MIST 2018: Workshop on Topology

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TITLE & ABSTRACT

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The disparity between smooth and topologically slice knots

Min Hoon Kim

Understanding the subtle difference between the topological and smooth categories is a central subject in 4-manifold topology. After Casson used the celebrated results of Freedman and Donaldson on 4-dimensional manifolds to find a topologically slice knot that is not smoothly slice, distinguishing topologically slice knots and smoothly slice knots has been extensively studied. I would like to give a survey talk on this topic, which is based on several joint works with Jae Choon Cha, Se-Goo Kim, Taehee Kim.

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L-space knots in twist families and satellite L-space knots

Kimihiko Motegi

Twisting a knot K in S^3 along a disjoint unknot c produces a twist family of knots K_n indexed by the integers. Comparing the behaviors of the Seifert genus $g(K_n)$ and the slice genus $g_4(K_n)$ under twistings, we prove that if $g(K_n) - g_4(K_n) < C$ for some constant C for infinitely many integers $n > 0$ or $g(K_n)/g_4(K_n)$ goes to 1 as n goes to ∞, then either the winding number of K about c is zero or the winding number equals the wrapping number. As an application, if K_n contains infinitely many L-space knots, then the latter must occur. We further develop this to show that if K_n is an L-space knot for infinitely many integers $n > 0$ and infinitely many integers $n < 0$, then c is a braid axis. We then use this to show that satellite L-space knots are braided satellites. This is joint work with Ken Baker.

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Spherical 3-manifolds bounding rational homology balls

Kyungbae Park

An interesting question in low dimensional topology, asked by Casson and appeared in Kirbys 1993 problem list, is which rational homology 3-spheres smoothly bound rational homology 4-balls. This question is closely related to the study of knot concordance, as providing a strong obstruction for knots to be slice. In this talk, we give a complete classification of spherical 3-manifolds bounding rational homology balls. Further, we determine the order of spherical manifolds in the rational homology cobordism group. To this end, we make use of constraints for 3-manifolds bounding rational homology balls coming from Donaldsons diagonalization theorem and Heegaard Floer correction terms. This is joint work with Dong Heon Choe.

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Homology spheres yielding lens spaces

Motoo Tange

It is well-known that there are so many knots which produce lens spaces by Dehn surgeries in S^3. For example, Berge gave families of such knots in S^3, which are called double-primitive knots. We give families of double-primitive knots in homology spheres but S^3, e.g., Brieskorn homology spheres and so on. We also compute Heegaard Floer homology of the 0-surgery of such knots and prove the genus estimates.

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Cable knots do not admit cosmetic surgeries

Ran Tao

Two Dehn surgeries on a knot are called purely cosmetic if the resulting manifolds are homeomorphic as oriented manifolds. Gordon conjectured that non-trivial knots in S^3 do not admit purely cosmetic surgeries. In this talk, we confirm this conjecture for cable knots. Our proof uses Gordon's classification of Dehn surgeries on cable knots and Budney's work on JSJ-decompositions of knot exteriors.