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What is Mathematical Reality?

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Modern Physics and Philosophy
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OVERVIEW

The project which this poster describes is an exploration of the philosophy of math, including its history, development, foundations, applications, and current status. It also provides original thinking on the most important questions within the philosophy of math, although writing and research is ongoing.

BACKGROUND

The philosophy of math asks why it is that mathematics describes the physical world so well, why methodologies in math are conducive to an understanding of it, and what the foundational objects of math are. The discipline in its modern form is several centuries old, but does not have total consensus on any of the above questions.

Answers have, however, been historically positioned around realism – whether or not the objects and/or truths of math are real. All of the primary schools of thought can be framed as differing combinations of stances on realism.

The majority of the issues facing any framing are related to self-reference and incompleteness.

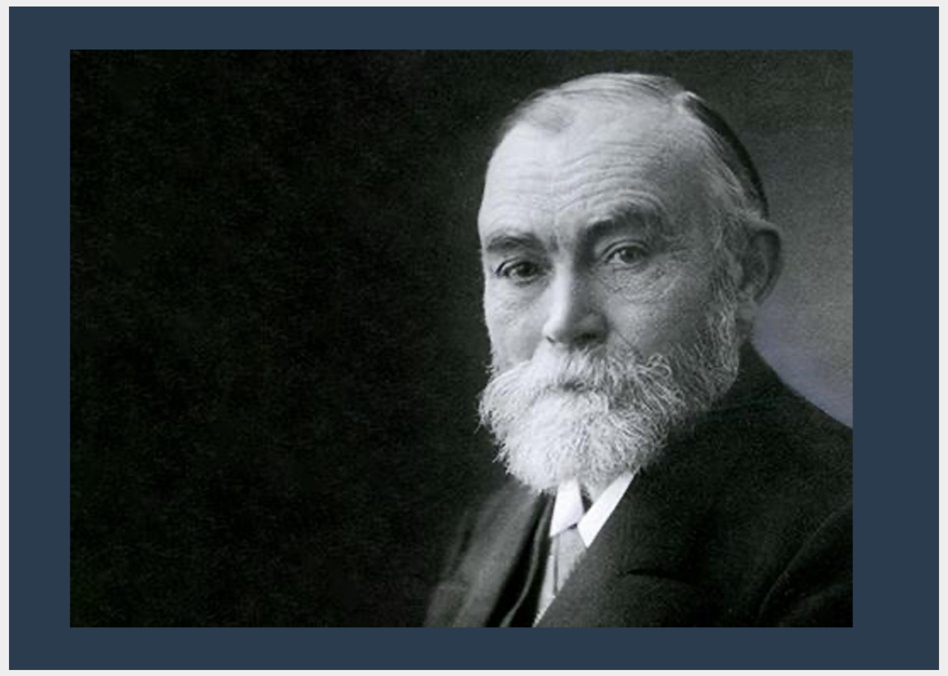

FIGURE 1: Gottlob Frege, a pioneer in the philosophy of math. Believed math was reducible to logic alone, a view known as logicism.

QUESTIONS

Most philosophers and mathematicians today are structuralist – either eliminative or non-eliminative, although eliminative set-theoretic is by far the more common.

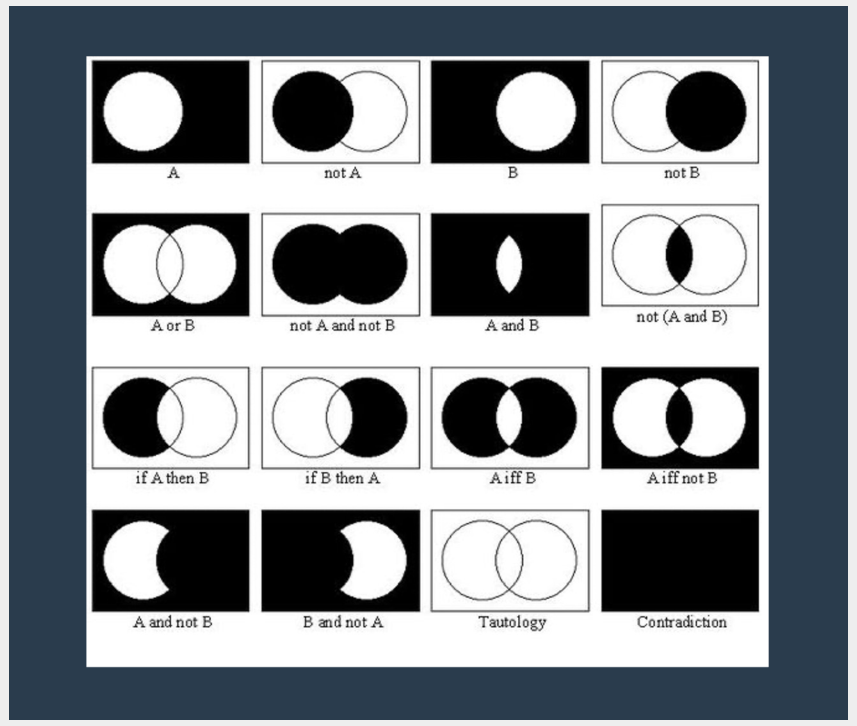

FIGURE 2: Basic operations in set theory, part of the basis of modern mathematics

This makes sense, as structuralism provides an incredibly elegant explanation of indispensability – if math is patterns, then the orderly universe must follow mathematics –, and eliminative modal structuralism in particular avoids the issues that come with postulating the existence of an abstract thing.

However, these more modern formulations hold either a binary stance towards object realism, or, in the case of eliminative structuralism, a stance that is noncommittal.

Could it instead be possible to transform object realism into a fluid question with broader answers?

MY WORK

In order to broaden the question of realism in math, we may ask instead of whether or not math is real (or whether or not it matters) what aspects of math are real, who or what assigns mathematical reality, and what reality means.

This more closely mirrors the way mathematicians engage with math; because they tend to think as platonists and act as formalists, it makes sense to hold that some aspect of mathematics' meaning is assigned by human thinkers – just not all of it, as intuitionists would hold. In other words, math has unique utility and use cases to people that exist only with them.

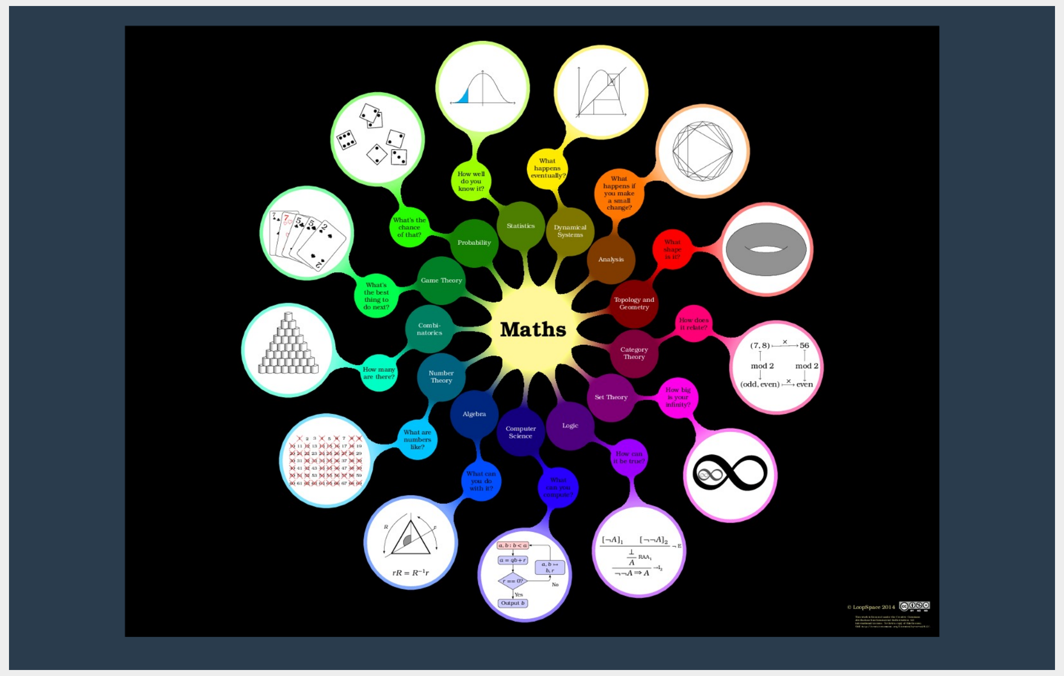

FIGURE 3: A poster from Mathforge relaying large questions within a wide range of mathematical disciplines

These utilities, use cases, and representations are emergent properties of patterned structuralist mathematics, but are nonetheless core to it; examples are the concept of a number of things, a graph, a proof, and anything else that humans construct.

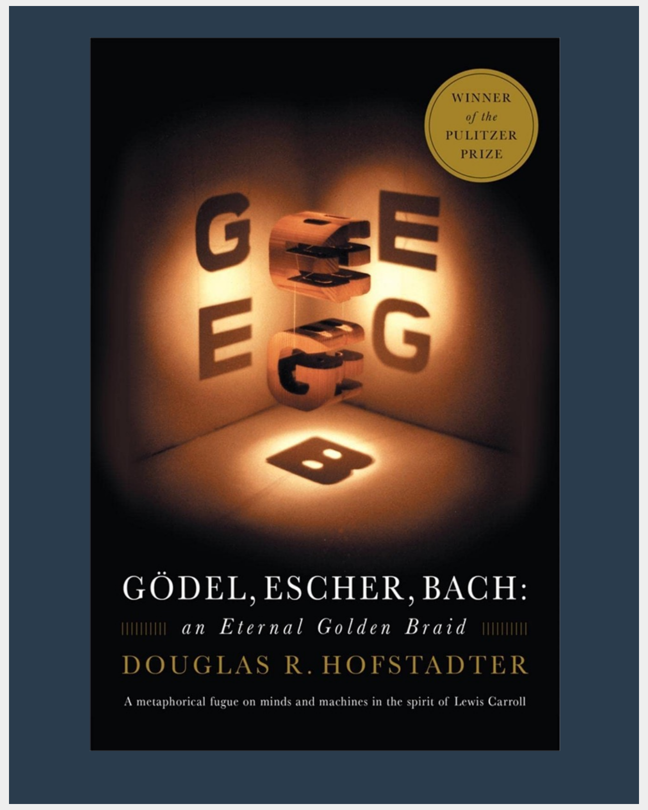

FIGURE 4: The book GEB, a significant inspiration for my ideas about self-reference

In essence, the concept of meaning is a human one that need not apply to patterning in the universe; representations are *meaningful*, while underlying patterns are *true.*

Excising the concept of meaning from patterns in the universe also allows self-reference paradoxes such as Russell's to be explored more deeply. And in fact, there is an existing framework for this known as dialetheism. Under dialetheism, contradictions are acceptable so long as they are coherent. This allows for deep exploration of mathematics that exhibits contradiction.

ONGOING DIRECTION

In order to develop my ideas, I intend to teach myself classical logic and set theory – these are necessary to a formal construction of ideas in philosophy of math. Additionally, I intend to explore the applications of dialetheism to physics; if contradiction were allowed in math, it would also presumably be acceptable in physics – an interesting thought, especially when quantum gravity is considered.