have been two, or 20, million years ago. There may be good evidence that it was roughly six million years ago, but it is perfectly sensible to ask the question. On the other hand, we are certain that the Earth has existed for billions of years. If someone wondered whether the Earth came into existence 200 years ago, with all the fossils, historical documents, buildings, people and their memories in place, that would be crazy.

It would be worse than crazy. The proposition that the Earth has existed for billions of years plays a key role in the foundations that support our thought. It gives us the context that allows us to think about evolution, continental drift, and so on. No-one can doubt the long life of the Earth, and remain engaged with the rest of us in discussing such things. Similarly, we cannot engage with anyone who doubts that 2 + 2 = 4. Propositions like these, about the age of the Earth and about arithmetic, underpin lots of other knowledge. If we denied them, we would not know how to carry on thinking. So even doubting them puts the doubter outside the community of people, with whom we can have sensible conversations.

Other propositions are certain, because of their type. If we doubted them without specific reasons, we would doubt that we were in touch with reality, and we cannot do that without creating chaos in our thought. These include propositions like “There is a table in this room”, and “Paris is the capital of France”. Sometimes, we may have reason to worry about hallucination. Then we might doubt that there was a table in the room. But if someone regularly doubted propositions of these types – propositions that reported straightforward observations or well-known facts – we would find it very difficult to have a conversation with them.

The propositions which are certain include propositions that we could only discover by studying the physical world. And we could have got that process wrong. A proposition may be certain, but mistaken. It used to be impossible to doubt Newtonian mechanics, with its absolute space and absolute time. Now we know that it was false all along, although not false in a way that we would notice in everyday life.

This example shows that there is no conflict between Quine and Popper, who claimed that any proposition which we currently accept might get denied, and Wittgenstein, who claimed that some propositions could not be doubted at the current time. We can, however, learn more about certainty, by combining the thoughts of Quine and Wittgenstein.

Quine’s Fabric and Wittgenstein’s Certainty

Quine’s image of a single fabric of knowledge can help us to identify propositions that are certain in Wittgenstein’s sense, or that come close to that kind of certainty.

At and near the centre of the fabric, we find propositions which are foundational. If we changed our logic, our mathematics, or our fundamental physics, that would have huge implications, all over the place. We can make changes to our fundamental physics. We did so, about a century ago, with the rise of relativity and quantum mechanics. We have still not finished the task of tying up all the loose ends which those changes created. So although these foundational propositions are not immune from change, the effects of change would be so big that we shy away from doubting them.

Further out, in the middle range of theories of non-fundamental physics, of chemistry and of biology, we have theories that would be reasonably easy to change, without having disruptive effects right across the fabric. We can, for example, discard the view that crystals all have patterns that repeat exactly, when we discover quasi-crystals. Dan Shechtman did that in 1982. There was a lot of fuss at the time, but the idea was eventually accepted, and he got a Nobel Prize in 2011. Propositions in this region are not certain, in Wittgenstein’s sense.

When we get to the edge, and simply report our observations of the world, we find propositions which Wittgenstein would regard as certain, because of their type. We just have to accept an observation that when we mix two given chemicals in some water, the water turns blue. We also have to accept readings that we get from sophisticated instruments, like the detectors at a particle accelerator. We have to do that, because those instruments work on the basis of well-established facts, such as the fact that a magnetic field will bend the path of an electron. Those facts are observed consequences of accepted physical theories. Wittgenstein would not let us doubt these observed consequences, because they themselves embody straightforward observations.

There are propositions of one more type that Wittgenstein should not let us doubt. These connect our scientific theories with observations. They state that our existing theories correctly predict the observations we will get, at least across the range of temperatures, concentrations of chemicals, and so on, over which we have tested them. These propositions combine data from our observations, and logical implications of our theories. Our theories imply that we should observe such and such. The data match those observations. All we have to do is recognize the match. Any doubt would have to be a doubt about our observations, or a doubt about the logic that allowed us to deduce the implications of our theories. Neither kind of doubt would be allowed by Wittgenstein.

Finally, Quine's fabric can allow us to doubt some propositions that Wittgenstein told us we could not doubt. Suppose that we doubt something foundational, like the great age of the Earth. We imagine denying it. Then the big interwoven fabric would support us. It would show us how we could adjust and realign our surviving beliefs. We would not have to throw away huge chunks of our knowledge, and be left with no idea of how to carry on thinking.

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