

**Universitatea Babeş-Bolyai**  
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# **Theories of reference**

PhD THESIS

SUMMARY

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# CONTENTS

|                                                                                  |            |
|----------------------------------------------------------------------------------|------------|
| <b><u>INTRODUCTION</u></b>                                                       | <b>5</b>   |
| <b><u>FUNDAMETALS OF FIRST ORDER LOGIC AND MODEL THEORY</u></b>                  | <b>24</b>  |
| <b><u>The algebraic structure of first order logic</u></b>                       | <b>24</b>  |
| <u>Alphabets, freely generated semigroups and unique factorization</u>           | 24         |
| <u>Alphabets and words</u>                                                       | 29         |
| <b><u>Propositional calculus</u></b>                                             | <b>34</b>  |
| <u>Preliminaries</u>                                                             | 34         |
| <u>A formal system of propositional calculus (<math>C_p</math>)</u>              | 37         |
| <u>The semantics of propositional calculus</u>                                   |            |
| <u>The completeness of propositional calculus (Kalmár)</u>                       | 56         |
| <u>The Henkin-type proof of the completeness of propositional calculus.</u>      | 61         |
| <u>Properties of maximal consistent sets.</u>                                    | 70         |
| <b><u>First order logic</u></b>                                                  | <b>77</b>  |
| <u>Syntax</u>                                                                    | 79         |
| <u>Semantics</u>                                                                 | 91         |
| <u>Substitution</u>                                                              | 101        |
| <u>Isomorphism and elementary equivalence</u>                                    |            |
| <u>An axiomatic system for first order logic</u>                                 |            |
| <u>Characterization theorems of first order logic</u>                            |            |
| <b><u>ANCIENT AND MEDIEVAL THEORIES OF REFERENCE</u></b>                         |            |
| <b><u>The significance of Cratylus' naming theories in logical semantics</u></b> | <b>139</b> |
| <u>Cratylus. A survey</u>                                                        | 140        |
| <u>385b-d</u>                                                                    | 142        |
| <u>Arguments against conventionalism</u>                                         | 148        |
| <u>The rejection of Protagoras relativism</u>                                    | 150        |
| <u>Plato on the function of names</u>                                            | 151        |
| <u>Reference and truth in Plato's <i>Sophist</i></u>                             | 153        |
| <u>Aristotle on names</u>                                                        | 158        |

|                                                                                        |            |
|----------------------------------------------------------------------------------------|------------|
| <u>Medieval semantics</u>                                                              | 159        |
| <u>Reference as a theory of supposition vs. reference as a theory of signification</u> | 160        |
| <u>Signification and supposition</u>                                                   | 164        |
| <b><u>DESCRIPTIVIST THEORIES OF REFERENCE</u></b>                                      | <b>168</b> |
| <u>Prolegomena to descriptivist theories of reference</u>                              | 168        |
| <u>Frege's puzzle</u>                                                                  | 174        |
| <u>Sense and reference</u>                                                             | 185        |
| <u>The compositionality of sense and reference</u>                                     | 187        |
| <u>Sense, reference and non-referential terms</u>                                      | 190        |
| <u>Sense, reference and propositional attitudes</u>                                    | 192        |
| <u>Fregean semantics. A review</u>                                                     | 194        |
| <u>Background of Russell's theory of descriptions.</u>                                 | 198        |
| <u>Russellian semantics.</u>                                                           | 201        |
| <u>The analysis of sentences containing definite descriptions.</u>                     | 206        |
| <u>The analysis of negative existential statements.</u>                                | 212        |
| <u>The analysis of statements containing propositional attitudes.</u>                  | 214        |
| <b><u>ANTI-DESCRIPTIVIST THEORIES OF REFERENCE</u></b>                                 | <b>215</b> |
| <u>Objections to the descriptivist theories of names.</u>                              | 215        |
| <u>Semantic argument</u>                                                               | 217        |
| <u>Epistemic argument</u>                                                              | 218        |
| <u>Modal argument</u>                                                                  | 220        |
| <u>Historical-causal theories of reference</u>                                         | 221        |
| <u>The problem of non-trivial true identity statements</u>                             | 227        |
| <u>The problem of negative existential statements</u>                                  | 229        |
| <u>The problem of statements involving propositional attitudes</u>                     | 232        |
| <u>Thesis on proper names</u>                                                          | 233        |
| <u>Modalities and rigid designators</u>                                                | 234        |
| <u>Propositional modal logic</u>                                                       | 237        |
| <u>Quantified modal logic</u>                                                          | 245        |
| <u>The technical motivation for the introduction of rigid designators</u>              | 249        |
| <b><u>THE REJECTION OF REFERENCE</u></b>                                               | <b>257</b> |

|                                                                                      |            |
|--------------------------------------------------------------------------------------|------------|
| <b><u>The indeterminacy of translation</u></b>                                       | <b>260</b> |
| <b><u>The inscrutability of reference</u></b>                                        | <b>265</b> |
| <b><u>Ontological relativism</u></b>                                                 | <b>268</b> |
| <b><u>Model theoretic arguments</u></b>                                              | <b>269</b> |
| <u>The permutability argument</u>                                                    | 270        |
| <u>Intentional states and thought experiments</u>                                    | 276        |
| <u>'Just more theory' argument</u>                                                   | 278        |
| <br>                                                                                 |            |
| <b><u>THE PROBLEM OF REFERENCE IN CONTEMPORARY PHILOSOPHY OF MATHEMATICS 281</u></b> |            |
| <br>                                                                                 |            |
| <b><u>A survey of contemporary philosophy of mathematics</u></b>                     | <b>281</b> |
| <br>                                                                                 |            |
| <b><u>Benacerraf's dilemma</u></b>                                                   | <b>284</b> |
| <br>                                                                                 |            |
| <b><u>Reference and indeterminacy</u></b>                                            | <b>285</b> |
| <u>Benacerraf's puzzle</u>                                                           | 288        |
| <u>Categoricity vs referential indeterminacy</u>                                     | 289        |
| <u>Categoricity proofs and second order logic.</u>                                   | 295        |
| <u>Tennenbaum's theorem and the standard model of Peano's arithmetic</u>             | 305        |
| <br>                                                                                 |            |
| <b><u>The problem of reference in <i>ante-rem</i> structuralism</u></b>              | <b>315</b> |
| <u>Systems, structures and reference.</u>                                            | 315        |
| <u>Identity and reference</u>                                                        | 322        |
| <u>Automorphism and indiscernability</u>                                             | 327        |
| <u>Ladymann and irreflexive simetric relations</u>                                   | 333        |
| <u>A way out: identity is a primitive notion.</u>                                    | 336        |
| <br>                                                                                 |            |
| <b><u>The problem of reference in mathematical fictionalism</u></b>                  | <b>344</b> |
| <u>Fictionalism in mathematics</u>                                                   | 345        |
| <u>Fictionalism as a strategy of constructive-empiricism</u>                         | 345        |
| <u>The problem of reference in the local fictionalist strategy</u>                   | 347        |
| <u>Fictionalism qua fictionalism</u>                                                 | 351        |
| <u>Reference in global fictionalist strategy</u>                                     | 354        |
| <br>                                                                                 |            |
| <b><u>CONCLUSIONS</u></b>                                                            | <b>357</b> |

## Argument and methodology

The aim of the thesis *Theories of reference* is to present and critically assess the philosophical issue of reference. Set within the context of the analytical philosophy of language, the issue of reference deals with the relations occurring between the use of some expressions and what those expressions denote provided of course that there are any such relations at all. The classical expression of the problem has been formulated by Kripke<sup>1</sup> as follows: ‘So what *does* make my use of “Cicero” into a name of *him*?’ Leaving the narrow frame of the philosophy of language behind, we can state that the investigation of the relations that appear between a language and the model described by this language is the most important problem that theories of reference struggle to solve. Taken as such, this concern is neither new, nor does it belong to one particular field of research. Nevertheless, what makes the contemporary theories of reference stand out is the methodology used in order to investigate the nature of these relations, namely the mathematical and logical techniques and the use of some significant results in model theory to make or sustain several philosophical points about the nature of reference relations. This is the reason why this thesis dedicates considerable attention to the thorough elaboration of these techniques as well as to the rigorous proof of some fundamental logic results, which have been used to defend or to criticize or even reject different theories regarding the nature of the reference relation. One of the champions of the use of model theory theorems to draw relevant conclusions about the nature of the reference relation is Hilary Putnam. For example, in a famous article<sup>2</sup>, Putnam argues that the Löwenheim-Skolem theorem generates a ‘paradox’ in the philosophy of language which indicates the impossibility to establish a privileged reference relation between the expressions of a language and the intended models of that language. In two other papers<sup>3</sup> Putnam uses a theorem from model theory<sup>4</sup> and a logico-mathematical trick<sup>5</sup> to build unintended models of first order theories which are equivalent modulo truth conditions

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<sup>1</sup> Saul Kripke [1980], *Naming and Necessity*. Harvard University Press, p. 92.

<sup>2</sup> Hilary Putnam [1980], “Models and Reality” *Journal of Symbolic Logic* 45 (3), pp. 464-482.

<sup>3</sup> Hilary Putnam [1981], *Reason Truth and History*, Cambridge: Cambridge University Press

<sup>4</sup> the theorem under discussion is that which affirms that any two isomorphic structures are elementary equivalent.

<sup>5</sup> Basically, it is a matter of constructing a permuted model which preserve the structure of the “original” “intended” model.

with the intended model. This construction underlines a similar idea: a multitude of reference relations can be established between the expressions of a theory and the items of that theory's model, relations that obey all the requirements a reference relation should meet.

The thesis analyses these arguments and describes the conceptual mechanism behind these theorems as well as the relevant mathematical techniques used in the deployment of these arguments.

In what concerns the philosophical issue of reference, we should draw a first important distinction between two major ways of viewing reference: we have on the one hand a view that affirms the existence of a reference relation, and as a consequence, the philosophical inquiry should focus on identifying the mechanism behind this relation, and on the other hand, we have a view that refuses to admit the genuine existence of such a relation.

The first view branches in turn into three big categories, depending on the way in which the mechanism of reference is identified: descriptivist theories, causal theories, and hybrid theories. Before we analyse them separately, we must point out that these theories consider proper names to be a paradigmatic case of referential relations that emerge between a language and what that language describes. Hence, we can say that these are theories of reference of proper names.

### **Descriptivist theories of reference**

Descriptivist theories identify as reference-mechanism the unique identifying description attached to a proper name by the speaker of a language. According to descriptivists, in order to use a name one must know at least one description which relates the name to its referent. How exactly does a description relate a name to its referent? This is done by the satisfiability of the description: a name refers to that item which uniquely satisfies the description attached by the user to the name under discussion.

The paper analyses this views on names from a historical and critical perspective. Thus, the author presents the way in which this view came to be as a result of the difficulties that Gottlob Frege identified with the Millian theory of reference. It is worth

while mentioning that one of these difficulties came to be known in the literature as *Frege's puzzle*<sup>6</sup>. John Stuart Mill<sup>7</sup> developed a theory which stated that proper names are directly referring expressions, with no descriptive content.

In the first part of *A System of Logic*, entitled 'Of names and propositions', Mill presents his doctrine of proper names, set within the context of the traditional analysis of the structure of propositions.

For a better understanding of Mill's work we need to recall that traditional logic sees sentences as having a tripartite structure, with a logical subject, a logical predicate and a copula or a relational element between the two. Following Aristotle's footsteps, Mill's observation in this context is that names can be divided in two categories: general names and singular or individual names. General names „can be either true or false about an indefinite number of things”, and they can occupy the predicate position. Within the sentence they are the elements which „denote what is being affirmed or denied”, while individual names „are capable of being true only about an individual”. The next distinction Mill introduces is that between concrete and abstract names. Concrete names apply to entities (real or fictional), while abstract names apply to attributes or properties that concrete individuals possess. It is under in this context that Mill introduces his famous distinction between connotative and non-connotative names. Non-connotative names have a simple semantic connection to their referent: they signify this referent, be it a thing or a property, and that is the only semantical function a name has. On the other hand, connotative names have a mediated relation with their referent: an attribute comes between the name and the thing and it mediates the relation. Thus, the reference of that name is determined by the attribute implied by the connotative name. It might be the case that originally there was a motivation behind choosing a name, but that motivation cannot be considered a semantic glue between the name and what it denotes.

Let us summarise our discussion so far with the help of some examples. In the context of the traditional view on the structure of sentences, Mill distinguishes between two kinds of terms. Connotative terms denote things but connote attributes. For example, the word “white” denotes snow because it connotes whiteness, and snow possesses the attribute of

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<sup>6</sup> Nathan Salmon [1986], *Frege's Puzzle*, Cambridge MA: MIT Press.

<sup>7</sup> In John S. Mill [2009], *A System of Logic, Ratiocinative and Inductive* Tedington: Echo Library.

being white. Non-connotative words, on the other hand, denote just one thing or just one attribute and they do not connote anything, which is the same as saying that there is no property or attribute that could alone relate the word to that which it denotes.

Proper names go under the category of non-connotative terms because they are entirely empty of any attribute that the term might imply and in the virtue of which the reference could be fixed.

A proper name denotes a person and does not imply any attribute the person could or should possess and in virtue of which that person should carry that name. In simpler words, names are just labels of things, which is not to say that they don't have a significant part to play in the use of language.

Fifty years later, Gottlob Frege<sup>8</sup> elaborates and theorizes four important challenges to which the Millian theory of proper names must answer:

1. explain the cognitive value of informative, non-trivial identity statements;
2. explain how statements which contain singular non-referential terms are nevertheless intelligible;
3. explain the consistency of the Millian theory with the apparent failure of the substitutivity principle when applied to coreferential terms in statements which express propositional attitudes;
4. explain the semantic mechanism of negative existence statements.

### **Causal theories of reference**

Descriptivist theories were born as a result of the attempts to find a solution to the difficulties that the Millian theories of reference raised. Descriptivists came up with the idea of introducing an intermediary item between the expressions and their referents, namely the sense. In the case of proper names, sense is given by the uniquely identifying expression which a speaker of a language associates with the name.

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<sup>8</sup> Gottlob Frege, [1879] *Begriffsschrift, eine der arithmetischen nachgebildete Formelsprache des reinen Denkens*. Halle a. S.: Louis Nebert. Translation: *Concept Script, a formal language of pure thought modelled upon that of arithmetic*, by S. Bauer-Mengelberg in Jean Van Heijenoort, ed., [1967], *From Frege to Gödel: A Source Book in Mathematical Logic, 1879–1931*. Cambridge: Harvard University Press; Gottlob Frege [1892], "Über Sinn und Bedeutung" in *Zeitschrift für Philosophie und philosophische Kritik* 100: 25-50. Translation: "On Sense and Reference" in Peter Geach and Max Black eds. [1980], *Translations from the Philosophical Writings of Gottlob Frege*. Rowman & Littlefield Pub Inc.

Bertrand Russell begins his inquiry into the problem of referentiality from the Fregean account of the matter and develops it to the mature form of what we now call the “descriptivist theories of reference”. The thesis is concerned with more than the presentation of the historical evolution of descriptivist theories, it also critically assesses them, and it reinterprets them with the help of the devices of modern mathematical logic.

The causal theories of reference identify, as a mechanism of referring, a type of causal or historico-causal relation that takes places between names and their referents, relation which is neither reducible to nor reconstructible in terms of the descriptions which the speaker may associate with the expression in cause. It is because of this relation that a name refers to the item it designates and not to something else.

Historically, the causal theories had had a double origin. On the one hand, they have been constituted starting from certain technical considerations regarding the semantics of quantified modal logic and, on the other hand, their development is a consequence of developments in the analytic philosophy of language. The thesis is predominantly concerned with their first source, that is, the emergence of the concept of rigid designator as a salient element in the model theoretic study of modal logics and the application of this concept to natural language in order to explain and clarify the status of proper names. According to one of the first defenders of the historical theory of reference, the reference of proper names is constituted as follows:

1. the reference is determined through an initial baptism, where the referred object is either directly perceived by the members of the community or it is made available through a description.
2. once the reference is determined or fixed, the name is transmitted from speaker to speaker in the communication chain.

The first stage is the determination of the reference, the second it's its transmission. Both stages are important in the economy of the historico-causal theories of reference and they indicate the reason why such theories are called non-descriptivist: the transmission of a proper's name reference to a speaker doesn't automatically presuppose the transmission or the association of some descriptive content with it. Furthermore, the mechanism of referring is: A name N refers to an individual X iff the name N bears an adequate causal-

historical relation to the individual X; that is, a relation which spans up to the initial stage of reference determining.

Now, Kripke's theory is not the only causal theory of reference available. Both Hartry Field<sup>9</sup> and Hilary Putnam<sup>10</sup> have advocated causal theories of reference, the outcome of which has been, in the analytical tradition, the emergence of the so-called "semantic externalism".

Just like the descriptivist theories of reference, the causal ones have been developed in an attempt to solve some of the difficulties raised by the descriptivist theories. These problems have received standard formulations in the literature, under the form of anti-descriptivist arguments. In the meanwhile, a common taxonomy of these types of arguments occurred in the literature:

- a) semantic arguments;
- b) epistemic arguments;
- c) modal arguments.

The present work presents and analyses the above mentioned arguments as well as, generally, the deficiencies of these theories. Two problems feature prominently, the first raised by John McDowell and concerning the process of reference transmission as described by Kripke, and the second, original, concerned with the lack of a substantial characterization of the reference relation. We claim that the extant causal theories of reference fail to propose substantive results about the determination of the reference relation; in fact, the issue is merely turned into a problem regarding the determination of some causal relation. Exactly what kind of a relation is this causal relation, and how are we to construe it in a physicalistically acceptable fashion are questions which still await an answer. tg

### **Rejection of reference**

A third important theme in philosophical reflections over reference is the conception that there is no reference relation in virtue of which a competent speaker's use of a name

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<sup>9</sup> Hartry Field, "Conventionalism and Instrumentalism in Semantics," in *Noûs*, 9(4), 1975 in Hartry Field, *Truth and the Absence of Fact*, Oxford: Oxford University Press, 2001.

<sup>10</sup> Hilary Putnam [1975], "The meaning of meaning" in *Mind, Language, and Reality: Philosophical Papers*, vol. 2. Cambridge: Cambridge University Press.

connects the name to a referent. There is no semantic glue between the expressions of a theory and the elements of the model described by the theory which could connect them univocally. In this thesis we have synthesised the main arguments against the claim that the reference is a substantive relation, in the chapter “Refuzul Referinței”. These are the arguments advanced by Quine, concerning the indeterminacy of translation and the inscrutability of reference as well as those proposed by Putnam, i.e.:

- a) the model-theoretic arguments:
  - i. based on per mutability
  - ii. based on the Löwenheim-Skolem Theorems;
- b) the Twin Earth argument;
- c) the Just More Theory argument;

Model-theoretic arguments target two definite problems: the one based on permutability indicates that (if it a fact at all) the truth conditions of sentences cannot univocally fixe the reference of subsentential expressions, whereas the one based on the Löwenheim-Skolem Theorems points to the existence of unintended models for every first order theory (admitting infinite models), which undermines the reference relation.

The Twin Earth argument tells against the identification of intentional states as the semantic glue between the uses of an expression and its referent: by themselves, mental states cannot determine an expression’s reference.

Last but not least, although, we submit, the weakest of Putnam’s arguments, is the one directed against the defenders of the causal theory of reference. We argue that it relies on a confusion similar to that between use and mention. In any case, the model theoretic arguments have been more prominent and continue to be so in the space of the debates concerning reference, including the realism debate in the philosophy of mathematics. Three telling examples supporting this claim are the PhD thesis submitted at Cambridge by Tim Button, *Cats and Vats: Putnam’s Attacks on Metaphysical Realism*, which also re-launched the debate concerning the model-theoretic arguments (see his “The metamathematics of Putnam's model-theoretic arguments”, publishes this year in

*Erkenntnis*)<sup>11</sup>; Tymothy Bays' work concerning the mathematical apparatus of the model-theoretic arguments; and, finally, J. Robert G. Williams' PhD thesis, *The Inscrutability of Reference*<sup>12</sup>, which reexamines David Lewis' answer to Putnam's paradox and suggests a model based on the construction of Henkin models for first order theories which go around Lewis' criticism and safeguards Putnam's unintended interpretations.

### **The problem of reference in contemporary philosophy of mathematics**

The last part of the thesis turns to the themes of reference in the particular context of the philosophy of mathematics. We could look at the contemporary state of the philosophy of mathematics as answering the need to solve the challenge known in the literature as Benacerraf's Dilemma. Paul Benacerraf notes that there are tensions between the semantic dimension of mathematical discourse, which seems to favour a realist orientation in the philosophy of mathematics, by way the face-value construal of mathematical claims, and the epistemic dimension or, generally, the themes connected with the task of accounting for mathematical knowledge, which apparently pushes towards in favour of anti-realist solutions to many salient issues in the philosophy of mathematics. It is our opinion that Benacerraf's Dilemma can be construed as a challenge:

- i. to preserve the semantic unity and (qualitative) continuity between mathematical and ordinary discourse, while
- ii. offering a semantic analysis of the truth of mathematical statements which fits with the reasonable epistemic requirements concerning the generation and appropriation of mathematical knowledge.

We can classify the main trends in contemporary philosophy of mathematics according to their preference for either the semantic or the epistemic component. Thus, realists favour the semantic aspects and they go ahead offering an analysis which accords

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<sup>11</sup> Tim Button, [2011], "The metamathematics of Putnam's model-theoretic arguments", *Erkenntnis* 74/3, pp. 321 – 49.

<sup>12</sup> See also: J. Robert G. Williams [2007] , "Eligibility and Inscrutability" *Philosophical Review* 116 (3), pp. 361-399.

with our current intuitions about the semantics of mathematical discourse, but the realist-platonic epistemology is, according to reasonable epistemic standard, quite precarious, as, e.g., it sometimes postulates the existence of mysterious mental faculties which can directly grasp and truthfully describe non-spatial and causally inert entities.

The anti-realists, on the other hand, suggest a decent epistemology of mathematics, which accords with most contemporary scientific standards, but they have serious difficulties in elaborating a semantics for mathematical discourse which is in accord with our mathematical practice.

The problem of the reference appears in both of these components, semantic and epistemic. As far as the semantic aspect is concerned, it is usually recognised that the reference of mathematical theories is determinable only up to isomorphism. In other words, mathematical theories describe (mere) structures and any attempt to further precify or determine the reference relation is futile. From an epistemic standpoint, the issues of referring intervene in the form of a question concerning how to explain and generally approach mathematical knowledge, which we undeniably possess, to the extent that the realist semantics of mathematical discourse involves entities non-spatial and non-temporal entities which are causally inert. How can we get to know the “object” of mathematical discourse if it bears no causal relation to us whatsoever? Any respectable epistemology of mathematics must account for the referring mechanism which connects mathematical theories with the structures they describe. There are numerous proposals for the best way of managing the reference problem in the philosophy of mathematics; here, we critically assess, from a reference-determined perspective, the structuralist and nominalist proposals, as well as some proposals belonging to the realist family.

Within the philosophy of mathematics, another position with regard to reference promotes the view that mathematical expressions and theories are referentially indeterminate. This view has been promoted by Hartry Field, according to whom a large part of our mathematical concepts, especially those pertaining to set theory, as well as many logical concepts are indeterminate. To the extent that this is the case, the mathematical statements in which they feature will be themselves indeterminate in respect to their truth value.

This position has been challenged via an argument based on categoricity. Essentially, the argument shows that if all the models of a theory are isomorphic, then the truth values of the theory's statements is determinate, even if the theory itself is incomplete.

Let us now see how this connection is achieved. The determinate truth value thesis states that every proposition has a determinate truth value.

Now, this in turn can be tied with a theory's being categorical, by an argument which runs as follows:

Let  $T$  be a categorical theory and  $\sigma$  a sentence expressible in the language of the theory. Note that no constraint has been imposed upon the theory, in particular, decidability or completeness are not required. As far as we know,  $T$  may even be Gödelian incomplete; all that is required is that it is categorical. Under this hypothesis it will be true that:

(1)  $\sigma$  is either true or false in every  $T$ -model.

**Proof:** Suppose that  $\sigma$  is true in some  $T$ -models but false in others. Then, there is model  $M_1$  of  $T + \{\sigma\}$  and a model  $M_2$  of  $T + \{\neg\sigma\}$ . Consequently,  $M_1 \not\equiv M_2$  (that is,  $M_1$  and  $M_2$  are not elementarily equivalent). A fundamental theorem of model theory states that if two models are isomorphic, then they are elementarily equivalent, i.e:

If  $M_1 \cong M_2$ , then  $M_1 \equiv M_2$ .

By contraposition, it follows that  $M_1$  and  $M_2$  of  $T$  are not isomorphic, which contradicts the initial assumption. Therefore, if  $T$  is categorical, then any sentence  $\sigma$  expressible in  $T$ 's language is either true or false in every  $T$ -model.

To the extent that this argument is correct, the problem of categoricity becomes central for the realist position in the philosophy of mathematics and, at least in last 20 years, defenders of realism have struggled to obtain categoricity results for various mathematical theories. Our thesis attempts to capture the evolution of this argument, based on categoricity, from its early days to the latest results.

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