Univerzita Karlova
Matematicko-fyzikální fakulta

Vás zve na sedmnáctou

Jarníkovskou přednášku

Topological phases, field theories and manifold invariants

kterou přednese

Prof. Dr. Peter Teichner

(Max Planck Institute for Mathematics, Bonn, Germany)

ve středu dne 3. října 2018 ve 14.00 hod.

v posluchárně V. Jarníka (M1), děkanát MFF UK, 2. patro Ke Karlovu 3, Praha 2

Abstract: After recalling the Atiyah-Segal-Witten formalism for topological field theories (TFTs), we will explain some recent computations of Freed-Hopkins in the case of positive invertible TFTs. Their tables magically agree with computations made in condensed matter physics of gapped systems, namely for symmetry protected topological phases. In both approaches, the input is the space-time dimension d, together with a symmetry group H, and the output is a finitely generated abelian group TP(d,H) of topological phases. It remains an open question why these groups can be computed in two completely different ways. For fixed dimension d, there is a 10-fold way in which the groups H arise, and we will show how they are related to the 8+2 super division algebras (over the real and complex numbers). We will prove that invertible TFTs are classified by their partition function, an invariant of closed d-manifolds with structure group H. Finally, we will characterize such manifold invariants in terms of a 4-term cut-and-paste relation and connect these back to the Freed-Hopkins computations. The last part is current joint work with Matthias Kreck and Stephan Stolz.

Peter Teichner was born in Bratislava and moved with his family to Germany in 1968, after the Prague Spring ended abruptly. He received his Ph.D. in Mainz in 1992 and worked with Mike Freedman on the classification of topological 4-manifolds during his post-doc years. After semesters at MPIM, IHES and MSRI, Peter Teichner moved to UC San Diego as tenured faculty in 1996. He developed new knot concordance invariants using von Neumann signatures, as well as geometric interpretations of quantum invariants in terms of grope cobordism. He was an invited speaker at the ICM 2002 in Beijing and became Professor at UC Berkeley in 2004. His interests branched out to mathematical approaches to quantum field theory and in particular relations to (generalized, equivariant, twisted, differential) cohomology. In 2009, he moved to his current position as Director of the Max Planck Institute for Mathematics in Bonn, continuing also as Berkeley faculty until 2017. Over the years, Peter Teichner advised a large number of outstanding students in San Diego, Berkeley and Bonn, with many of them continuing their academic work all over the world.