



Posing with the patch-clampers at UW

What I have learned in the sabbatical

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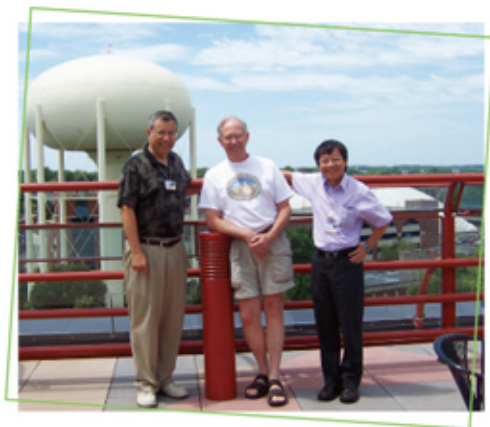
When I was asked to write some thing about my sabbatical leave for the Newsletter, I had requested the option to write in English mainly because my typing of Chinese is just too slow to be practical. Please accept my apologies for the inconvenience.

When I took off on a year-long sabbatical in the summer of 2004, I had already spent 13 years in a row on duty without recharging myself with a long leave. I still recall vividly my first leave, when I enjoyed it with my newly wedded wife. In the second leave, we were joined by two pre-school kids. By the last leave, one of our kids was in College. How time flies!

This time I made arrangements to work at two different laboratories in the States. One laboratory is at the Iowa University with the neurosurgeons, and another at the University of Wisconsin with the neurophysiologists. They represent two strikingly different experiences. For the Iowa project, it was a team work that I needed to work with associates not only physically but often long distance by email and internet. For the Wisconsin project, I had to work all by myself. In both cases, the experience has been equally refreshing.

At Iowa, the Department of Neurosurgery was headed by Matt Howard, one of the few physician scientists who recognize the importance of research in clinical science. He established a system of research training for those entering the Postgraduate Neurosurgery program. Young Residents are obliged to spend two years, free time clinical duties, to do basic research on a subject interesting to themselves and relevant to the team. And after finishing Residence, they have to go abroad for at least 6 months in another laboratory to broaden their vision before resuming duty at Iowa. This system works quite well as it has turned out several devoted physician scientists. The neurosurgeon whom I worked closely with is called Hiroyuki Oya. He to my surprise has already spent 5 years in doing research. According to Matt, Hiroyuki's work ethics is outstanding among neurosurgeons nowadays. Hiroyuki and I spent a great time together working on a project entitled 'functional connections at the human temporal cortex as revealed by Granger

causality analysis of near-field evoked potentials'. Granger, as some of us may know, is the recipient of the 2003 Nobel Prize in Economics. We took on Granger's statistical approach for assessing causal relationship between stochastic time-series and applied it to the analysis of auditory evoked potentials in humans. At Iowa, the Neurology Department was headed by Tony Damasio. They have the world's largest database (~2,000 patients) of well-documented neurological cases including brain images and ongoing behavioral tests. In collaboration with Neurosurgery, they are conducting consented studies on intractable epileptic patients who are routinely implanted with intra-cranial electrodes for investigatory purposes. Between their seizure attacks, over a period of about 2 weeks the patients agreed to participate in some basic research in neuroscience. We therefore had the opportunity to conduct electrophysiological experiments in humans that I planned for studying complex sound, or more specifically FM sensitivity. This is a topic related to what I have been doing at home on small rodents. During this time of experiment, the patients stayed in a dedicated ward at the Clinical Research Center, and the experiment involved presenting computer controlled sounds to the patient and recording the sound-evoked brain activities under passive listening conditions. The design of study had deviated slightly from my original proposal, as modified according to the constraints of the human experimentation that I was not fully aware of at the beginning. But the nature of experiment remained unaltered. This project required an understanding of the mathematics behind Granger causality, computer programming with MATLAB, and sophisticated software and hardware control of data acquisition. I learned quite a lot on the basics and new frontiers in evoked potential analysis and am planning to apply the technique to chronic recording studies on rats now I am doing with my



The frequent travelers at the UI Hospital



*An outing to Chicago with
the Fulbright scholars*

students at NCKU. For this project, we have one paper in press and two more in preparation.

At the Department of Physiology, University of Wisconsin, I worked on ion channels of the cochlear nuclei in the brain slice of young mice using neuropharmacological approaches. This project is an addition to my original sabbatical plan. The technique itself is quite unfamiliar to me, though it is closely related to the electrophysiological work of single unit and evoked potential I have been doing. I was very fortunate to be able to be assigned an exclusive setup to work at my discretion. As sharing a setup with other investigators is often complicated for this kind of technically-involving experiment. In the past years, my laboratory at home is basically occupied by my graduate students and therefore my own engagement was often placed at a low priority. I must confess that after long period of semi-detachment from the laboratory, the past year of patch-clamping presented itself as a great challenge to me. I went through substantial frustrations many of our new graduate students may encounter when they first start working in the laboratory. But I am pleased to say, after many repeated trials-and-errors, I finally became competent in the experiment (on patch-clamping the octopus cells in the cochlear nucleus of very young mice), the project which I was assigned to at the very beginning. Unfortunately much time was spent to overcome the various technical problems and I was only able to complete the project in part. Another associate Xiao-Jie Cao at Wisconsin will need to help in finishing the study. I really wish I had a little more time on this project. According to my Wisconsin collaborator Donata Oertel, patch-clamping the young octopus cells is likely one of the most difficult experiments she is aware of in the land of brain-slice study. I am glad that I have sailed through it with my confidence unshattered.

In addition to working in laboratories, I had the chance of participating in research seminars at the Departments of Neurosurgery and Physiology. I attended 2 seminars on a weekly basis and gave a total of 4 talks myself. It was such an inspiring feeling since it has been rather difficult for me to find and interact with people of the auditory field in Taiwan. In fact, I am still joining the Iowa seminar every week on skype even after my

return. The Iowa team is kind enough to allow me to continue the collaboration with them on the human project. It is quite clear that such internet conferencing will become useful in the ever-increasingly popular international collaborations.

The funding agent of my sabbatical is called the Fulbright Foundation, a division of the Department of States, USA. I must say that Fulbright took good care of their scholars during the entire stay. Each month, the Fulbright office at Chicago will arrange social and cultural events for the scholars and their families in the nearby 4 states. This operation is clearly better than the Commonwealth Fellowship or Fogarty International Fellowship which I was fortunately being awarded during my previous sabbaticals. I think either time has changed, and/or simply because Fulbright has a better-organized program.

The Iowa team had 3 members out-of-state residing at Madison, Wisconsin. As a consequence, the three of us (John Brugge, Rick Reale and myself) had to travel every week between Iowa city and Madison. That meant a car-ride of 3-4 hours/trip over a distance like that between Tainan and Taipei plus frequent stays at hotels. In all expeditions, we stayed often at the same places together and had interactions on many occasions. We chatted freely on any things, including research, social and cultural issues, in the car and over dinner tables. That was indeed a great cross-cultural exchange for me and likely for my American friends as well.

Outside the academic field, I am also happy to be able to spend some easy times with my family and to make new friends. The family life there is often more leisurely spent compared to similar settings in South East Asia. I also took the opportunity to visit an old acquaintance of mine, Andy Durkin at Bloomington, Indiana where I had studied for a Ph.D. degree. When we first met each other, Andy was a junior staff at the Indiana University and I was a graduate student. Thirty-one years later, we are now relatively senior teachers in different parts of the world.

*Relaxing with the Brugges at a
BBQ table*

