

Scholarship Report

Swiss Japanese Chamber of Commerce

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Introduction: goals and proposal

Over a year ago, I was invited to do research in the Fujita-lab under the supervision of Dr Agnès Tixier. The title of the project I was invited to work on was “Realization of a Bio-Microsystem for Gene Therapy”, however, the project was subjected to some modifications. The revised project is “Nanoprobe Attachment on KIF1A”, in collaboration with Dr Agnès Tixier of the Fujita-lab of the Institute of Industrial Science, University of Tokyo and Dr Yasushi Okada of the Hirokawa-lab of the Graduate School of Medicine, University of Tokyo. KIF1A is a special member of the kinesin family, a group of proteins responsible for various linear movements in cells. Most kinesins have two “legs” with which they “walk” along microtubules (structural elements inside cells). KIF1A kinesins however have only one

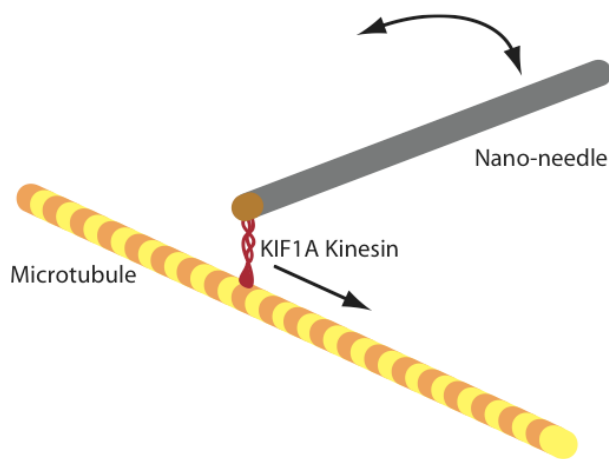


Figure 1. Schematic representation of KIF1A kinesin attached to a microtubule, with a nano-needle to visualize protein movement.

leg, but nonetheless move along microtubules. Obviously they cannot “walk” with only one leg, so naturally the question arises: how can KIF1A move? The purpose of the project is to illuminate this question. While Dr Okada is a worldwide leading specialist on KIF1A, Fujita-lab will supply visualization microprobes (Figure 1). The aim is to fabricate nano-needles and attach them to the KIF1A molecules; when these protein-needle structures move along a microtubule, the needle will amplify the movements the protein undergoes; in this manner, information on the details of KIF1A movement will be gained. The specifications of the nano-needles are firstly that a small area of the needle surface must be of gold;

this is necessary for the attachment to KIF1A. Secondly the dimensions of the needle are important, the length is to be 1-1.5 μm , and the diameter in the range of 200 nm. Finally, large quantities should be easily producible.

I arrived in Japan in the last week of September 2003, attended a full-time Japanese course in Kyoto until end of December 2003, then transferred to Tokyo. In the first week of January 2004 I began my stage at the University of Tokyo, Institute of Industrial Science, Fujita-lab. I have been at the Fujita-lab for over half a year, and my stage will continue until the end of December 2004. I will extend my stay at the lab for an additional 6 months until the end of July 2005.

Language course in Kyoto

The first three months in Japan I spent attending a full-time language course in Kyoto. The language school, Kyoto International School for Language Studies, may be recommended as a serious, trustworthy institution. It shares the facilities with the Kyoto University for Art and Design, and thus can offer more than a private language school normally would. The school is well established and has a network of host families, which are experienced in contact with foreign students. On arrival my Japanese skills were of the most basic, so I was placed in a beginners class. The pace of the class was comfortable in the beginning, but increased to an unreasonable level rapidly; after doing all the homework required, I had neither the time nor energy to memorize words or kanji, not to mention seeing much of Kyoto. The staff was incredibly helpful and enthusiastic, and did not shy any effort to support us- requests for conversation sessions and interview-excursions were readily accepted. The mode of learning was perhaps typical for Japan; we learned many grammatical structures, but practiced very little free speaking. We were trained to complete patterns, but I found the application of the learnt patterns in real life difficult. The experience of living in a host family was most excellent. Although I did not speak very much Japanese with my host mother, I believe that I learned a lot nonetheless. I had the opportunity to experience a Japanese home, perhaps not a typical one but nonetheless embedded in Japanese culture (my host mother was a single, divorced woman, professional musician and former jazz club owner). When I had questions on society & culture, I had someone to ask. My host mother could show and explain me things I would not have had access to on my own. This was most certainly a rewarding experience.

The current level of my Japanese is functional- I can perform everyday tasks, and survive reasonably well, but in conversations I rapidly come to my limits. I am currently attending a Japanese course offered by the institute, 2 hours weekly, in addition to one hour weekly of conversation with neighborhood volunteers. This is a service organized by the ward of Meguro-ku, and a most pleasurable opportunity to meet the locals. With my colleagues I speak mostly English, most can speak quite well. I wish to improve my Japanese to the level that I feel comfortable in social situations, something I believe is possible and am working towards.

Project results and current standing

At the time of writing, the first batch of samples is near being ready. As always, many different ways lead to the result we want. In our situation, we chose to follow multiple strategies. It was uncertain which would lead to success; some have the advantage of being robust processes, and do not require absolute perfection of each step to achieve good results; on the other hand, the easier processes have other disadvantages, for example that large amounts are very time-consuming to produce. For these reasons, multiple strategies were followed simultaneously. Currently, we have succeeded in producing nano-needles (Figure 2) by a process that is moderately suitable for mass production. We will be able to fabricate a test-batch of samples, and perform preliminary investigations on biomolecules with them. The next goal will be to improve the process so that large amounts of samples can be made effortlessly. First steps in this direction are underway.

The facilities of the Fujita-lab are managed by a superuser-instructor-user principle. Superusers are responsible for maintenance, and only instructors may teach newcomers how to use the machine. To gain permission to use a machine, a newcomer must first pass a training with an instructor, then operate the machine under the supervision of the instructor, and in a third session independently operate the machine under observation of the instructor. This is the procedure to pass the license as “user”, after which you can use the machine independently whenever necessary. Nearly all machines, including chemical drafts and observation tools, are managed this way. While the system ensures good regulation of user qualifications, as a newcomer it takes a substantial amount of time to acquire all the licenses necessary to work independently. It took me easily 4 months to get to the point where I could work on my own and the only reason this was possible is because my supervisor, Agnes Tixier, has been in the lab for many years and is instructor for a wide range of facilities. I consider myself very lucky, firstly to be under such excellent supervision, and secondly to have been so lucky as to enter a lab which can offer such extensive facilities. Although it sometimes takes willpower to be patient when you are eager to advance, it was always without doubt many times worth it.

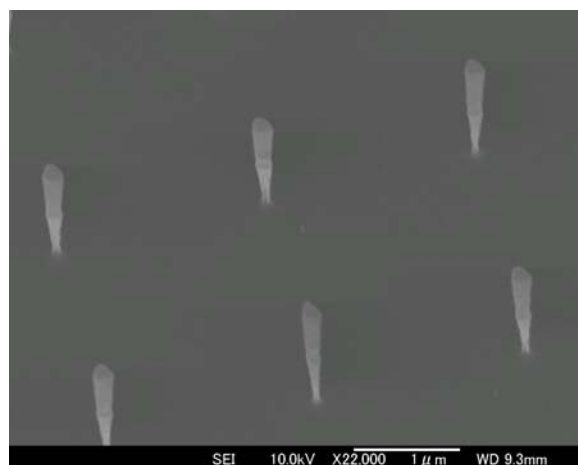


Figure 2. Scanning electron micrograph of fabricated nano-needles, maximum diameter 250nm, height 1.9 μm

While the first few months of my time in Tokyo were spent learning and going through training, I also tried to produce some data that would be useful for the rest of the lab community. I performed a series of measurements to tabulate certain process parameters, which are now available to all on the web. I hope that what I learn will not just say with myself, but can be useful for others. In the same line, I have already started teaching newcomers some of the things I have learned. I find my schedule is well filled with the work I do towards the advancement of my own project, learning new techniques, and passing my knowledge on to others.

Project outlook

Within the course of a few months, the project ought to be completed. The fabrication of nano-needles of the proper dimension, structure and quantity will be mastered. After this, I have been invited to propose a project of my own. My interest is in the direction of intracellular measurement. A microsystem that can perform parallel intracellular measurements on an array of cells would be a tool of interest for industrial purposes, and an interesting challenge for myself. The work I will have done on nano-needles will be well applicable, as well as the work done by others in the Fujita-lab on the aspiration of cells onto an array. I have been invited to stay an additional period, on my request a half year; if the visa and financial support offered by the lab work out, I will be able to use this additional half year to work on my own project.

Intercultural Experience

I feel I am double lucky, first for the research opportunities I enjoy, and second for the experience of working in Japan. Every time I go out the door I see something new and interesting- even after having been here nearly one year. While many things are same for



Figure 3. Hanami (cherry blossom picnic) with the lab

working in a Swiss lab or in a Japanese lab, many things are different. I enjoy the culture of common activities, the welcome parties for newcomers, the monthly basketball evenings, the pizza dinners after spring-cleaning. Under some aspects the Fujita-lab is perhaps a little special; there are a great number of foreigners, which has some interesting effects. The lab easily segregates into groups by nationality; the different cultures tend to coexist, not mix. I find myself a bit in the middle sometimes, neither here nor there.

In contact with the Japanese colleagues it is not all easy to find access. Perhaps this takes a lot more time than 5 months. My experience is: I receive more support when I adapt. For Japanese members it is understood that working nights and weekends is part of the job. If I comply with their customs, even if it is by no means requested of me, I am more likely to be invited to lunch or tennis with the Japanese, or receive help in the lab. While the female quota is equally low as in comparable Swiss institutions, I sometimes feel I am definitely a foreigner to assume I would be judged by what I achieve and nothing else. In many things foreigners are measured by different measures than Japanese. While this has advantages, it has the disadvantage that it is difficult to become fully accepted. I am trying to learn some of the Japanese ways of interacting with others, I believe these are skills I will be able to apply globally: for example the degree to which consideration towards a superior is practiced, or the courtesy a guest receives.

As for the fellow foreigners who work with me, a small but well organized network exists, to which I have access and can count on for support. This spans over many different labs, having the extra benefit of interdisciplinary support. I am very grateful for this network, this is a place to find help on any question, inside or outside the lab. I believe I would have had considerably more difficulties advancing, if I had not received so much help from these people. The existence of this network is a strong recommendation in favor of IIS.

Life in Tokyo

With the help of lab members, I have been able to get a room at the Todai International Lodge in Shirokanedai, near Meguro station. This is an excellent arrangement for me; by Tokyo standards the rooms are luxurious, and very affordable. Shirokanedai is an area with a high percentage of foreigners; almost anything I would want to get in Switzerland is available in the neighborhood. I can comfortably go to the lab in Komaba by bicycle, or by public

transport. I feel I have the possibilities to move around freely, something that is important to me. Tokyo offers an enormous range of cultural activities, entertainment and things to do, in every possible category- the only difficulty is finding what you want. I have various Japanese friends I occasionally spend time with, as well as the clique of the French I work with; there is also a handful of Swiss in the institute I socialize with. I have become member of the Swiss Chamber of Commerce and Industry in Japan, which offers (besides the regular meetings and luncheons) occasional activities for the about 20 student members. I feel comfortable where I am, and am glad to be here.

I am deeply thankful to the SJCC for the financial support I have received. It is an incredibly enriching experience, and I am sure this will change how I think about many things. In the academic field, I have the opportunity to learn skills, which are invaluable. I have the possibilities to leap forward in huge strides. In cultural terms, I have the chance to learn about this fascinating society, for which I consider myself lucky. In turn I pay attention that I might be a good representative of Switzerland and the Swiss; I make the most of this exceptional opportunity in all aspects; I do not forget the generosity that has been shown to me and do my best to contribute to the community that supports me. I feel very honored that this has been enabled for me.

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