

*Japan-Italy Joint Forum
Sendai Workshop on*

Quantum Probability and Mathematics of Information

September 24 - 26, 2001

*Graduate School of Information Sciences
Tohoku University*

Preface

Welcome to Sendai Workshop on Quantum Probability and Mathematics of Information. This has been realized as one of the advanced research workshops organized within the framework of Japan-Italy Joint Forum: Quantum Probability, Physics, and Information Theory in the special year of ITALIA IN GIAPPONE 2001. The main goal is to examine the possibility of common interests and possible collaboration between Italian and Japanese scientists. In particular, we focus on mathematical or theoretical approaches to modern information science including quantum probability, algebraic probability, operator algebras, quantum estimation, quantum computation, algorithms, computational geometry, stochastic limit, data analysis, and related fields.

We thank Graduate School of Information Sciences, Tohoku University, and Vito Volterra Center, University of Rome Tor Vergata for their joint organization and technical assistance. Moreover, we are deeply grateful to Italian Embassy in Tokyo for their cooperation. It is our pleasure to remember this workshop together with the special year of ITALIA IN GIAPPONE 2001.

*September, 2001.
Organizers*

Organizing Committee

Nobuaki Obata (Chair, Tohoku University)

Fumio Hiai (Tohoku University)

Masanao Ozawa (Nagoya University)

Hiroshi Imai (University of Tokyo)

Luigi Accardi (University of Rome Tor Vergata)

Program

September 24 (Mon/Holiday)

09:45-10:00 Opening

Chair: F. Hiai

10:00-10:45 Luigi Accardi (Univ. Rome Tor Vergata)
Interacting Fock spaces and orthogonal polynomials in several variables

10:45-11:30 Takeshi Tokuyama (Tohoku Univ.)
Quantum computation in computational geometry
(with K. Sadakane and N. Sugawara)

11:45-12:15 Naofumi Muraki (Iwate Pref. Univ.)
The five independences in algebraic probability theory

Chair: Hiroki Shizuya

13:45-14:30 Toshiya Itoh (Tokyo Inst. Tech.)
Min-wise independent permutation family

14:30-15:00 Ruben Sabbadini (Univ. Rome)
A generalization of Grover's algorithm

Chair: Luigi Accardi

15:15-16:00 Yoshimichi Ueda (Hiroshima Univ)
Some recent developments in free probability theory

16:00-16:30 Noboru Watanabe (Tokyo Sci. Univ.)
On mathematical treatment of quantum logical gate
on Fock space (with Wolfgang Freudenberg and
Masanori Ohya)

16:30-17:00 Paolo Facchi (Univ Bari)
Van Hove's limit in relativistic quantum field theory

September 25 (Tue)

Chair: Naofumi Muraki

09:45-10:15 Akihito Hora (Okayama Univ.)
Quantum aspect of asymptotic spectral analysis on large graphs

10:15-10:45 Kenji Oosawa (Nagoya Univ.)
Two-dimensional pattern formation with coloration:
Application for genome analysis

Chair: Takeshi Tokuyama

11:00-11:30 Keiji Matsumoto (Quantum Computation and Information Project,
JST)

First order asymptotic theory of quantum statistical estimation

11:30-12:00 Masahito Hayashi (RIKEN)

Variable length universal entanglement concentration by local operations and its application (with Keiji Matsumoto)

12:15-13:00 Masanao Ozawa (Nagoya Univ)

Quantum information theory and completely positive map valued measures

13:00-18:00 free

18:00-20:00 A Buffet-Party at KKR Sendai

September 26 (Wed)

Chair: Keiji Matsumoto

09:45-10:15 Mitsuru Hamada (Quantum Computation and Information Project,
JST)

On quantum channel capacity

10:15-10:45 Saverio Pascazio (Univ Bari)

Zeno dynamics yields ordinary constraint

10:45-11:15 Kazuya Yuasa (Waseda Univ)

Spin relaxation in a ``strong"-coupling regime via stochastic limit
(with Gen Kimura and Kentaro Imafuku)

Chair: Hajime Urakawa

11:30-12:00 Yun-Gang Lu (Univ. Bari)

The number operator in the stochastic limit

12:00-12:45 Massimo Regoli and Luigi Accardi (Univ. Rome)

The EPR correlations and the chameleon effect
(public demonstration of the experiment is planned)

12:45-12:50 Closing

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2001
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GIAPPONE



Japan-Italy Joint Forum

Quantum Probability, Physics and Information Theory

Global Organizer
Luigi Accardi
Centro Matematico Vito Volterra
Universita di Roma Torvergata

The forum should take place from mid september to the first days of october 2001, with possible further activities in the spring 2002. The goal of the forum is to examine the possibility of common interests and possible collaboration, between italian and japanese experts, on the topics mentioned in the title. The talks shall be expository, possibly with historical introduction and comments on open problems. The text of the talks shall be included in the proceedings volume of the Meeting.

The forum will combine different activities to be held in different japanese cities. In particular:

I) High level contacts among a small group of highly qualified participants on the topic: "The information society and the challenges of the quantum era" In this strategic meeting, to be held at the Italian Embassy in Tokyo, members of the Italian delegation will compare their experiences and perspectives, on this important challenge for modern society, with their Japanese colleagues and with representatives of the Mombusho, of the JSPS and of Japanese and Italian industry, exploring the possibilities of establishing joint research programmes both in the direction of pure research and of possible fall outs for industry.

II) A series of "advanced research workshops" to be held in known japanese universities or research centers devoted to illustrate advanced research topics related to the main topic of the Forum. The following Japanese universities have already proposed to organize a workshop in their venues:

1. "Japan-Italy Joint workshop on: Quantum Information theory" Kyoto International Institute for Advanced Studies. Main japanese organizer: Professor Takeyuki Hida, 17-20 September 2001
2. "Japan-Italy Joint workshop on: Quantum Probability and Information Theory", Tohoku University, Sendai. Main japanese organizer: Professor Nobuaki Obata, 24-26 September 2001
3. "Japan-Italy Joint workshop on: Fundamental Problems in Quantum Mechanics," Waseda University. Main japanese organizer: Professor Shuichi Tasaki (stasaki@mn.waseda.ac.jp), 27-29 September 2001
4. "Japan-Italy Joint workshop on: Quantum computer and quantum complexity theory," Tokyo Science University. Main japanese organizer: Professor Masanori Ohya, 1, 2 October 2001

III) Initiatives addressed to a more general, non specialistic but cultivated, public. This will include a series of public lectures or round tables, jointly organized by the Italian and the Japanese side. One important channel of cultural communication is realized through good books of scientific popularization. One of the goals of the Japan-Italy Joint forum is to promote the translation of books by japanese authors in italian and by italian authors into japanese, especially those books which underline mutual relationships between the two countries.

We will create a forum to discuss some of the fundamental conceptual issues of contemporary science. The forum should realize its activities through periodic public debates involving speakers of the two countries and of different generations. Each debate should take the move from some book of Italian or Japanese authors devoted to the conceptual, or historical or pedagogical aspects of science or technology and extend the discussion to more general topics.

I intend to propose the presentation and translation of the following books:

1. "What is Physics", by Prof. Toshiyuki Toyoda: this should be the introduction to a public debate on the role of physics in contemporary society.
2. "A History of Japanese Scientists at the Naples Zoological Station", edited by Eizo Nakano. This is a fortunate occasion, describing an old collaboration between Italy and Japan, begun more than 100 years ago, and should offer the occasion for a debate on the perspectives of collaboration in the field of biological studies.
3. "The encyclopedia of information sciences" by Masanori Ohya (ed.). This book was a considerable success in Japan and will be ideal for an introduction to some fascinating challenges for modern science, such as a quantum computer, quantum communication and cryptography, ...
4. "Urns and chameleons: a debate on the laws of chance and the interpretation of quantum mechanics", by L. Accardi. The debate on the laws of chance is centuries old and that on the interpretation of quantum mechanics has been the central topic of the philosophy of science in the past century. The unification of the two debates should be of great interest for a wide public.

These presentations should take place during the spring 2002 and their realization is subject to the funding of additional support either from Italian or from Japanese side. It would be also important to find support also for organising the translation of these books.

Professor T. Hida is organizing, jointly with the Aichi Prefecture Association, a presentation, to be held on Friday September 21, of the Japanese translation of the book: Accardi L., "Urne e camaleonti, Dialogo sulla realtà, le leggi del caso e la teoria quantistica. Il Saggiatore (1997). It is hoped that, by 2001, also the Japanese translation of the other book: Accardi L., Y.G. Lu, I. Volovich: "Quantum Theory and its Stochastic Limit", Tokyo Springer, will be ready so that another presentation can be organized.