Report on completion of the short-stay study abroad program

Name: Anik Budhi Dharmayanthi
School and Dept.: School of Advanced Science Department of Evolutionary Studies of Biosystem
Destination country: Taiwan
Receiving institute: Academia Sinica, Taiwan
Period of study: 03/12/2015 – 25/01/2016

1. General description of Academia Sinica

    Academia Sinica, the most preeminent academic institution in the Republic of China, was founded in 1928 to promote and undertake scholarly research in sciences and humanities. Academia Sinica has three divisions, Division of mathematics and physical sciences, life sciences, and humanities and social sciences. Each division has their own research institute, and BRCAS (Biodiversity Research Centre, Academia Sinica) where I worked under the division of life sciences. BRCAS was established in 2004 to provide the scientific foundation for conservation, education, and sustainable use of biodiversity with four focuses of research; Marine Biodiversity and Ecosystem, Terrestrial Biodiversity and Ecosystems, Evolutionary Genetics and Genomics and Microbial Diversity and Bioinformatics. For more detail information please visit BRCAS's website http://biodiv.sinica.edu.tw/en/

2. Preparation before leaving Japan

    I had heard about the short study abroad program that was held by SOKENDAI. This program aims is to provide opportunities to pursue research in institutes abroad. The program covers all expenses such as transportation, accommodation and other expenses during your stay in another country for study. After I read a paper about NGS analysis that is related with my doctoral study, I decided to apply for this program following discussion with my supervisor Prof Yoko Satta. The author of the paper is Prof. Wen-Hsiung Li from Academia Sinica, Taiwan. I sent an email to Prof. Wen-Hsiung Li and explained the purpose of my intent to visit. After he agreed to be a host for me, I requested an acceptance letter which was then used for the grant and visa applications. I contacted the Taiwan representative office in Japan about visa application because I would be in Taiwan for more than 30 days. Processing a Taiwanese visa took only two days. Before departing Japan, I had to schedule my trip such as booking hotels and air tickets.

3. Study and/or research during the stay

    Comparison of Whole Genome Sequences of Cemani and Silky chicken that was generated from Next Generation Sequencer (NGS) was a part of my doctoral course research. As a biology student, I have no experience in bioinformatics, the basic knowledge of NGS analysis, so that I needed to learn about bioinformatics from the beginning. For analyzing the Cemani and Silky's WGS, several tools have been used. Dr. Wen Lang Fan, who analyzed the WGS of Silky and Taiwanese chicken, taught me how to analyze the data at a beginner level. For the first step, he suggested that I carefully read the manual of each tool required for analyzing the NGS data. The following is the list of tools that were used in my short study:

1. BWA (Burrows-Wheeler Aligner)
2. SAMTOOLS
3. GATK (Genome Analysis Toolkit)
4. BCFTOOLs
5. Picard
6. ANNOVAR

Three steps were used for getting the variants of Cemani and Silky from reference sequence (*Gallus gallus*). First, I mapped the sequences using BWA tools (a software package for mapping low-divergent sequences against a large reference genome) and Samtools. Next I improved the variant calling of mapped data using GATK(a software package for analysis of high-throughput sequencing data), Samtools and Picard. It was important to reduce the number of miscalls of indels (insertions and deletions), the effect of analysis artifacts produced by the sequencing machine and to identify duplicates from the mapped data. Then the last part was variant calling, I used Samtools and Bcftools to call genotypes and reduce list of sites to those found to be variant, followed by additional filtration on the depth and quality for calling the variants. These variants of Cemani and Silky were then annotated using ANNOVAR, a software that utilizes update-to-date information to functionally annotate genetic variants detected from diverse genomes. I had analyzed WGS of Silky and L2 Taiwanese chicken and obtained the variants, however since there was a different data encode of Cemani's WGS generated from Illumina sequencer machine, I could not finish for analyzing Cemani's WGS. Furthermore, instead of calling the variants of each sample, Dr. Wen Lang Fan suggested me to call the variants of WGS of Cemani, Silky and L2 Taiwanese chicken in the same time for more reliable result. Even though I have not finished my analysis during my stay in Academia Sinica, I still can continue the analysis in Japan and communicate with Dr. Wen Lang Fan.

I did not register in any classes, but I attended two lectures and one special seminar during my study in BRCAS. One lecture presented by Dr. Yu Ju Lin, Post-doctoral fellow in BRCAS and another one by Dr. Carol Eunmi Lee, Professor from University of Wisconsin, Madison. In the last day, I had a chance to attend a special seminar about the computational method for improved detection of genomic indels from next-gen genome sequence data that was given by Prof. Paul Horton. This seminar addressed some of my recent problems associated with the determination of indels (insertion and deletion).

4. Activities other than study or research during the stay
In the weekend during my stay, I have visited some famous places such as museums, national parks and tourist attractions. In addition, during my stay, I had the opportunity to join a party for New Year celebration.

5. Expenses
Generally, the living expense in Taiwan is cheaper compared to Japan. However, because I went to Taiwan in December to January, the hotel price was more relatively expensive than usual especially in the Taipei city. I recommend staying in the student dormitory or Academia Sinica's guesthouse because the price is cheaper than staying in a hotel. However, to reside at the dormitory or guesthouse of Academia Sinica, one must confirm with the host one or two months before leaving Japan about availability. The advantage of staying in these

places is that the location is near Academia Sinica, within 10 minutes walking distance, so that one can reduce transportation expenses from Taipei to Academia Sinica. Food price around Academia Sinica was around 80-120 NTD (~ 320-480 Japanese yen), which is cheaper than in Japan. The transportation was also cheaper compared to japan. For one way (bus), the cost is 15 NTD (~60 Yen) and for train travel is dependent on the distance.

6. Language at the receiving university/institute
   Academia Sinica is a large research institute in Taiwan and recently have introduced TIGP (Taiwan International Graduate Program). The program is conducted in English and foreign students are able to apply for this program, so that the languages used in Academia Sinica are English and Chinese.

7. Things you found difficult (if any)
   Overall, I did not find any difficulties during my stay in Taiwan since Pei-Ju Chen, a student of our department gave assistance to me. However, for information, in daily life, the people use Chinese language for communication. Even though some people can speak English, most of markets in Taiwan use Chinese. In addition, information about bus schedule in the bus stop is provided in Chinese characters so it was difficult for me to read and understand. Most of the restaurants around Academia Sinica were open from 11:30 -14:00 and 17:30 -20:00 in weekdays and closed on Saturday and Sunday.

8. Advice for future applicants
   This short stay abroad program affords students the opportunity to study and also share our research with many researchers in abroad. You can achieve many benefits from such a study program, including broadening of research networks with professors and researchers and gaining new knowledge from other fields of research. I recommend that future applicants contact the Professor or the host immediately after deciding to apply for this program in order to get an acceptance letter. Moreover, it is important to make clear to your host about your research goals during the visit to their institute (what you want to do in their institute). Also, please do not forget about processing a visa for the destination country.

9. Photos taken during the stay