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MULTISCALE ANALYSIS, MODELING, AND SIMULATION
Kickoff Meeting, Mathematics & Physics Unit,
Top Global University Project, Waseda University
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Date: February 20, 2015
Venue: Large Meeting Room, 1st Floor, 62W Bldg.
西早稲田キャンパス 62 号館 W 棟 1 階大会議室

15:00-15:30 Yoshihiro Shibata (Waseda University)
Title: Aims and Scope of Mathematics & Physics Unit

15:30-16:30 Vladimir Georgiev (University of Pisa)
Title : PhD Research Projects Based on Quantum Mechanical and
Biomedical Models

17:00-17:30 Hiroaki Yoshimura (Waseda University)
Title : Mathematical Modeling in Mechanics

17:30-18:00 Hiromichi Nakazato (Waseda University)
Title : Introduction to Research in Quantum Theory at Waseda

18:15- Reception
Venue : Large Meeting Room, 1st Floor, 62W Bldg.

Organized by Hideo Kozono and Tohru Ozawa
Supported by Top Global University Project, Waseda University
Institute of Mathematical Fluid Dynamics, Waseda University

==============abstract==============================

15:00-15:30 Yoshihiro Shibata (Waseda University)
Title: Aims and Scope of Mathematics & Physics Unit

Abstract: The Mathematics and Physics unit started in the early of November in 2014 as one of six units in the Top Global University Project of Waseda University supported by JSPS. The core members are so far Hideo Kozono, Hiromich Nakazato, Shinichi Oishi, Tohru Ozawa, Yoshihiro Shibata, Mitsunori Takano, Yoshihiro Yamazaki, Hiroaki Yoshimura, and Kazuya Yuasa. Our purpose is to build the international scientific communities and the new education system in the Ph.D course about the muti-scale analysis, modeling and simulation. Our scientific background is nonlinear partial differential equations, global geometry, numerical science, quantum mechanics, fluid mechanics, biophysics, condensed matter physics, …. In this talk, I would like to explain more details of our idea conception of international and interdisciplinary study and education.

15:30-16:30 Vladimir Georgiev (University of Pisa)
Title: PhD Research Projects Based on Quantum Mechanical and Biomedical Models.

Abstract:
As for the quantum mechanics there are several ideas to be developed as projects for PhD students:
1) Breaking of symmetry and Klein-Gordon and Maxwell-Klein-Gordon systems.
2) Perturbation methods to establish asymptotic stability of solitary waves (for Schrödinger equation).
3) Uniqueness of minimizers for variational problems in quantum mechanics for the cases, when the two basic methods: shooting and Pohozaev identities have difficulty to be applied.

As for bio-physical-mathematical models from the discussions with colleagues in Pisa and our partners of the project Math4health:
1) Study of REM NREM cycles in sleep models.
2) Models for dendritic cell-based immunotherapy.
The first project is in collaboration with Centre for sleep disorders in Pisa, while the second is in collaboration with Laboratory of Tumor Immunology, University Sapienza Roma (Head: Prof. M.Nuti).

17:00-17:30 Hiroaki Yoshimura (Waseda University)

Title: Mathematical Modeling in Mechanics

Abstrac: We will first make a short review of recent research topics in mechanics such as a geometrical approach to nonholonomic mechanics, space mission design in astrodynamics, and modeling of fluid dynamics. Then, amongst those topics, we will illustrate specific problems in fluids focusing upon modeling unsteady phenomena of cavitation bubbles.

17:30-18:00 Hiromichi Nakazato (Waseda University)

Title: Introduction to Research in Quantum Theory at Waseda

Abstrac: A personal review of research activities in quantum theory at Waseda University is given, including the memory of the great founder, the late Professor Mikio Namiki. Some of the recent research works born under the long-lasting international collaborations are introduced.

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MULTISCALE ANALYSIS, MODELING, AND SIMULATION
Mini Course, Mathematics & Physics Unit,
Top Global University Project, Waseda University
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Date: February 23-24, 2015 / 10:00-17:00
Venue: 06 Room, 17th Floor, 51 Bldg., /
早稲田大学 西早稲田キャンパス 51 号館 17 階 06 室

Mini Course 10:00 - 11:00 / 11:10 - 12:10
Lecturer: Vladimir Georgiev (University of Pisa)
Title: Kato - Ponce inequality and its applications to NLS

1) Introduction: Basic facts about Bernstein inequality and Paley decomposition.
Energy and Strichartz estimates for Schrodinger equation.

2) Kato Ponce inequality and decay for cubic one dimensional NLS with small data
initial data

3) Introduction to perturbation phenomena: Bernstein and Kato-Ponce inequality
in presence of potential. Applications to global behavior and decay for supercritical
one dimensional NLS.

Mini Course 14:00 - 15:00 / 15:30 - 16:30
Lecturer: Nicola Visciglia (University of Pisa)
Title: Scattering Theory for NLS, several point of view

LECTURE 1: In the first part of the lecture I will recall quickly the classical
strategy by Ginibre-Velo in dimension $d>2$ and by Nakanishi in dimension $d=1,2$; in
the second part of the lecture I will first recall the interaction Morawetz estimate
and then I will show, based on a suitable localized Gagliardo-Nirenberg inequality,
how it implies the scattering.

LECTURE 2: I will recall the Kenig-Merle strategy and I will show how it can be adapted
to the case of NLS with a delta interaction.