



# *EINLADUNG*

## Literaturseminar

zum Vortrag

von

**Moritz Reintjes**

(Konstanz)

über

## ***„HOW TO SMOOTH CRINKLES IN SPACETIME AND EXTEND UHLENBECK'S CURVATURE BOUNDS TO LORENTZIAN GEOMETRY BY THE ELLIPTIC RT-EQUATIONS“***

### **Abstract:**

When can you remove a singularity of spacetime by coordinate transformation? I will report on our recent discovery of a system of nonlinear elliptic PDE's on spacetime, the Regularity Transformation equations (RT-equations), which determine whether a non-optimal connection  $\nabla$  can be smoothed to optimal regularity by coordinate transformation, (i.e., to one derivative smoother than its Riemann curvature tensor  $\text{Riem}(\nabla)$ ). The RT-equations apply to connections on a tangent bundle  $TM$  of an arbitrary manifold  $M$ , including semi-Riemannian and Lorentzian manifolds of Relativity. By developing an existence theory for the nonlinear RT-equations for such connections in  $L^1$ , we prove that optimal connection regularity  $W^{1,p}$  (any  $p < 1$ ) can always be achieved and that no regularity singularities exist at GR shock waves. The celebrated curvature bounds of Uhlenbeck (a topic of this year's Abel prize) are deeply related to Riemannian geometry. We managed to extend these curvature bounds to connections on tangent bundles of Lorentzian manifolds, the setting of relativistic Physics, because the RT-equations are elliptic regardless of metric signature.

**Zeit:** Donnerstag, 10.10.2019, 14.00

**Ort:** Arbeitsgruppe Gravitation, Währinger Straße 17,  
Seminarraum 218, 2. Stock

gez.: P. T. Chruściel, D. Fajman