

Forum “ Math-for-Industry”

Casimir Force, Casimir Operators and the Riemann Hypothesis

Nishijin Plaza, Kyushu University, Fukuoka, Japan
9 – 13 November 2009

The year 2009 marks the 100th birthday of Casimir and the 150th birthday of the Riemann hypothesis. Actually the paper in which Riemann proposed the hypothesis was published in November 1859. It was also the year when he was appointed as full-professor at Göttingen. Casimir, known for the Casimir force in physics and Casimir operators in mathematics, was director of Philips research for a long time in his career. Casimir got his PhD in November 1931 at Leiden University and the named operators appeared in his thesis. He is remembered for his outspoken opinion on the importance of fundamental science for industry. There is a nice connection between Casimir and Riemann. The Casimir force was first proven to exist theoretically, using the analytic continuation of the Riemann zeta function. Recently the force was measured experimentally.

The conference will highlight some aspects of Casimir’s and Riemann’s heritage and focus on the following topics:

- Casimir operators in harmonic analysis and representation theory
- Number theory, in particular zeta functions and cryptography
- Casimir force in physics and its relation with nano-science.
- Mathematical biology.
- Importance of mathematics for innovation in industry.

Organizing committee

Masato Wakayama (Kyushu University, Japan), chairman

Gerrit van Dijk (Leiden University, The Netherlands)

Roger Howe (Yale University, USA)

Evgeny Verbitskiy (Philips Research Laboratories, The Netherlands)

Masanobu Kaneko (Kyushu University, Japan)

Setsuo Taniguchi (Kyushu University, Japan)

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Plenary speakers

- Jean-Pierre Bourguignon (CNRS-IHÉS) : “Mathematics and Industry: Towards a Challenging New Cooperation”
- Federico Capasso (Harvard University) : “Casimir-Lifshitz forces: vacuum fluctuations, quantum levitation and the future of nanomachines”
- Samuel Patterson (University of Göttingen) : “The Riemann Hypothesis - pro and contra”
- Martin Schuurmans (EIT) : “Casimir Lessons, Innovation and Technology”

Invited speakers

- Mihai Ciucu
(Indiana University : Algebraic Combinatorics & Statistical Physics)
- Caterina Consani
(Johns Hopkins University : Algebraic Geometry & Riemann Hypothesis)
- Christopher Deninger (University of Münster : Riemann Hypothesis)
- Shai Haran (Technion, Israel : Riemann Hypothesis, Geometry & Arithmetic)
- Gert Heckman (University of Nijmegen : Harmonic Analysis)
- Roger Howe
(Yale University : Invariant Theory, Representation Theory & Harmonic Analysis)
- Minoru Itoh (Kagoshima University : Representation Theory & Invariant Theory)
- Yoh Iwasa (Kyushu University : Mathematical biology)
- Kazufumi Kimoto
(University of the Ryukyus : Zeta Functions & Representation Theory)
- Nobushige Kurokawa (TIT : Zeta functions, Riemann Hypothesis & Casimir Force)
- Stefan Michalowski (OECD/ GSF : OECD/GSF Mathematics in Industry)
- Hiroyuki Ochiai (Nagoya University : Harmonic Analysis & Zeta Functions)
- Jinsung Park (KIAS : Zeta Regularization & Global Analysis)
- Misha Pevzner (University of Reims : Representation Theory)
- Hisayoshi Sato (Hitachi, Ltd., Systems Development Laboratory : Cryptography)
- Tsuyoshi Takagi (Future University Hakodate : Cryptography)
- Kei Tokita (Osaka University : Mathematical biology & Statistical Physics)
- Evgeny Verbitskiy
(Philips Research : Applications of Mathematics in Natural sciences and Medicine)
- Lin Weng (Kyushu University : Zeta Functions and Algebraic Geometry)
- Chengbo Zhu (National University of Singapore : Representation Theory)

*The years 2009 marks also the 150th birthday of

“The Origin of Species- Charles Robert Darwin (published 24 November, 1859)”*