6th Northern German Differential Geometry Day

(Hamburg – Hannover – Kiel)

Christian-Albrechts-Universität zu Kiel – Friday, June 5, 2015

Programme

10:30 – 11:30, R. 423 (Konferenzraum)
Arrival / Welcome / Coffee

11:30 – 12:30, R. 424 (Kleiner Hörsaal)
Markus Röser (Hannover)
Hyperkähler Implosion

12:30 – 14:30
Lunch Break

14:30 – 15:30, R. 424 (Kleiner Hörsaal)
Benedict Meinke (Hamburg)
Homogeneous almost quaternionic pseudo-Hermitian spaces

15:30 – 16:15, R. 423 (Konferenzraum)
Coffee Break

16:15 – 17:15, R. 424 (Kleiner Hörsaal)
Colloquium
Christian Bär (Potsdam)
From Gauss-Bonnet to particle-antiparticle creation

Conference venue	Christian-Albrechts-Universität zu Kiel Mathematisches Seminar Ludewig-Meyn-Str. 4, 24118 Kiel Lecture Hall R. 424
Organizers	Roger Bielawski (Leibniz Universität Hannover) Vicente Cortés (Universität Hamburg) Jens Heber (Christian-Albrechts-Universität zu Kiel) Knut Smoczyk (Leibniz Universität Hannover) Hartmut Weiß (Christian-Albrechts-Universität zu Kiel)
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Abstracts

Markus Röser (Hannover):
Hyperkähler Implosion (11:30 – 12:30)

Symplectic Implosion is an abelianisation procedure for Hamiltonian group actions on symplectic manifolds with interesting links to non-reductive geometric invariant theory and toric geometry. In this talk we shall explore an analogue of this construction in hyperkähler geometry using gauge-theoretic techniques. This is joint work in progress with Andrew Dancer and Frances Kirwan.

Benedict Meinke (Hamburg):
Homogeneous almost quaternionic pseudo-Hermitian spaces (14:30 – 15:30)

In 2011 Ahmed and Zeghib studied irreducible homogeneous almost complex manifolds with index 2. They proved that such manifolds are Kähler.
In my talk I will show how their methods and ideas can be used to study the quaternionic setting, i.e. irreducible homogeneous spaces of index 4 which admit an almost hypercomplex or an almost quaternionic structure. It will turn out that these spaces are hyper Kähler or quaternionic Kähler respectively.

Christian Bär (Potsdam):
From Gauss-Bonnet to particle-antiparticle creation (16:15 – 17:15)

The Gauss-Bonnet formula expresses the Euler number of a closed surface in terms of its curvature. This formula is a classical special case of the Atiyah-Singer index theorem, one of the main mathematical results of the 20. century. The index formula relates the index of certain partial differential operators with the geometry of the underlying space. If one allows nonempty boundary, this leads to the Atiyah-Patodi-Singer index formula.

After a survey over these classical results we will discuss recent work with A. Strohmaier where spaces are replaced by spacetimes. The resulting PDEs are hyperbolic rather than elliptic. Even though the analysis is entirely different, an analog to the Atiyah-Patodi-Singer index formula has been found. The boundary conditions now have a natural physical interpretation.