

JSPS Short-Term Award Report

Michael Allman

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Research Institution: University of Tokyo.

Department: Graduate School of Mathematical Sciences.

Host Researcher: Professor Tadahisa Funaki.

Length of Fellowship: Four months.

Research Summary

Systems of interacting particles are widely used to model the rupture dynamics of polymers. Physically, the main idea is to apply an external force to a molecular bond and see how much force is required before it breaks. Such systems involve a degree of randomness coming from thermal fluctuations. Mathematically, this leads to probabilistic models and interacting Brownian particles.

The long-term aim of my research is to study rigorously polymer dynamics from a probabilistic viewpoint. For my PhD I have investigated chains of interacting Brownian particles under strain and have obtained results about rupture events.

The aim of my visit to Japan was to start a collaboration that will lead to the achievement of this long-term goal. The immediate task was to try and extend results I had already obtained to much longer chains of particles with a view to taking the limit of an infinitely long chain. Professor Funaki has also considered models of interacting Brownian particles in which the total number of particles approaches infinity.

During my stay in Japan, Professor Funaki and I devised a strategy for extending my previous results and were able to implement this fully in certain cases. This work will feature in my PhD thesis. The remaining cases should also follow in a similar way and I am currently completing the necessary details.

Tips For Living In Japan

The first few days in Japan may be a little overwhelming if it is your first time to that part of the world, as it was for me. It is definitely worthwhile learning some basic Japanese phrases beforehand, especially how to ask for directions when you first arrive! But do not worry too much as everyone is very friendly and will try their best to help you.

I also recommend learning how to use chopsticks before going as it will make life a little easier and shows a willingness to fit in.