

## **Description for the general public**

The project's objective is to propose a novel structural ontology of space-time in the context of the theory of general relativity (GR). I take as a starting point the general ontological position developed and presented by S. French and J. Ladyman called ontic structural realism (OSR). The claim made in OSR is that the ontology of fundamental levels of the physical world (one considers here quantum physics and relativistic physics, i.e. both the micro- and macroworlds) consists in the category of structure. According to OSR, structures (understood as real systems of relations) are ontologically primitive while individuated (by means of e.g. having some intrinsic properties) objects are not. In the case of relativistic spacetime spacetime points are interpreted as objects (in a metaphysical sense, while in a physical sense these points are interpreted, of course, as events which can be parameterized by fourdimensional coordinate charts). In the received structuralist approaches certain claims are defended: a) that spacetime points are eliminable; b) that spacetime points are ontologically secondary, i.e. they derive from spacetime structures (M. Esfeld, V. Lam); c) spacetime points are ontologically on a par with spacetime structure (O. Pooley, J. Stachel). In every case, points (understood metaphysically as some kind of objects) are not ontologically primitive.

Previous versions of spacetime structuralism are problematic (Ch. Wüthrich, H. Greaves). For example, one can show that spacetime structuralism can be reduced at the same time to both classical views on the ontological status of spacetime: substantivalism and relationism. There are arguments in which it is claimed that only an interpretation based on epistemic version of structuralism is viable in the context of spacetime physics (E. Slowik, J. Bain). There are problems with certain presuppositions which lead to the consequence that spacetime structuralism has sense only in special, symmetric cases of spacetimes (J. Müller). Furthermore, general worries are formulated when it comes to eliminating or ontologically weakening objects – claims are made that such moves are conceptually absurd or at least artificial (S. Psillos, A. Chakravartty).

In the research conducted in this project I am concerned with providing answers to abovementioned problems and with offering a developed interpretation of the general perspective connected to OSR (and other) in the context of philosophy of spacetime. I propose a new standpoint in spacetime structuralism, where the central claim is that one can ascribe to spacetime in GR a structural mode of being which consists in, for the given case, having the property of being an element of a more general, gravitational structure.

The meaning of the results of the project rests on providing a new conceptualization of the scientific worldview in GR. For philosophy (mainly for philosophy of physics and so-called scientifically informed metaphysics) the meaning of the results lies in such development and modification of the concept of structure in philosophical interpretations of spacetime physics that allows for sound representation of the ontological complexity of spacetime in GR. Because the proposed position is thought as being open at analysis of the problem of the emergence of spacetime from quantum regime, the question of the connection between the micro- and macroworld in view of the concept of the gradable autonomy of the real structure is also implemented. In the context of increased collaboration between physicists and philosophers in the work on the clarification of the new conceptual foundations of fundamental physics (because of the search for a „good” theory of quantum gravity), the motivation for realizing this project lies in the desire to participate in the mentioned fundamental work and in a strong belief that the category of structure is interpretatively relevant with respect to GR and to what is possible to derive from it.