Tinkertoys, superconductors, and the universe: Topology and the changing face of science

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Topology, first developed as a theoretical branch of geometry, is emerging as an essential tool for understanding our universe. Topology was first investigated by Leonard Euler in his study of bridge crossings in the late 1700s, and later developed by Henri Poincaré during his investigation of planetary motions around 1900. Topology enabled two great revolutions in the twentieth century, chaos and Nash equilibrium, and is essential in the development of string theory. There is presently a growing number of applied fields, including cosmology, cell biology, DNA, medical imaging, computer graphics, robotics, economics, superconductors, liquid crystals, and protein formation, where topology plays an essential role in solving important problems.
In this talk we will examine the historical development of this field and its transition for an abstract theory to powerful scientific tool. We will also look at some of the emerging applications where topology has been used by researchers from outside of mathematics. Mathematical requirements for this talk are minimal, requiring only the ability to count objects.

Bio:
Dr. Basener received his PhD in mathematics from Boston University in 2001 and is currently an assistant professor at R.I.T. His thesis was on using topology to measure chaos in dynamical systems. In addition to continuing research on topology in dynamical systems, he has worked on topology in condensed matter physics, knot theory, planetary motion, protein phase changes and collapse of ancient civilizations. Dr. Basener has recently completed his first textbook, Topology and Its Applications, which presents the emerging role of topology in cosmology, cell biology, medical imaging, computer graphics, robotics, economics, condensed matter physics, protein formation, and other applied fields. Dr. Basener has worked with Discover television, National Geographic, the National Science Foundation, and he has been quoted in media including sciencedaily