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## Review

of the habilitation thesis by **Igor Khavkine, PhD.**

### **Invariants in Relativity and Gauge Theory**

The habilitation thesis is written as a presentation of five published papers, which are equipped an accompanying text. These articles deal with classical and quantum gauge field theories and general relativity. The research is closely connected to the theory of special partial differential equations.

The paper *Local and gauge invariant observables in gravity* is devoted to the *gauge invariant* of local functionals in the theory of gravitational fields. This paper contains interesting results, therefore it has many citations from authors of different research fields.

The paper *Calabi complex and Killing sheaf cohomology* deals with the structure of the Calabi complex with explicit calculations based on the representation theory of  $GL(n)$ . The author also studied how the cohomology in terms of locally constant sheaves can be adapted to linearized gravity on other backgrounds and to other gauge theories. This paper contains explicit formulas for the differential operators in the Calabi complex arguments, some methods of the cohomology of locally constant sheaves computation and example of Killing sheaf cohomologies computation.

In further papers on *Cohomology with Causally Restricted Support* the author introduced a method of computation casually restricted cohomologies in terms of cohomologies with either compact or unrestricted supports. He also discussed applications to the other complexes and generalized casual structures and functoriality.

Another very interesting paper deals with the *IDEAL* (Intrinsic Deductive, Explicit, ALgorithmic) characterization of higher dimensional spherically symmetric black holes. The author described the first *IDEAL* characterization of generalized Schwarzschild-Tangherlini spacetimes, which contain an extension of higher dimensional spherically symmetric black holes. The proof of Birkhoff's theorem has been given too.

Dr. I. Khavkine published 26 papers (in WoS) in physics and mathematical physics area, and he has 240 citations (without self citations) in prestigious journals.

**Conclusion:** In my opinion, the habilitation thesis *Invariants in Relativity and Gauge Theory* by *Dr. Igor Khavkine* contains original scientific results, their originality and high professional level is documented, among other things, by being published in reviewed international journals and in proceedings of prestigious international conferences. This work complies with the conditions imposed on habilitation theses and therefore I propose that Dr. Igor Khavkine should be awarded the title of Associate Professor (Docent) on the basis of a habilitation procedure.



Prof. RNDr. Josef Mikeš, DrSc.