

---

# Abstracts

---

Filozofia Nauki 18/4, 157-160

---

2010

Artykuł został opracowany do udostępnienia w internecie przez Muzeum Historii Polski w ramach prac podejmowanych na rzecz zapewnienia otwartego, powszechnego i trwałego dostępu do polskiego dorobku naukowego i kulturalnego. Artykuł jest umieszczony w kolekcji cyfrowej [bazhum.muzhp.pl](http://bazhum.muzhp.pl), gromadzącej zawartość polskich czasopism humanistycznych i społecznych.

Tekst jest udostępniony do wykorzystania w ramach dozwolonego użytku.

## **Abstracts**

### **Pawel Zeidler, Is it Possible to Observe Orbitals? On the Problems of Observability and Reality of Theoretical Entities**

In September 1999 „Nature” magazine announced that atomic orbitals were directly observed. Opposing it, Eric Scerri, editor-in-chief of „Foundations of Chemistry”, claimed that what could be observed in the experiment was electron density, not orbitals. The main purpose of this paper is to consider philosophical and methodological aspects of the above controversy. Especially, the problems of direct observability and reality of theoretical entities are taken under detailed discussion. From the point of view of quantum mechanics there are not any reasons to believe that orbitals exist. However, realistically treated orbitals are very effective tools in the laboratory practice of chemistry.

*Keywords:* theoretical entities, atomic and molecular orbitals, electron density, direct and indirect observability, realism-antirealism debate, laboratory practice of chemistry

### **Wojciech Krysztofiak, Multi-temporal Counting Structures. Indexed Natural Numbers in Light of Cognitive Arithmetic**

The paper presents a new model of the structure of basic arithmetical representations encoded in minds which enable them to solve simple story-tasks. According to the dominating paradigm the process of acquiring basic counting abilities culminates in encoding the exact number line in mind. This linear number representation enables the mind to solve simple story-tasks which do not require any mathematical mastery knowledge comprising laws, definitions and theorems. Some researchers try to show that the process of encoding the exact number line stems from transformations of the

approximate number line (the mental number line) whereas others model this process as being dependent on the linguistic and logical resources of mind.

In the paper the dominating approach is rejected in favor of a new paradigm of comprehending the structure of the basic mature arithmetic representation. The new paradigm assumes that the first, pre-school stage of developing arithmetical capacities is completed when a child acquires a cluster of exact number lines. Hence, the basic arithmetical structure enabling children to solve simple mathematical story-tasks cannot be a semantic model of Peano's arithmetic. If it was the case, then seven-years-old children engaged in solving simple story-tasks would have to use unconsciously very sophisticated set-theoretic tools. It is rather impossible because children provide solutions to these tasks in the very short time (sometimes in seconds) whereas the use of the set theoretic representations in processing input data given in the contents of the tasks would result in prolongation of the time needful for computing the outputs.

The formal model of the cluster of number lines requires constructing a formal arithmetical theory which is called the *arithmetic of indexed natural numbers*. The theory is a generalization of the standard arithmetic of natural numbers. In light of the proposed model, the verbal number line does not function as a tool for counting cardinalities of sets. Its main role is enabling the mind to construct categorial number lines belonging to the cluster-structures processed in the course of solving story-tasks. Unlike the classical model, the presented model explains children's abilities in solving tasks without reference to the tacit set theoretic knowledge encoded in children's minds.

*Keywords:* number sense, mental number line, indexed natural numbers, arithmetic competence

### **Zbigniew Tworak, On the Notion of Truth in Mathematical Intuitionism**

The basic philosophical idea of intuitionism is that mathematical entities exist only as mental constructions and that the notion of truth of a proposition should be equated with its verification or the existence of proof. However different intuitionists explained the existence of a proof in fundamentally different ways. There seem to be two main alternatives: the actual and potential existence of a proof. The second proposal is also understood in two alternative ways: as knowledge of a method of construction of a proof or as knowledge-independent and tenseless existence of a proof. This paper is a presentation and analysis of these alternatives.

*Keywords:* intuitionism, truth, knowledge, verification, existence of a proof, law of excluded middle, Brouwer, Heyting, Dummett, Prawitz

### **Daniel Chlastawa, Three Arguments Against Mathematical Constructivism**

This paper contains a criticism of mathematical constructivism, i.e. the class of views in the philosophy and foundations of mathematics according to which only constructive notions and methods of proof should be allowed in mathematics. Three

main arguments are deployed against such view and its philosophical background. Firstly, an argument from pluralism: constructivism often appeals to intuitive evidence as the root of mathematics, effectively excluding large parts of classical, abstract mathematics. But appeals to «intuition» are utterly subjective and unstable, which results in multitude of incompatible constructivist systems of mathematics and makes any criticism toward classical mathematics as «non-constructive» unsubstantiated. Secondly, an argument which shows that epistemological arguments, deployed by many constructivists against intelligibility of classical mathematics, are unsound, and moreover, consistent appeal to such arguments leaves constructivists in no position to avoid the menace of ultrafinitism. Thirdly, it is argued that constructivism faces a dilemma whether to consider mathematical truth as what is actually proved, or what is provable, and that this dilemma is unsolvable in a satisfactory way, because the first horn of the dilemma is highly counter-intuitive or absurd, and the second one is impossible to square with constructivist views.

*Keywords:* constructivism, intuitionism, classical mathematics, realism, anti-realism

### **Jerzy Gołosz, Is There a Flow of Time?**

The article explores the strategy of reconciliation of the idea of objective flow of time with science. In the first part of my paper, I analyze different conceptions of the passage of time and ponder on how we should understand it. The second part is devoted to the problem whether there is the passage of time in science.

*Keywords:* flow of time, science, presentism, eternalism

### **Tomasz Kąkol, Against Substantialism**

In this paper I criticize substantialism by analyzing two well-known puzzles concerning identity and change — Tibbles the Cat puzzle and the fission paradox. All the approaches assuming substantialism I know lead to untenable consequences (e.g. bilocation) and I conclude that we should seriously take the possibility of processual or eventistic picture of our material life world.

*Keywords:* change, fission, identity, substantialism, survival

### **Joanna Komorowska-Mach, Emergence — a Textbook for Non-restive**

The review tries to summarize the main topics covered by the book „Między redukcją a emergencją” by Robert Poczobut and also to highlight certain points that might be controversial to the philosophically-oriented reader. In particular, Poczobut’s methodological claims regarding the boundary between natural sciences and philosophy of mind are brought under scrutiny. While the book presents a broad range of views on matters regarding emergence and reduction, especially with respect to the psychophysical problem, it remains to be proven that the views presented

by the author are in reality the most viable option that a philosopher of mind wishing to conform to scientific results has at her disposal.

*Keywords:* emergence, mind, science, methodology

**Robert Poczobut, In Search of a New Paradigm. A Reply to Joanna Komorowska-Mach**

In the article I am answering some questions posed by J. Komorowska-Mach (in her review of my book) concerning such problems as: (a) relation between cognitive science and ontology of mind, (b) nature of downward causation, (c) methodological status of the theory of psychophysical emergence, (d) nature and mode of existence of the mind in a physical world, (e) ontological commitments of cognitive neuroscience, and (f) fundamentals of emergentist world-picture. The main aim of the paper is demonstration of a connection between the theory of psychophysical emergence and the problem of interdisciplinarity within the context of mind research.

*Keywords:* mind, emergence, downward causation, reduction, philosophy of mind, cognitive science, neuroscience