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A report on the Habilitation Thesis of Doctor Martin Žofka

Dr. Žofka has been an established and recognized researcher in the area of the Einstein's general relativity theory. He has made important contributions to the area exact solutions of the Einstein-Maxwell equations. In the following, I will briefly go over some of his contributions.

In [7], [15] Dr. Žofka and his co-authors studied cylindrically symmetric solutions of the the Einstein-Maxwell equations. He found a non-trivial generalization of the Bonnor-Melvin solution of to the case of a nonvanishing cosmological constant. The spacetime is cylindrically symmetric and static but, unlike the original solution, it truly represents a homogeneous magnetic. It happened that the proposed approach also leads to a much richer class of exact solutions with cylindrical symmetry describing the spacetimes filled with a non-homogeneous magnetic field. Dr. Žofka succeeded in finding a simple explicit form of the metric and analyzed in detail its global structure. The found class of solutions can provide a valuable tool for describing the structure of magnetized astrophysical objects.

Much of Dr. Žofka's work has been devoted to the Majumdar–Papapetrou family of exact equilibrium solutions. His approach [22], [23],[25] was to use Majumdar–Papapetrou solution to study gravitational field of discrete sets of charges – the spacetime crystals. He analyzed the local and global properties of the discrete string-like charged objects in four and higher dimensions.

His approach in studying dynamics of extended objects is also quite appealing and can be useful in applications to the study dynamics of astrophysical objects. I would only advice to correct a typo in the definition of conservation laws in the last paragraph of the page 30 of the thesis.

To summarize, Dr. Žofka has been working on really interesting and active topics. He has produced many results by combining tools from different areas of gravitational physics. I believe this is a very good and productive approach, which has a lot of potential for future research. Dr. Žofka is a very good expert in general relativity what gives Dr. Žofka a clear advantage for future achievements in this field. I have gone through the check of originality of the thesis done by the system Turnitin and it is absolutely clear for me that the thesis represents an original work with a minimal overlap with the existing literature.

In view of this, I believe that Dr. Žofka definitely deserves to get Habilitation degree.



Andrei Zelnikov