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TOPOLOGY SEMINAR SS 2022

ELLIPTIC GENERA OF SMOOTH MANIFOLDS

Time and Place: We meet Thursdays 2-4pm c.t., INF 205, SR 4. The first meeting is on April 21, 2022, at which point talks will be distributed.

Registration: Please register for the seminar online on the MÜSLI-System.

Info: A *genus* is an assignment of complex numbers to oriented closed manifolds in such a way that oriented boundaries of compact manifolds have vanishing genus, and the genus is additive under disjoint union and multiplicative under cartesian product. The L-genus (i.e. the signature) and the $\hat{A}$-genus are basic examples. Elliptic genera depend on a parameter, and for special values of this parameter one obtains the L- and the $\hat{A}$-genus. The universal elliptic genus is a modular form. In mathematical Physics, elliptic genera arise, as explained by Witten, from a perspective of free loop spaces of manifolds. This viewpoint leads, for example, to an extension of classical rigidity results due to Atiyah and Hirzebruch concerning the vanishing of the equivariant $\hat{A}$-genus for nontrivial circle actions on spin manifolds to the equivariant universal elliptic genus (Taubes, Bott). The seminar will develop these ideas, starting at a quite basic level with an introduction to bordism, characteristic classes, and the Atiyah-Singer index theorem. Multiplicativity in certain fiber bundles yields interesting characterizations. The seminar language is English.

Prerequisites: Basic algebraic topology and the notion of a smooth manifold. Some previous exposure to complex analytic function theory may be helpful.

Literature:
F. Hirzebruch, T. Berger, R. Jung, *Manifolds and Modular Forms*, 2nd edition, Aspects of Math., Max Planck Institut für Mathematik Bonn, Springer Fachmedien Wiesbaden 1994.