

Dear Committee:

I am writing to apply the Faculty Grants for International Connection. I plan to use two weeks in the summer of 2012 to visit two great experts in my research area: Professor Jibin Li (Department of Mathematics, Zhejiang Normal University) and Professor Wenan Yong (Zhou Peiyuan Research Center of Applied Mathematics, Tsinghua University). Jibin Li is the Director of Center for Nonlinear Science Studies (in Differential Equations and Dynamical Systems) at Zhejiang Normal University and Wenan Yong is the Director of Zhou Peiyuan Research Center of Applied Mathematics at Tsinghua University. Both have done great research in my areas for a long time and have obtained excellent results. I have received invitations from both experts to visit them for research collaboration.

I visited Jibin Li in 2008 for a few days and we discussed many interesting research problems. I visited Wenan Yong in 2008 and 2009 and also had fruitful discussions in mathematics research. Then Jibin recommended two of his former Ph.D students (Lijun Zhang<sup>1</sup> and Haihong Liu<sup>2</sup> to visit me at Lehigh University for a whole year. These visitors are visiting me at Lehigh this current academic year. Jibin Li himself will visit me for a week (April 9 to 14, 2012). During that week, Jibin Li, the two visitors, my current Ph.D student and I myself will hold a mini-symposium. Each day will focus on one research topic, we will have detailed discussions on ideas, technical tools of solving important mathematics problems and future research directions in applied mathematics. In particular, we will start to write our first joint paper (Jibin Li and I will be the main authors, others may join). 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 will 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 open problem. Throughout the mutual visits, We hope we will build a strong connection between Lehigh University and Zhejiang Normal University and we may regularly exchange Ph.D students, post-doctoral, former students (current faculty in some university) in the near future.

The purpose I write this proposal is to apply the Faculty Grant for International Connection to visit Jibin Li and Wenan Yong for two weeks in the summer. There are several purposes in this proposed trip:

- (I) We hope to finish the joint paper (at least finish the most important parts: including generating the main ideas, overcoming the main difficulties, completion of main theorems, etc).
- (II) Give a series of lectures to his Ph.D students and post-doctorals.
- (III) Discuss how to direct/advise Ph.D students/post-doctorals more efficiently. We will share our experience (both positive and negative).
- (IV) How to run programs in applied mathematics more successfully (discuss materials to be covered in core courses, the best time to offer qualifying exams, how many times to offer qualifying exams).
- (V) Topics for Ph.D thesis, research topics for post-doctoral.
- (VI) Our future collaborations: which research directions/areas to go, what mathematical problems to choose, how to overcome main difficulty, etc.
- (VII) To apply National Natural Science Foundation from China (Jibin Li mentioned this before

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<sup>2</sup>Associate Professor, Department of Mathematics, Yunnan Normal University, Kunming, China.

and Haihong Liu supported this idea) to support the joint research.

(VIII) To interchange and discuss 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 is strong in dynamical systems. Therefore, we should exchange ideas about what materials will be highlighted when teaching core courses and how to do that.

(IX) Improvement of book writing. I am writing two books in my research areas. Jibin has published many books. This trip would be a wonderful opportunity to learn from him how to write very good books.

When I visit Wenan Yong at Tsinghua University, we will discuss essentially the same things as above.

Wenan and I will start to write a new paper on bounded explicit traveling wave solutions of nonlinear balanced conservation laws when I visit him this summer.

Budget

Hotel (hopefully the other side will pay it)  $\$80 \times 14 \text{days} = \$1120$

Air ticket (economic)  $\$1800$

Local expenses (taxi, long distance Transbridge bus, train)  $\$400$

Visa related expenses  $\$200$

Meals  $\$25 \times 16 \text{ days} = \$400$

Total (excluding hotel expenses)  $\$2800.00$ .

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Email from Jibin Li. *Dear Linghai,*

*I would like to invite you to visit me for a few weeks in the summer of 2012 and I hope you will accept my invitation. I think we should be able to complete our first paper (to solve the important open problems in Fitzhugh-Nagumo equations). Please do not worry about local expenses (like hotel, buses) at Zhejiang. We have a grant to cover it. Thank you.*

*Best!*

*Jibin Li*

*PS: I like your idea to devote each day to focus on the discussion of one research topic while I visit you in April 2012.*

*Jibin Li*

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Email from Wenan Yong. *Dear Linghai:*

*I am very interested in your traveling waves in mathematical neuroscience. It is my great pleasure to invite you to visit me at Tsinghua University for a week in the coming summer. I believe we can begin a very interesting joint paper in traveling waves of nonlinear balanced conservation laws. Please let me know your decision as soon as possible. Thank you!*

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