

**“Multiscale Analysis, Modeling and Simulation”
Top Global University Project, Waseda University
REPORT ON STUDY ABROAD**

Date: March 3, 2015

Name: Miho Murata

- 1. Study abroad destination: University of Pittsburgh, USA**
- 2. Dates of stay: February 10, 2015 – March 7, 2015 (26days)**
- 3. Purpose:** To prove solvability to the fluid-rigid body interaction problem for compressible fluids.
- 4. Host Professor: Prof. Giovanni P. Galdi (University of Pittsburgh)**
- 5. Education and research activity in the destination**
 - I. Seminars, lectures, Conferences, etc:**

Yoshihiro Shibata (Waseda University), “On the maximal L_p - L_q regularity for the operator in the study of the viscous fluid flow in unbounded domains”, Analysis seminar, University of Pittsburgh (USA) February 25, 2015.
 - II. Presentations:**

Local well-posedness of the fluid-rigid body interaction problem for compressible fluids, Analysis seminar, University of Pittsburgh (USA) February 17, 2015.
 - III. Research Results:** I considered global well- posedness in L_2 - L_2 framework for the system describing the motion of rigid body immersed in a compressible fluids with Prof. Galdi. For simplicity, we assume that fluid and rigid body are contained in 2 dimensional whole space and rigid body is a disk. To prove global solvability, it is natural to extend a local solution, therefore we proved a local in time unique existence theorem by linear theory and contraction mapping principle. In order to show a unique existence theorem to linearized problem, we got a priori estimate for transport equation and applied semigroup theory for the coupled system of equation of motion of fluids and rigid body. Prof. Galdi helped me to solve transport equation by a simple way which is getting a priori estimate by using integration by parts. I haven't finished the proof of global well-posedness yet, but I proved a local in time unique existence theorem and understood what estimates we should get to prove global solvability.

6. Other comments: First, I could talk about my research in the seminar and work with Prof. Galdi. In the seminar, I explained about the future work that is global well-posedness for the fluid-rigid body interaction problem in L_2 - L_2 framework as well as local well posedness in L_p - L_q framework which I already proved. It was great pleasure that he was interested in my future work. This seminar gave me a chance I can work with him.

Secondly, I received a lot of stimulus by the motivation of another students and researchers because many exchange students come to University of Pittsburgh to get Ph.D. degree. I was also surprised that they discussed for a long time. Thus I concentrated my research and discussed positively with Prof. Galdi and researchers to get a result to realize the future work. This experience is good influence on my research.