

COE Lecture Note Series

Volume No. : 21

Title : Forum "Math-for-Industry"

Casimir Force, Casimir Operators and the Riemann Hypothesis

Editor : Faculty of Mathematics, Kyushu University

Written In : English

ISSN : 1881-4202

Published In : 2009 年11 月9 日

Authors : Tan Eng Chye, BOURGUIGNON, Jean-Pierre, PATTERSON, Samuel,  
TAKAGI, Tsuyoshi, MICHALOWSKI, Stefan, OCHIAI, Hiroyuki,  
CAPASSO, Federico, TOKITA, Kei, SATO, Hisayoshi, VERBITSKIY, Evgeny,  
CIUCU, Mihai, WENG, Lin, SCHUURMANS, Martin, PARK, Jinsung, HOWE, Roger  
ITOH, Minoru, CONSANI, Caterina, KIMOTO, Kazufumi, HECKMAN, Gert,  
ZHU, Chengbo, IWASA, Yoh, PEVZNER, Misha, HARAN, Shai,  
KUROKAWA, Nobushige, DENINGER, Christopher

Contents:

Opening Address.....	1
Tan Eng Chye (National University of Singapore)	
Mathematics and Industry: Towards a Challenging New Cooperation...	2
BOURGUIGNON, Jean-Pierre (CNRS-IHÉS : Differential Geometry & Global Analysis)	
The Riemann Hypothesis - pro and contra.....	3
PATTERSON, Samuel (University of Göttingen : Number Theory & Zeta functions)	
Pairing-Based Cryptography and its Security Analysis.....	8
TAKAGI, Tsuyoshi (Future University Hakodate : Cryptography)	
Mathematics in Industry and Beyond: Issues and Options for Policymakers.....	18
MICHALOWSKI, Stefan (OECD/ GSF : OECD/GSF Mathematics in Industry)	
Zeta functions and Casimir energies on infinite symmetric groups.....	21
OCHIAI, Hiroyuki (Kyushu University : Harmonic Analysis & Zeta Functions)	
Casimir-Lifshitz forces: vacuum fluctuations, quantum levitation and the future of nanomachines.....	23

CAPASSO, Federico (Harvard University : Solid State Physics & Nano-mechanics)	
<b>Random matrices and their application to mathematical biology.....</b>	<b>24</b>
TOKITA, Kei (Osaka University : Mathematical biology & Statistical Physics)	
<b>An Algorithm for Generating Rational Points and Hash Functions into Elliptic Curves.....</b>	<b>26</b>
SATO, Hisayoshi (Hitachi, Ltd., Systems Development Laboratory : Cryptography)	
<b>Mathematics in the industrial environment: Dutch perspective.....</b>	<b>36</b>
VERBITSKIY, Evgeny (Philips Research : Applications of Mathematics in Natural sciences and Medicine)	
<b>A Casimir force in dimer systems.....</b>	<b>41</b>
CIUCU, Mihai (Indiana University : Algebraic Combinatorics & Statistical Physics)	
<b>Symmetries and the Riemann Hypothesis.....</b>	<b>45</b>
WENG, Lin (Kyushu University : Zeta Functions and Algebraic Geometry)	
<b>Casimir and lessons for Innovation .....</b>	<b>55</b>
SCHUURMANS, Martin (EIT : Solid State Physics & Biomedical Engineering)	
<b>Spectral Invariants and dynamical zeta functions for noncompact hyperbolic manifolds.....</b>	<b>56</b>
PARK, Jinsung (KIAS : Zeta Regularization & Global Analysis)	
<b>Maxwell, Casimir, and dual pairs.....</b>	<b>59</b>
HOWE, Roger (Yale University : Invariant Theory, Representation Theory & Harmonic Analysis)	
<b>On Extensions of the Tensor Algebra.....</b>	<b>60</b>
ITOH, Minoru (Kagoshima University : Representation Theory & Invariant Theory)	
<b>Schemes over <math>F_1</math> and zeta functions.....</b>	<b>68</b>
CONSANI, Caterina (Johns Hopkins University : Algebraic Geometry & Riemann Hypothesis)	
<b>Arithmetics derived from the non-commutative harmonic oscillator.....</b>	<b>69</b>
KIMOTO, Kazufumi (University of the Ryukyus : Zeta Functions & Representation Theory)	
<b>Hyperbolic structures associated with hypergeometric equations.....</b>	<b>78</b>
HECKMAN, Gert (University of Nijmegen : Harmonic Analysis)	

Multiplicity one theorems and the Casimir operator.....	79
ZHU, Chengbo (National University of Singapore : Representation Theory)	
Modeling morphogenesis in development.....	82
IWASA, Yoh (Kyushu University : Mathematical biology)	
Composition formulas for the Weyl calculus and phase space representations.....	86
PEVZNER, Misha (University of Reims : Representation Theory)	
The Geometry of Generalized Rings.....	89
HARAN, Shai (Technion, Israel : Riemann Hypothesis, Geometry & Arithmetic)	
Absolute zeta functions, absolute Riemann hypothesis and absolute Casimir energies.....	90
KUROKAWA, Nobushige (TIT : Zeta functions, Riemann Hypothesis & Casimir Force)	
Number theory and foliations.....	92
DENINGER, Christopher (University of Münster : Riemann Hypothesis)	