DISTINGUISHED LECTURE SERIES

Coherent sheaves, Chern character, and RRG

Let X be a compact complex manifold. If (E, ∇^{En}) is a holomorphic vector undle, and if g^E is a Hermitian metric on E, we get an associated Chern connection on E, and corresponding Chern character forms.

I will show how to extend this construction to arbitrary coherent sheaves, using the antiholomorphic superconnections of Block. An antiholomorphic superconnection is a differential operator of degree 1, with the same principal symbol as $\overline{\partial}$, whose square vanishes.

Using generalized metrics, we obtain a Chern character with values in Bott-Chern cohomology.

For complex varieties and arbitrary coherent sheaves, we establish a Riemann-Roch-Grothendieck theorem with values in Bott-Chern cohomology. One can interpret part of this theorem as a refined version of the Atiyah-Singer famlies index theorem.
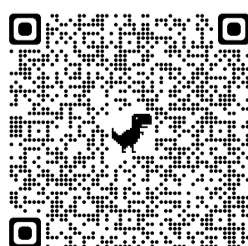
This is joint work with Shu Shen and Zhaoting Wei.

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This talk is part of the Conference on Index Theory and Related Topics (23–27 August 2021)
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Professor Jean-Michel Bismut
Université Paris-Saclay, France

23 August 2021 (Monday)
10–11am (GMT+2, Paris)
4–5pm (GMT+8, Singapore)

Jean-Michel Bismut received his PhD from Université Paris VI. He joined the department of Mathematics at Université Paris-Sud (now Université Paris-Saclay) in 1976. He is a member of the Académie des Sciences, of Academia Europaea, of the German National Academy Leopoldina, and an international member of the National Academy of Sciences (USA). Prof. Bismut is a 2021 Shaw Prize recipient in Mathematical Sciences. His research interests include the Atiyah Singer index theory and its local refinements, and the interplay between probability theory, analysis and differential geometry. His work includes the stochastic calculus of variations, refined local versions of the Atiyah-Singer index theorem, eta invariants, analytic torsion, and Quillen metrics. His recent work includes the development of the hypoelliptic Laplacian, a family of operators that interpolates between the standard Laplacian and the geodesic flow.

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