



Politecnico
di Torino

Dipartimento di Scienze
Matematiche "G. L. Lagrange"



DISMA
Dipartimento di
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G. L. Lagrange
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When: Tuesday **March 15th, 2022** at **4:30PM**

Where: **Room 11i** (also streamed on: **Zoom**)

COLLOQUIUM

Prof. **Detlef MÜLLER**

Christian-Albrechts-Universität zu Kiel

On sub-Riemannian geometries, the L^p -functional calculus for associated sub-Laplacians, and connections with Heisenberg's matrix quantum mechanics

Abstract. Sub-Riemannian geometries play a role in many different contexts, such as optimal control and even robotics, representation theory of Lie groups, or higher-dimensional complex analysis. Associated sub-Laplacians \mathcal{L} , which can be viewed as kind of Laplace–Beltrami operators for such a geometry, often arise as sum of squares operators $\mathcal{L} = -\sum_{j=1}^m X_j^2$, where X_1, \dots, X_m is a system of vector fields on a d -dimensional manifold M (where often $m < d$) satisfying Hörmander's bracket condition (H).

In my talk, I shall first explain condition (H) and present two basic consequences of it (geometry; regularity of \mathcal{L}), exemplifying the main concepts in more detail for the case of the 3-dimensional Heisenberg group. In a second part, I shall discuss some problems concerning the L^p -functional calculus for such operators \mathcal{L} and explain connections with Heisenberg's matrix mechanics as well as estimates for associated wave equations.

Bio. Detlef Müller studied at the University of Bielefeld, Germany, where he received his doctorate in 1981 under the supervision of Horst Leptin, and his habilitation in 1984. As a recipient of a Heisenberg Fellowship, between 1988 and 1992 he was active at several universities in the United States, including a membership of the IAS in Princeton for the academic year 1990–1991. From 1992 to 1994 he was a professor at the Université Louis Pasteur in Strasbourg, France, and since 1994 he has been a professor at the Christian-Albrechts-Universität zu Kiel, Germany. Following his official retirement in March 2021, he was awarded the title of *Senior professor* by the University of Kiel, where he continues his research activities.

Müller's research deals with harmonic analysis (including analysis on Lie groups) with applications to partial differential equations. He is the author of more than 90 publications, including articles in *Annals of Mathematics*, *Acta Mathematica* and *Inventiones Mathematicae*. In 1998 Müller was an Invited Speaker at the International Congress of Mathematicians in Berlin. He was named a Fellow of the American Mathematical Society in 2018. He is a member of the editorial boards of the *Journal of Lie Theory* and the *Annali di Matematica Pura ed Applicata*.