

The h -principle Seminar and autumn school

Bern, Spring 2012, and Les Diablerets, September 2–8, 2012

Topic. In differential geometry and topology one often deals with systems of partial differential equations, as well as partial differential inequalities, that have infinitely many solutions whatever boundary conditions are imposed. It was discovered in the fifties that the solvability of differential relations (i.e. equations and inequalities) of this kind can often be reduced to a problem of a purely homotopy-theoretic nature. One says in this case that the corresponding differential relation satisfies the h -principle. Two famous examples of the h -principle, the Nash-Kuiper C^1 -isometric embedding theory in Riemannian geometry and the Smale-Hirsch immersion theory in differential topology, were later transformed by Gromov into powerful general methods for establishing the h -principle. Following the book by Eliashberg and Mishachev, we shall learn two main methods for proving the h -principle: holonomic approximation and convex integration. With a few notable exceptions, most instances of the h -principle can be treated by these two methods. We shall make a special emphasis on applications to symplectic and contact geometry.

Organizers. Sebastian Baader, Zoltan Balogh and Frank Kutzschebauch (Bern), Felix Schlenk (Neuchâtel)

Time plan. Weekly seminar at University of Bern, on Wednesday, 14:15– 16:00, starting on February 22, and Les Diablerets, Hôtel Les Sources, September 2–8, 2012

We shall follow the book [EM]. In the seminar we shall learn the most basic h -principle (holonomic approximation) and learn Gromov's h -principle (Parts 1 and 2 of [EM]). As an application we shall see a proof of Smale's Inversion of the Sphere theorem. At les Diablerets, we shall see applications of these methods to symplectic and contact geometry, and learn the method of convex integration, in order to go into the proofs of the C^1 -Nash embedding theorem (Parts 3 and 4 of [EM]).

Participants. We shall invite to Les Diablerets Tobias Ekholm (Uppsala) and Hansjörg Geiges (Köln) as experts. The participants will be, besides for the organizers and their students, students from other Swiss universities, and Peter Albers (Münster) and Janko Latschev (Hamburg) with some of their students.

Prerequisites: It would be good if each participant has a sound knowledge on basic topics in differential geometry and algebraic topology.

[EM] Y. Eliashberg and N. Mishachev. *Introduction to the h -principle*. Graduate Studies in Mathematics **48**. AMS, Providence, RI, 2002.