

# Multiscale Analysis, Modeling and Simulation

## -Top Global University Project, Waseda University-

### Report on Study Abroad

Name: Ryosuke Odoi

Date: November 30, 2020

1. Destination:

Indiana University-Purdue University Indianapolis (IUPUI), United States of America

2. Dates of Stay:

January 8, 2020 – May 21, 2020

3. Purpose:

To study constant problem of the tau-function of the  $tt^*$ -Toda equation

4. Host Professor:

Alexander Its (IUPUI)

5. Education and Research Activity:

I am studying the  $tt^*$ -Toda equation, which is a special case of the radial (or cylindrical) reduction of the two-dimensional Toda equations (with opposite sign) which appeared in the work of Cecotti and Vafa on two-dimensional supersymmetric field theories. The main purpose of the trip is to evaluate the asymptotic constant of the tau-function of the  $tt^*$ -Toda equation as an application of a result I had shown before the trip.

During the trip, I solved the constant problem for the tau-function of the  $tt^*$ -Toda equations in the case that the solutions are global. I am writing a paper about this result, and it will be submitted soon. Professor Its kindly helped me about solving the constant problem. He taught me prior researches about constant problem and classical action. And I attended his lecture course of the Riemann-Hilbert approach to the Painlevé equations. I also attended conferences several times.

After solving the constant problem, I started generalizing the result to the case of solutions which are not necessarily global. This project is still ongoing, and Professor Its keeps helping me.

6. Other comments:

My trip to IUPUI was priceless experience. People I met in Indianapolis were very kind. I would like to express my gratitude to Professor Its. He treated me graciously in math and beyond. And I am grateful to the friends I met at IUPUI. I had dinner and talked with them

many times, and those experiences allowed me to live a pleasant life in Indianapolis.

This trip is supported by Mathematics and Physics Unit “Multiscale Analysis, Modelling and Simulation”, Top Global University Project, Waseda University. I am grateful to Professor Yoshihiro Shibata, Professor Martin Guest, Ms. Ishizaki, Ms. Yoshida and all the staffs who supported my trip.

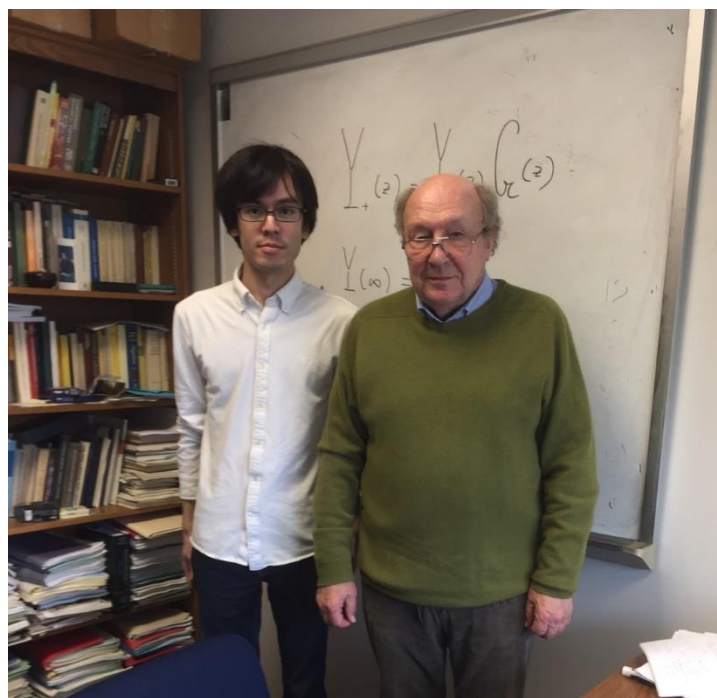


Figure 1. With Professor Its at IUPUI