Ecology oriented Doctoral cursus at Okayama University -- The successful experience of a French Master student

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- Interview conducted in Okayama by Pr. CHENEVIER * in September - 2020 -

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My interest in Japan

When I was around 7 - 8 years old I was already fascinated by the Japanese movies in particular by the genre "Anime" (アニメ). These animated feature films are often treated in a childish and fantastic way with a strong message in the background, linked to major contemporary themes such as ecology. For example "Princess Mononoke" (MIYAZAKI Hayao). A great epic fresco, Princess Mononoke is at the same time picaresque story, initiatory tale and political fable, Miyazaki alternating with real narrative mastery the sequences of battles, scenes of fights and more intimate moments.
She is raised by wolves. Men want to exploit Nature for the mining resources and wood of the Forest. A spirit of the Forest - very much in the Shinto approach - opposes it. Men want to kill God to facilitate access to resources.

The spirit is then killed by villagers by chopping off its head (referring to Seppuku) and keeping it in a safe. Nature is destroyed, Earth is no longer a livable place. Princess Mononoke, child of Nature, associated with village children will take the head out of the safe and return it to God. The Earth then comes back to life.

I really liked this philosophy of history for children, imbued with eco-friendly concepts, in particular with the feeling that Nature is not an omnipotent force.

Over time, the initial interest in "Anime" gradually shifted towards traditional Japanese cinema, witness and actor of Japanese culture: family life 万引き家族, Manbiki kazoku in Japanese, 'Shoplifting Family' in english or 'Ran (乱)'from Akira KUROSAWA, inspired from 'King Lear' by Shakespeare.

As time went on, my interest in travelling grew up and going to Japan was obviously one of them. Going to visit Japan - and performing research there in eco-friendly research topics - was like the fulfillment of my childhood dreams. It happened later in Japan when I started a Ph-D work on a major topics to save energy on Earth (Li-Ion Batteries), this subject received the Nobel Prize -2019 and a Japanese researcher was one of the 3 recipients (Pr. Akira YOSHINO). I am delighted to see that my life is connected with such prestigious scientific recognitions including a Japanese scholar.

Scientific Background and preliminary contacts with Okayama University

Benoît graduated from ENSIP Poitiers, an Engineering School from the "Ecoles Nationales Supérieures d'Ingénieurs" french system that runs in parallel and in connections with Universities. He tooks the special course "Fluids Dynamics and Energetics" and he could be trained to interdisciplinary approaches of sciences and technologies. And some specializing in materials and technologies focused on energy matter.

As Benoît definitely wanted to get Japanese professional and cultural experience in the country with ecology in mind, he started in 2015 with some contacts at Kyoto University and Tokyo Institute of Technology. Encouraged by this first experience, he want to pursue research in Japan. He ended this initial period with a meeting at Okayama University after getting in touch with Pr. Chenevier in late 2015. A collaboration was initiated with Professor Teranishi's group, where he got a 6 months Internship program that allowed him to prepare his master thesis in 2016 on the topic of “high performance positive electrode”. Then he returned to ENSIP to get his final Graduation. During his internship he worked in close connection with Pr. Nishina's group. And as he demonstrated good abilities to research, Pr. Nishina proposed to keep him in his group for a 3 years Ph-D course. The financial support came from research contracts. The financial support was sufficient to allow Benoît to meet his accommodation costs and daily expenses, and to enjoy life in Japan.

Ph-D at Okayama University - "Carbon chemistry: towards new generation of high performance batteries"

My Ph-D formally started on April 2017. My objectives were to develop new synthesis methods for the preparation of graphene and its applications to lithium/sodium ion batteries. Conducting this research in Japan was a chance as Japan is one of the world leader in the research and development of lithium ion battery. Conducting research in Pr. Yuta Nishina’s laboratory was a life changing experience. Firstly, Pr. Yuta Nishina is truly passionate about science, he provided me the guidance and friendship which help me grow as an independent

researcher. He also listened a lot my requests and contributed in solving the difficulties I sometimes faced. His teams are rich of enthusiastic researchers with various professional and cultural backgrounds. Here, I met my good friend Sohail with whom I started and ended my Ph-D. Within Pr. Yuta Nishina's group, I had the opportunity to directly use various equipment, such as SEM, TEM, XRD, Raman, XPS, TG-MS, BET, which allowed me to become able to conduct disruptive research by my own. During, my Ph-D I was selected to conduct my experiment at SPRING-8, it was a really amazing experience. I graduated from Ph-D course on September 2020. **I published 3 papers in International Journals.**

Benoît and Ph-D coursemate Dr. SOHAIL at the Graduation Ceremony on September 25th - 2020

SPRING-8 hall where Benoit spent some of his days and nights for preparing Ph-D

Perspectives of international professional career

At the end of my Ph-D, I obtained a post-doctoral position of 3 years in Pr. Naoki Yabuuchi's laboratory at Yokohama National University. Pr. Yabuuchi's group is expert in high energy density positive electrodes for lithium-ion battery called "lithium/sodium excess" materials. The aim of my research is to enhance the usage speed of batteries by synthesized new materials combining "lithium/sodium excess" materials and carbon based materials such as graphene. The main difference with my Ph-D: I work here on improving **the cathode of the battery**.

My ambition is to become a professor in a Japan or in a European academic institution, conducting research on materials science for energy storage devices. As a researcher, I want to be deeply involved in international research collaboration to thrive toward greater research and to strength international scientific and cultural relationship. As a professor, I want to convey my passion for research and other culture to future generation and help them to become the researcher of tomorrow.

My daily life at Okayama - Practical features

Special interest in traditional arts and crafts:

Crafting has always been for me a source of interest as it tells us the way people have shape their environment and daily life. Japanese craft is no exception observing and experiencing crafting give us a glimpse to Japanese cultural past and present. Near Okayama there is a real history of crafting

a - Bizen pottery

If there is one country particularly renowned in the art of ceramics, it is Japan. If Japanese ceramics first saw the light of day in the 13th century, thanks to techniques imported from China, many Japanese kilns are still in operation today. Bizen ceramics, with ocher, brown and red tones as if licked by the flames, experienced a particularly important boom thanks to the development in the archipelago of the tea ceremony during the Momoyama period (14th century). Even today, ceramists do not use any color to tint their productions. It is thanks to the warmth of the ground and the movements of the flames in the oven that the objects are colored and adorned with dancing patterns.

b - Tokushima indigo dyeing

Benoit (left) enjoys dying techniques

The cultivation of the indigo tree and the production of indigo tincture originated in Tokushima in the 10th century. Everything destined the region to produce ai-zome, both its rich soils and the abundant presence of water. In a few decades, indigo awa or Japanese blue became the region's flagship color.

The technique is simple: I dried indigo leaves ferment in water for three to four months before being mixed with the ash. The resulting ai-zome made the city prosper and contributed to its fame: indigo blue is found in many Japanese craft techniques including the traditional print, aizuri-e. This prosperity allow the establishment of several traditions: every year, the sumptuous Awa-Odori masturi, one of the most important festivals in Japan, is organized, as well as many traditional puppet shows, the Awaji Ningyo.

Daily activity in Okayama

Okayama is a really peaceful city where I enjoyed my free time. You will find in Okayama the gentlest people in Japan. It is a city counting numerous hiking and cycling path in the forest or alongside rivers where you will found truly beautiful point of view and historical sites. In Okayama, there is a lot of facilities where we can practice sport. I often went to Undo-Koen to play basket-ball with my friends, there I could meet friendly people from Japan, America, China, Vietnam, etc. Sometime, my friend Harada invited me to his local tennis club, it was really fun to play with him and his friends.

Housing in Okayama

During, my internship I stayed in the university share house dormitory.

Yet, I could not stay there for my Ph-D. Thus, I search a new place to live. With the help of Pr. Takashi Teranishi I could find a host family willing to accept me. Rental fees (house, gas, water, electricity, wifi) were only 28,000 yens per month. The host family was a Japanese couple.

For more than 40 years, this family had welcomed foreigners within their home. The husband is a conductor of the Okayama Symphony orchestra and gives concerts in Okayama. I had the pleasure to be invited to a concert at Symphony Hall so I could appreciate his talent. When he was younger, he traveled a lot with his orchestra and he for instance enjoyed a lot the "Moulin Rouge in Paris". It left him with lasting memories. His father was a teacher at Okayama University. His wife was a principal of a high school in Okayama. She also traveled a lot around the world. Interestingly she liked France, a very romantic country. When I arrived at my host home, the Japanese couple was housing a Russian couple and their daughter. They were all very friendly, openminded, personally and culturally.

Once in a week we had dinner together. It was usually cooked by ourselves. My Japanese hosts gave me the opportunity to experience the New Year meal called "O-setchi". It is a meal during which we drink sake at 10:00 a.m...., really efficient to go back to sleep. At the end of my stay, I considered them my Japanese family.

Roaming around Okayama and further

The most important object you need to own in Okayama is likely a bicycle. The reason is that Okayama is actually flat so it becomes really easy to go to any place, such as train station, from home to university, and to restaurants once you have a bicycle.

One of my favorites place for cakes is the **Jarny** “patisserie”. The owners are really lovely people and I always took time to have pleasant conversation with them. Every month I ordered cakes that I could share and enjoyed with my host family.

Two other places that I loved were, **Lassen** and **Little Mermaid**. There, you can buy delicious pizza, bread, and even Panini.

As a matter of conclusion:

In short: my stays in Japan meet my expectations and even well beyond.

My professional career in connection with ecological considerations gradually focuses on the development of materials for energy and more specially on improving batteries performances. High-performance batteries are major challenges for the development of alternative energies since they make it possible to regulate the intermittence of production linked to the wind or the sun. I find in Japan particularly good conditions for carrying out cutting-edge research in the field.

After my 3 years Ph-D at Okayama University, I started a post-doc research period, keeping on working aspects on improving Li-Ion battery performances. At the Yokohama National University I am working on the improvement of cathode properties. Graphene will be inserted to increase the conductivity and the stability of Li -Metal oxide elements.

This post-doc stay is a part of a global strategy to consolidate my CV and Background and make me able to apply for a teaching position in a University when I'll return to France.