

# Inaugural Singapore Mathematics Symposium 2010

## Singapore Mathematical Society April 26, 2010

(Venue: IMS Auditorium, <http://www2.ims.nus.edu.sg/>)

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### Program

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| 1:30 – 2:00pm | Registration & Viewing of Posters  |
| 2:00 – 2:10pm | Opening remarks by Zhu Chengbo (President, SMS)  |
| 2:10 – 2:55pm | Invited talk 1<br>Speaker: Zhang De-Qi, Department of Mathematics, NUS<br>Title: Symmetries of complex spaces: their dynamics and building blocks<br>Chair: Chair: Ling San                                    |
| 2:55 – 3:00pm | Break  |
| 3:00 – 3:45pm | Invited talk 2<br>Speaker: Chua Chek Beng, School of Physical & Mathematical Sciences, NTU<br>Title: On generalized complementarity problems<br>Chair: Loke Hung Yean  |
| 3:45 – 4:30pm | Tea Break & Viewing of Posters   |
| 4:30 – 5:15pm | Invited talk 3<br>Speaker: Chan Hock Peng, Department of Statistics & Applied Probability, NUS<br>Title: Signal detection in flow cytometry, epidemiology and genetic association studies<br>Chair: Sun Defeng |
| 5:15 – 5:30pm | Closing & Prize Presentation   |

## Abstract of invited talks

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### 1. Symmetries of complex spaces: their dynamics and building blocks

(Zhang De-Qi, Department of Mathematics, NUS)

Abstract: We show that all dynamically interesting symmetries of compact spaces are canonically built up exactly from those on the following three types of spaces: Complex tori, Calabi-Yau manifolds, and rationally connected varieties. An optimal upper bound will also be given for the rank of commutative space symmetries groups. The main ingredient is our development of the Equivariant Minimal Model Program.

#### Brief biography of the speaker:

De-Qi Zhang has been with the Department of Mathematics, NUS, since 1991, after obtaining his PhD from Osaka University. He is working in the area of Algebraic Geometry.

### 2. On Generalized Complementarity Problems

(Chua Chek Beng, School of Physical & Mathematical Sciences, NTU)

Abstract: A (nonlinear) complementarity problem is the problem of finding nonnegative solutions to a system of nonlinear inequalities, together with a special condition that expresses the complementary relation between each nonnegative variable and the slack in the corresponding inequality. Complementarity problems with linear inequalities (a.k.a. linear complementarity problems) form an important tool in solving optimization problems, and physical and economical equilibrium problems. Recent developments of complementarity problems saw the generalization of the nonnegativity conditions to convex conic constraints. Contemporary methods for solving generalized complementarity problems focus on fixed-point/homotopy approaches by re-expressing the problem as an equivalent system of nonsmooth equations. This talk shall present some of the modern theoretical and algorithmic results on generalized complementarity problems.

#### Brief biography of the speaker:

Chek Beng Chua is currently an Assistant Professor at the School of Physical and Mathematical Sciences in Nanyang Technological University – a position he had held since July 2006. Prior to that, he held the position of Assistant Professor at the Department of Combinatorics and Optimization in the University of Waterloo between July 2003 and June 2006. In 2003, the speaker obtained his Ph.D. from Cornell University under the supervision of Professor James Renegar. He won the SIAM Student Paper Prize in 2003 for his work "The primal-dual second-order cone approximations algorithm for symmetric cone programming".

### **3. Signal detection in flow cytometry, epidemiology and genetic association studies** (Chan Hock Peng, Department of Statistics & Applied Probability, NUS)

Abstract: Flow cytometry is a technique for examining microscopic particles and has applications in clinical studies. Epidemiology is the study of factors affecting the health of the general population. In genetic association studies, we would like to find genes associated with a disease or trait of interest. We are interested in the following problem. Given the massive amount of information carried in these datasets, are we able to determine localized regions which show a significant difference between a case study and a control sample? We describe what is widely known as scan statistics and discuss how mathematics (theoretical statistics) is useful in establishing basic principles for the proper application of scan statistics, and also in analyzing and predicting their performances.

#### **Brief biography of the speaker:**

Chan Hock Peng graduated from the National University of Singapore (NUS) with an Honours degree in Mathematics in 1993. He was admitted to the Statistics PhD program in Stanford University and returned to Singapore in 1998, as an Assistant Professor in the Department of Statistics and Applied Probability, NUS. He is currently an Associate Professor in the same department. He works on scan statistics, multiple testing problems and importance sampling of rare events.