Report from trip to China (May 22 - June 10, 2012)

Dear Professor El-Aasser:

First of all, I would like to thank you for offering the Faculty Grant for International Connection to me to have a wonderful and fruitful trip to China.

I mainly visited Professor Jibin Li (Zhejiang Normal University) and Professor Wenan Yong (Tsinghua University). At the suggestion of Professor Jibin Li, I also visited some other famous institutions, gave talks and made new friends in applied mathematics. Jibin Li and I, Wenan Yong and I, respectively, have started writing joint papers in the originally proposed research area. Below I will describe the papers a bit.

Bounded explicit traveling wave solutions of the Fitzhugh-Nagumo equations (with Jibin Li). *The representation of bounded explicit traveling wave solutions (representing nerve impulses) of the Fitzhugh-Nagumo equations has been open for a long long time. The Fitzhugh-Nagumo equations is a simplified version of the classical Hodgkin-Huxley equations which has been published in 1952. This is a Nobel Prize model, a very important mathematical system in neuroscience. We investigate explicit bounded traveling wave solutions of the Fitzhugh-Nagumo equations in the joint paper and investigate how the wave speeds depend on various biological parameters. Mathematically and biologically, this is a very important/interesting problem. We finished some important parts (including generating some important ideas, overcoming some main difficulties, completion of some main theorems, etc). We will continue to write this paper.*

Exact limits of global strong solutions of balanced hyperbolic conservation laws (with Wenan Yong). *Nonlinear hyperbolic conservation laws occupy a very important position in partial differential equations. Wenan Yong had done a lot of important research in this area. He also obtained decay estimates with sharp reates. The purpose of the join paper between him and me is to improve previous results - to establish the exact limits of global strong solutions of the hyperbolic conservatiopn laws by using my ideas.*

Altogether I gave seven talks at various universities. The talks given at Zhejiang Normal University are roughly the same as the talks given at Tsinghua University. We also discussed many very important/interesting topics in applied mathematics and in Ph.D students/post-doctorals training. In particular,

(I) We discussed how to direct/advise Ph.D students/post-doctorals more efficiently and we shared our experience (both positive and negative).

(II) We discussed how to run programs in applied mathematics more successfully (discussed materials to be covered in core courses, the best time to offer qualifying exams, how many times to offer qualifying exams).

(II) We discussed topics for Ph.D thesis, research topics for post-doctorals.

(IV) We talked about our future collaborations: which research directions/areas to go, what mathematical problems to choose, how to overcome main difficulty, etc.

(V) We interchanged and discussed course materials. I am strong in mathematical neuroscience because I have published many important papers in this area and the citation rates are very high. Jibin Li is strong in dynamical systems. Therefore, we exchanged ideas about what materials will be highlighted when teaching core courses and how to do that.

(VI) I talked about book writing with Jibin Li and Wenan Yong. I am writing two books

in my research areas. Jibin Li has published many books and Wenan Yong will write his first book. This trip is a wonderful opportunity to learn from Jibin Li how to write very good books in applied mathematics.

When I visited Wenan Yong at Tsinghua University, I discussed essentially the same things as above.

In terms of research collaboration, we will make the international connections between Lehigh University and Zhejiang Normal University, also between Lehigh University and Tsinghua University stronger.

Again, thank you so much for offering me the Faculty Grant for International Connection. I really appreciate it because I made more international connections and I learned how to conduct more serious, important/interesting research in applied mathematics better!

Linghai Zhang
Department of Mathematics
610-758-4116
liz5@lehigh.edu