

# A U S H A N G

FREIE UNIVERSITÄT BERLIN

Fachbereich Mathematik und Informatik

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## D I S P U T A T I O N

**Montag, 16. Mai 2022, 14:00 Uhr**

[WebEx](#)

**Disputation über die Doktorarbeit von**

**Herrn Daniel Kirchner**

Thema der Dissertation:

**Computer-Verified Foundations of Metaphysics and an Ontology of  
Natural Numbers in Isabelle/HOL**

Thema der Disputation:

**What a Round Square and Flying Pigs can tell us about Abstraction  
and the Nature of Mathematical Objects**

Die Arbeit wurde unter der Betreuung von **Prof. Dr.-Ing. habil. C. Benzmüller** durchgeführt.

Abstract: The most commonly used and well-established foundational theory of Mathematics is set theory. But while most of the objects of Mathematics can be represented as sets, there are foundational questions that cannot be answered on the basis of this reduction: What kinds of objects are Mathematical Objects, e.g. Natural Numbers? Are Natural Numbers really sets? Do they "exist"? What does "existing" mean exactly? In this talk, we will discuss a different, much broader foundational approach which, in the first instance, provides a formal metaphysical theory of abstraction inspired by natural language and the process of human thought. For historic context, we will sketch an argument between Russell and Meinong about the nature and inferential behavior of Impossible Objects: Does the Round Square "exist" and, if so, in what sense? Can there be true statements about it? While the Russellian view initially prevailed, more recently it has been recognized that it falls short of providing a precise analysis of human thought and reasoning involving "non-existent" objects ("Russell and Meinong argued about the Round Square." and "Flying pigs are fictitious." are examples of true statements that are already hard to analyze using Russell's strategy). On the other hand, the so-called "dual copula strategy" (formulated by Ernst Mally) provides a basis for consistently formalizing Meinong's thoughts, as done by Edward Zalta with his Theory of Abstract Objects. We will sketch this strategy and discuss how it can gracefully deal with impossible and fictitious objects, how it explains abstraction and what challenges it has to overcome. We will draw the connection between Zalta's object theory and foundational questions of Mathematics and sketch how Natural Numbers can be constructed and explained in object theory on the basis of common intuitions about properties and predication, rather than with a purely technical construction using sets. Finally, we will briefly discuss the implications of object theory in a broader context. We will explain in what way the (relational) type theory underlying Zalta's formal theory differs from Church's (functional) type theory, how object theory can be used to argue for Logicism, what implications object theory may have for the development of Artificial Intelligence, and which set-theoretic issues are involved in a potential future construction of set-theoretic models for unbounded higher-order object theory.

Die Disputation besteht aus dem o. g. Vortrag, danach der Vorstellung der Dissertation einschließlich jeweils anschließenden Aussprachen.

**Interessierte werden hiermit herzlich eingeladen**

Der Vorsitzende der Promotionskommission  
Prof. Dr.-Ing. habil. C. Benzmüller