IMS Public Lecture

Knot or not Knot ?

Speaker: Professor Burkhard Kümmerer
Technical University of Darmstadt, Germany

Date: Wednesday, 13 August 2008
Time: 6:30pm - 7:30pm
Venue: LT31, Block S16, Science Drive 1
National University of Singapore

FREE ADMISSION

About the Speaker

Professor Burkhard Kümmerer was educated in Germany at the University of Tübingen, his home town, where he earned his diploma (1979) and his PhD in mathematics (1982), and finally also the habilitation (1987). He held teaching and research appointments at various European institutions, including the King's College London and the University of Heidelberg. In 1997, he was appointed Associate Professor at the University of Stuttgart, and since 2002 he is Professor of Mathematics at the Technical University of Darmstadt.

Professor Kümmerer has received numerous prizes and awards in recognition of his excellence as a researcher and teacher. His research in the fields of operator algebras and quantum probability are highly appreciated by his peers. His outstanding contributions include work on the mathematical aspects of quantum scattering theory, a subject on which he collaborated with Professor Hans Maassen. Both of them are presently organizing a Session as part of the IMS Program on Mathematical Horizons for Quantum Physics.

Abstract

Knots are found in Celtic ornaments and the story, how Alexander the Great "untied" the Gordic knot is legendary. But why are serious mathematicians spending their time with knots? Do sailors really need their help?

The path along which knots found their way into mathematics is more entwined. The problem of how sailors on their journeys round the world could navigate on the oceans has made the great mathematician Carl Friedrich Gauss to think about knots. Some years later people were hoping to understand the periodic table of chemical elements by studying knots.

What is knot theory about? It tries to answer the simple question, whether a knot is really knotted or whether it is only looking complicated but nevertheless can be disentangled to become a circle (without using a pair of scissors). More generally, one is asking whether two knots are "equal".

In our talk we take a look at the origins of knot theory and we look with the eyes of mathematicians at messing up a knot. A method for distinguishing different knots by attributing to them certain polynomials is one of the great achievements in recent mathematics: For this discovery V. Jones was awarded the fields medal in 1990, which is the most distinguished price in mathematics. Essential features of this discovery can be understood with only elementary mathematics. We end this talk by mentioning some further unexpected applications.

The talk is on knots but it is also on the question: "What is mathematics?" Mathematics is more than about numbers, mathematics requires lots of fantasy, and, last but not least: mathematics is fun.

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