RESEARCH REPORT

1. Name: Pierre-Emmanuel CAR （ID No.: SP07201 ）

2. Current affiliation: C.N.R.S (Centre National de la Recherche Scientifique)

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences

X Chemistry Engineering Sciences Biological Sciences

Agricultural Sciences Medical, Dental and Pharmaceutical Sciences

Interdisciplinary and Frontier Sciences

4. Host institution: Institute for Chemical Research, Kyoto University (Uji Campus)

5. Host researcher: Professor Yuichi Shimakawa

6. Description of your current research

Polyoxometalate (POM) chemistry has drawn considerable current interests from both fundamental and practical points of view. Polyoxometalates have been widely studied in the fields of analytical, clinical, and biological chemistries, and have also been used as catalyses, medicines and solid-state device materials. In polyoxovanadates only a few structural modifications, which consist of edge- and corner sharing VO_5 square pyramids, are known so far. Considering a large number of borate mineral structures, we focus on the polyoxovanadium borate system and try to synthesize and characterize new samples in the vanadium – boron – oxygen – system.

The samples were prepared under hydrothermal conditions and the resulting products were analyzed by single crystal X-ray diffraction, magnetic susceptibility and thermal (TG and DSC) analysis. The obtained compounds contain six, ten and twelve VO_5 square pyramids and the borate polyanions are liked to the vanadium pyramids by oxyo-bridges. The magnetic measurements revealed that both antiferromagnetic and ferromagnetic coupling between S=1/2 magnetic moments of V^{4+} (d^1) ion appear depending on the resulting structure. These observed low dimensional magnetic properties are expected form the characteristic crystal structures and the short distance between magnetic ions. The behaviours were also explained by a theoretical model.

7. Research implementation and results under the program

Title of your research plan:

" Preparation of magnetic compounds by using high pressures and high temperatures synthesis routes "

Description of the research activities:

The aim of my present project in the Prof. Shimakawa's Laboratory was to learn new experimental technique for synthesis of transition metal oxides under high pressure and high temperature conditions. With this technique my research activities during the JSPS summer program were dedicated to the two material synthesis projects.

The first project concerns the synthesis of ferrimagnet $BiCu_3Mn_4O_{12}$ [1], whose crystal and magnetic structures will be analyzed by neutron diffraction at ILL in Grenoble (France) in this coming September. This project gave me a good opportunity to learn the high pressure and high temperature synthesis. In order to get high quality $BiCu_3Mn_4O_{12}$ sample, I first needed to prepare pure MnO_2 raw material and I succeeded to find good experimental conditions. With this pure raw MnO_2, I have made a large amount of the $BiCu_3Mn_4O_{12}$ sample enough for the neutron experiments. To confirm the purity of my $BiCu_3Mn_4O_{12}$ sample, I also learned magnetic measurements by using a SQUID (Superconducting Quantum Interference Device) magnetometer.

The second project was dedicated to the preparation of new polyoxovanadium and vanadoborates with interesting magnetic properties. These compounds are closely related to my current research in France. Since the vanadoborate $Na_3[B_6O_9(VO_4)]$ [2] was synthetized at 720°C by a solid-state reaction, I tried to synthesize a similar but K-containing compound from a ternary system (K_2O-V_2O_5-B_2O_3). The raw materials were prepared in a glove box and treated under 6 GPa pressure at 800°C for 30min. The obtained brown crystals were studied by X-ray diffraction with an imaging plate to determine the cell parameters, but the highly mosaic structures of the crystal didn't allow me to determine the structural parameters. The detailed crystals will be analyzed again in France. I also tried a new system (V_2O_5-$V_2O_4B_2O_3$-Na_2CO_3) under the 6 GPa and 800°C for 30min condition, but the resultant material is a known compound, NaV_6O_{15}. Although I have not got new compounds during this summer program period, it might be possible to synthesize new polyoxovanadium or vanadoborates by using the high pressure-and high temperatures-method.

[1] Shimakawa, Y.; Takata, K.; Yamada, I.; Azuma, M.; Takano, M. *Physical Review B*. **2007**, *76*, 024429-1

[2] Touboul, M.; Penin, N.; Nowogrocki, G. *J. Solid State Chem.* **2000**, *150*, 342-346

8. Please add your comments (if any):

This JSPS summer program in the Prof. Shimakawa's Laboratory gave me a good opportunity to learn new experimental techniques. They are high pressure and high temperature synthesis and magnetic property measurements. For my PhD thesis, the learned techniques and my experience in Japan will be very useful. I hope to continue this intensive international collaboration in future between my laboratory in France and the Prof. Shimakawa's laboratory in Japan.

RESEARCH REPORT

1. Name: FEILLET Celine （ID No.: SP07203 ）

2. Current affiliation:

Laboratoire de Neurobiologie des Rythmes, Strasbourg, FRANCE

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences
Chemistry Engineering Sciences X Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: Graduate School of Science and Engineering, Waseda University

5. Host researcher: Pr. Shigenobu Shibata

6. Description of your current research

In search for new insights in biology in general and in biological rhythms in particular, RNA expression for diverse genes has been analysed. But those analyses were only performed on fixed or frozen tissue, by *in situ* hybridyzation, RT-PCR or northern blot. Those techniques successfully measure the quantity of target RNA present in the tissue at a given hour, but unfortunately they are unable to give dynamic images in living tissue. Nonetheless, some years ago molecular advances provided biological rhythms research with real-time recording: that technique allows following gene expression continuously with a luciferase (light producing molecule) reporter: all cells are modified so they express luciferase under the control of the same promoter as the gene of interest. The higher the light measured, the higher the RNA expression.

Biological clocks are not only present inside the brain, but also in each and every single cell of rodents. Their functioning relies on rhythmic expression of clock genes such as *Per*, *Cry*, *Clock* and *Bmal1*. Recently, the dynamic recording of periodic fluctuation of clock gene expression in peripheral tissues of rodents opened new doors for understanding clocks machinery. Part of my PhD project is to understand the influence of the timing of food access on central and peripheral clocks.

It has been demonstrated that in nocturnal rodents, which usually eat during nighttime, giving food exclusively during the day can change the timing of expression of many known clock genes by as much as 12 hours. Obtaining this results using northern blot for example, requires a great number of animals killed throughout a 24-hour cycle. By means of real-time recording, Pr. Shibata's team reproduced this result with a much smaller amount of mice and could record *Bmal1* (a clock gene) oscillation for as much as 7 days in liver tissue culture in *Bmal1*::Luciferase mice. They established that after one day under fasting conditions, one day of food access at a given time (during the days or the night) is sufficient to modify the phase of expression of the *Bmal1* gene.

During my stay at the host institute, I had the chance to have access to *Bmal1*::Luciferase mice to better understand how food could elicit such a fast resetting in the liver and other peripheral tissues.

7. Research implementation and results under the program

Title of your research plan:

Real-time recording of clock gene expression in peripheral oscillators: food synchronization.

Description of the research activities:

My first task was to establish whether the shift in *Bmal1* expression observed in the liver in response to a change in food availability was applicable to another peripheral tissue, i.e. lungs. I had to learn how to culture liver and lung tissues pieces to be able to record real time oscillations of *Bmal1* in those tissues. I also tested various culture conditions for lung tissues, so as to increase the culture efficiency. It seems that lungs cannot be reset by one single day of change in the access to food, but this preliminary result will have to be confirmed in more animals.

We also wanted to establish why food could shift *Bmal1* expression so fast in the liver. In the first protocol used, the mice were fasted for one day before the food was given during the day or the night. Was it possible that the fasting day itself was responsible for the resetting of clock gene expression in the liver? We then submitted mice to one or two days of fasting before tissue sampling. We could not observe the same shift as when the food was given at various times. This result will have to be reproduced on more animals but is pretty encouraging because it would indicate that food is a potent signal for the liver clock.

We then wondered if a pre-existing state of food deprivation was necessary for the food to act fast on the liver clock. I could not get data in the liver for that experiment, so it will be done again later by another student in the lab.

Ultimately, we tried to understand why lungs could not be reset as fast as liver by food. Papers in the literature suggested that the presence of corticosterone signaling (a glucocorticoid produced by the adrenal gland) can delay the shift of peripheral tissues by feeding cues. I then set up an experiment in which I surgically removed the adrenal gland, allowed mice to recover and submitted them to the same protocol as before. These experiments are still in progress and I hope to get clear results before I leave.

In the end, even if I did not get as many results as I would have wished for (you never do anyway), I became familiar with tissue culture and luciferase assays, which were techniques I did not know before. I also had the chance to discover another way of working, and I will now apply a few tips I learnt here when I come back to France. All the people in the lab were very kind with me and I really appreciated that they made the effort to speak English because my Japanese, though it improved, is still not good enough to communicate properly.

8. Please add your comments (if any):

If another student asks to come to Pr. Shibata's lab in a future program, you can be sure he will have a good time. I am very thankful that he and his students received me and integrated me in the life of the lab and helped me in my daily life. I hope I can come back here again in the future.

RESEARCH REPORT

1. Name: Laurent Fertier （ID No.: SP07204）

2. Current affiliation:

Institut Européen des Membranes, Montpellier (France)

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences
X Chemistry Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: Measurement Technology Group,
Research Institute for environmental Management Technology,
AIST, Tsukuba

5. Host researcher: Dr. Shigeru Kurosawa

6. Description of your current research

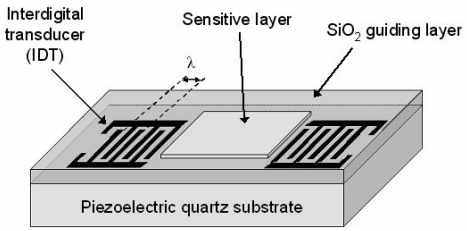
My research interest is the development of a portable piezoelectric sensor for the analysis of heavy metals in solution.

Indeed, current technology using spectroscopic analytical techniques such as atomic absorption or fluorimetry do not permit the portability of detection equipment for heavy metal ion sensing applications. Developing and fabricating a multiplexed, ultra-sensitive, inexpensive, portable sensor will benefit potable water testing.

The studied piezoelectric transducer is based on Acoustic Love Waves (SAW sensors) which constitutes a generic platform allowing different surface fictionalization or sensitive coating deposition to improve detection sensitivity and selectivity. These devices consist typically in AT-cut quartz substrates with titanium-gold interdigited electrodes and a guiding top layer.

Heavy metals detection can be carried out using complexing molecules as aroylthioureas. This sensitive agent was grafted on surface electrode of SAW sensor by a terminal amino groups nonametric layer.

To expand the scope of the use of chemical micro-sensors, Doctor Kurosawa is working on QCM devices and STW devices which are other techniques for miniaturize sensors.



7. Research implementation and results under the program

Title of your research plan:

Heavy metals detection using acoustic waves sensor devices

Description of the research activities:

Doctor Kurosawa research group is working for the detection of biomolecules using Quartz Crystal Microbalances (QCM) based on Bulk Acoustic Waves (BAW). My fellowship allows us to fabricate a sensing platform for heavy metals analysis using aroylthioureas based of BAW. By this way, we will follow the nanoscale changes during the complexation process both by changes in resonant frequency and impedance. Indeed, the binding event of the target analyte causes the formation of a chelate complex, which changes the chemical interactions within the polymer network. Detection can be accomplished by monitoring macroscopic viscoelastic changes (*i.e.* frequency shift and impedance (resistance parameter) shift) in conjunction with shifts in the polymer layers.

The elaboration o the platform consisted in two steps: firstly, I functionalized the top-gold layer of QCM with terminal amino groups based of chemisorption of L-Cystein or Cystamine, and deposition of thin film of polyallylamine. Then, I grafted my complexing molecule on QCM via an amide bond between terminal amino groups and my molecule. Thus, the functionalized QCM was in contact with a cadmium solution to observe a mass variation based of shift of resonance frequency of the QCM. Mainly, we observe an increase of the frequency: no mass phenomena were observed but physical phenomena.

In a second time, with the collaboration of Dr. Hiromi Yatsuda research group (Japan Radio Co., Ltd.), I used another platform for the detection: STW device. Similar to the SAW, the Surface Transverse Wave (STM) device uses input and output transducers to launch and receive the propagating acoustic surface wave. However, the differences are two-fold. First, the STW device uses a metal trapping grating structure to trap the propagating wave to the surface of the substrate. Experiences in batch mode show us a negative shift of the phase when STW devices were in contact with cadmium solution. This result is due to the mass effect on the surface explained by the complexarionof the metal by the sensitive.

8. Please add your comments (if any):

My stay in Doctor Kurosawa laboratory has been very beneficial. I could improve my manipulation skills and see other techniques used with these sensor devices. I could also attend to very high quality seminars and I was impressed the excellence of Japanese students and researchers. I was presented 2007 JSPS Summer Program topics entitled "**HEAVY METALS DETECTION USING ACOUSTIC WAVE SENSOR DEVICES**" on *the 24th Conference of Photopolymer Science and Technology* at 28 July 2007 held Chiba University (http://www.ao.u-tokai.ac.jp/photopolymer/program/proe07.html), and I have a plan to submit my research results for Journal of Photopolymer Science and Technology as a communication paper on left time from Japan.

On a personal point of view, my stay in Japan was a very enriching experience. I have had the opportunity of visiting some very interesting and culturally rich places. Moreover, I met some very nice people I wish to keep in touch with as long as possible.

9. Advisor's remarks (if any):

Mr. Laurent Fertier is a good research scientist on my laboratory. He has performed many good contributions for our research group. I believe that the 2007 JSPS Summer Program is good opportunity to start new international collaborations.

RESEARCH REPORT

1. Name: Frégier Yael （ID No.: SP07205 ）

2. Current affiliation: Luxembourg University

3. Research fields and specialties:

Mathematical and Physical Sciences

4. Host institution: Keio University

5. Host researcher: Hitoshi Moriyoshi

6. Description of your current research

The aim of the stay in Japan was to learn K-theory with a view to apply it to define and study a discrete version of equivariant Cohomology and localization formulas . More precisely:

Let M be a differentiable manifold and G a Lie group acting on M. The quotient space M/G is an important geometric object which corresponds to physical states of a given physical system (one identifies the different descriptions of a single state, the orbit of a point of M). But generally this space M/G is singular, it is not then a differentiable manifold, it is called an orbifold. However, one can continue to have access to the tools of differentiable geometry and handle an orbifold in the same way one treats a differentiable manifold, the analogue for orbifolds of differentiable forms and de Rham cohomology being given by “equivariant forms” and “equivariant cohomology”. These forms can be integrated and lead to localization formulas.

But such tools are defined only for Lie groups. The aim of this research was to study the possibility of developing an analogous theory of equivariant forms and localization formula for actions of disrete subgroups of Lie groups. It has be suggested by Richard Nest, a specialists of K-theory , that K-theory could be the natural framework to accomplish this aim.

7. Research implementation and results under the program

Title of your research plan:

Equivariant cohomology and localization formulas for discrete groups

Description of the research activities:

The research activity consisted in regular participation to the different seminars of the mathematics department of the Keio University. I gave a seminar in the geometry seminar about my results in contact geometry. I also gave a seminar about the Weil algebra as a universal classifying space. I participated to a poster session in a COE seminar.

I found a very stimulating group of postdocs and graduate students. They were interested in my project, in particular in its equivariant cohomology aspects. Therefore we created a research group and met regularly. We plan to continue our collaboration this year (Tomoo Matsumura is going this year to the Max Planck institute in Bonn, only 300 kilometers away from Luxembourg)

In particular we intend to work on a generalization of the Weyl algebra in order to build a classifying space for Hopf-Galois extensions.

I didn't study the K-theoretical aspects of my research project since it was not possible to interact much with my host, because of a very busy schedule. Instead I learned from Tomoo about orbifolds and their generalizations, Stacks.

8. Please add your comments (if any):

Keio mathematics department has a COE program this year. Therefore, many scientists visited the lab. It was a very good opportunity for me to meet these people.

RESEARCH REPORT

1. Name: Hardou Lucie (ID No.: SP07206)

2. Current affiliation: CNRS

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences

X Chemistry Engineering Sciences Biological Sciences

Agricultural Sciences Medical, Dental and Pharmaceutical Sciences

Interdisciplinary and Frontier Sciences

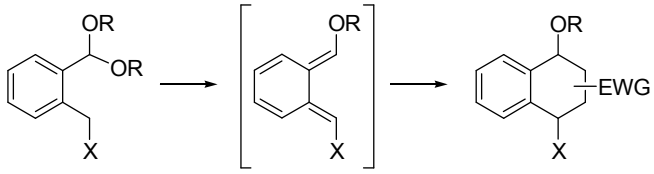
4. Host institution: University of Tokushima, Graduate School of Pharmaceutical Sciences

5. Host researcher: Prof. Kozo Shishido

6. Description of your current research

The Rouen laboratory has been working for a while on the conjuguate elimination reaction and has shown this reaction can be considered as a simple and potent way to prepare 1-alkoxydienes bearing substutuents in particular in the 4-position.

Our project consists in extending the access to this same familly of dienes by propaging the elimination through double bonds belonging to aromatic rings. The temporary dearomatization of the nucleus should provide an exocyclic diene (orthoquinodimethane) wich could be trapped by various nucleophiles (scheme).



Scheme

The application of this strategy to heterocyclic substrates, such as pyridines for instance, is expected to give access to polyfunctionalized quinolein and isoquinolein skeletons of particular relevance in medicinal chemistry.

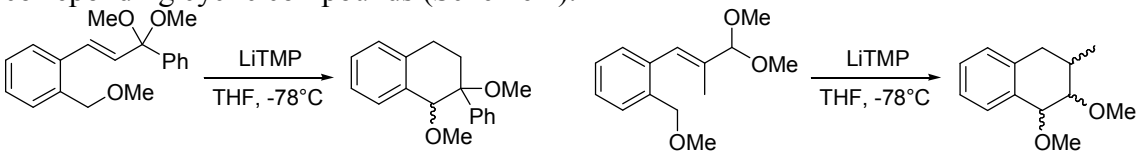
7. Research implementation and results under the program

Title of your research plan: Elimination reaction by intramolecular version

Description of the research activities:

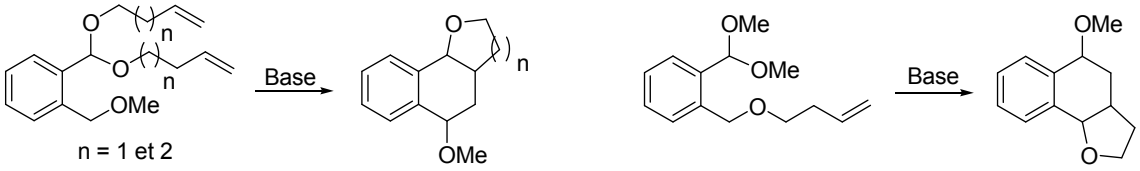
The project consisted in extending access to a familly of alkoxydienes by using elimination reaction throught double bonds of aromatic rings by an intramolecular version.

The first study concerned with unsaturated acetals. Two compounds were synthetized and traited with a base, tetramethylpiperidine lithium amide, for obtaining correponding cyclic compounds (Scheme 1).



Scheme 1

The reactivity of three other compounds was studied. They have olefinic acetal functionalities on benzylic position for leading directly to cyclic products (Scheme 2).



Scheme 2

8. Please add your comments (if any):

Even if the results obtained are not those awaited, this experience was a chance for me, I will never forget.

9. Advisor's remarks (if any):

The research project which has been done by Lucie Hardou would be an important basic study for a novel access to heterocyclic ring systems, which would be useful for the construction of biologically active compounds.

RESEARCH REPORT

1. Name: Diane LARLUS-LARRONDO （ID No.: SP07210 ）

2. Current affiliation: INRIA Rhône-Alpes – INPG
Grenoble, FRANCE

3. Research fields and specialties:
Humanities Social Sciences Mathematical and Physical Sciences
Chemistry X Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: Intelligent System Research Institute – JRL – AIST – Tsukuba

5. Host researcher: Pr Kazuhito YOKOI, Dr Olivier STASSE

6. Description of your current research

Our research activities are concerned with computer vision and more specifically with building models and classification methods in the context of object category classification and detection. Object categorization is a very challenging task because of pose and illumination changes, scale variations, occlusions and intra-class variability which potentially make two images of the same class very different.

Very efficient statistical models have been used to address this problem: the bag of features model is one of them. It is based on a visual codebook (similar to a vocabulary one would use for text description) which captures images local statistics. An image is described using this visual codebook. This representation is then fed into a classifier, previously trained on a set of annotated images containing the object of interest, and this classifier will predict a class label, for any new image.

There is no universal codebook, as it is specific to the task. Thus we worked on building more accurate codebooks in order to improve the representation given to the classifier and therefore the classification accuracy.

We are now working on extending this bag of features model in order to take into account weak geometrical constraints. The new methods are designed to solve object localization and segmentation tasks.

7. Research implementation and results under the program

Title of your research plan:

Automatic object model construction and detection in a robotic framework

Description of the research activities:

The conducted research is about the Humanoid Robot HRP-2 available at AIST-Tsukuba in the context of the "treasure hunting" project. Software tools that will make humanoid robot HRP-2 able to find a pre-defined object in a room were developed. Starting from a generative model developed during my PhD, the model was enhanced by some robotic specifically available information. The enriched model was shown to be more efficient than the standard model in this application.
The robotic platform allowed to demonstrate the strength and the limits of our object recognition method on such a concrete and challenging application.

This work was then extended. Instead of using a pre-defined object, object categories are now considered. A new experiment has been designed where the robot is looking for an unknown object of a given category. We started working on a framework considering multi-categories of tools such as a drilling machine depicted Figure 2.

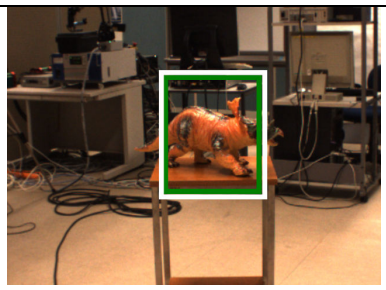


Figure 1 - Example of successful object detection

Figure 2 - Work on category: unknown drilling machine the robot has to recognize

This started a promising collaboration between INRIA and the JRL

The first part of this work has been submitted to the Humanoid conference at the end of July, and the second part will be submitted to the ICRA conference in September.

8. Please add your comments (if any):

This summer program has been a great experience. I am very glad to have had the opportunity to collaborate with Dr Stasse and Pr Yokoi and with such a good robotic lab in general.
The research outcomes are numerous. It first concerns the experimental validation of some of my PhD work in a concrete system and for a challenging task, and the contribution to the “treasure hunting” project of the hosting lab, in particular in the recognition problem.

RESEARCH REPORT

1. Name: LEJEUNE Erwan （ID No.: SP07211 ）

2. Current affiliation: European Molecular Biology Laboratory (EMBL)

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences
Chemistry Engineering Sciences **X** Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: Institute of Molecular and Cellular Biosciences, University of Tokyo

5. Host researcher: Yoshinori Watanabe

6. Description of your current research

Accurate chromosome segregation is a vital cellular event, as defects in this process are associated with several diseases and genetic disorders. Chromosome instability, for example, can predispose cells to tumorgenesis and rapid proliferation.

Meiosis is the process by which one diploid eukaryotic cell divides to generate four haploid germ cells. To accomplish this, sister chromatids must segregate together during the first meiotic division (meiosis I), which requires cohesion of the sister chromatid to persist at centromeres. Recent studies have demonstrated the crucial role played by an evolutionary conserved protein family called *Shugoshin* in protecting centromere cohesion during meiosis.

In *Schizosaccharomyces pombe*, shugoshin Sgo1 is a meiosis-specific factor that cooperates with protein phosphatase 2A to ensure centromeric cohesion during meiosis I. The second shugoshin-like factor Sgo2 present in fission yeast, which requires the chromodomain protein Swi6 for viability, plays a key role for accurate chromosome segregation at both meiosis and mitosis. However, the mechanism(s) underlying Sgo2 recruitment, allowing this factor to specifically exert its function at centromeres, remains elusive.

7. Research implementation and results under the program

Title of your research plan:

Study of the fission yeast Sgo2 protein complex

Description of the research activities:

Strategy:

No antibody is available against Sgo2 directly, so I used C-terminus epitope-tagged Sgo2 constructs expressed from the endogenous promoter.

Approach n#1: Sgo2-3HA

- Strain taken from stock (Kitajima-san) PZ875 and PZ875' –2nd independent colony-
- Strain PZ875 is written as "Functional" on the stock list
- Check expression by Western-blot

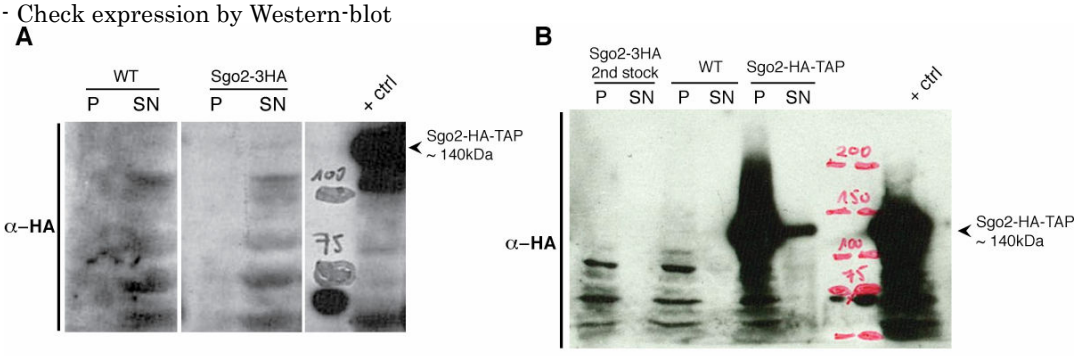
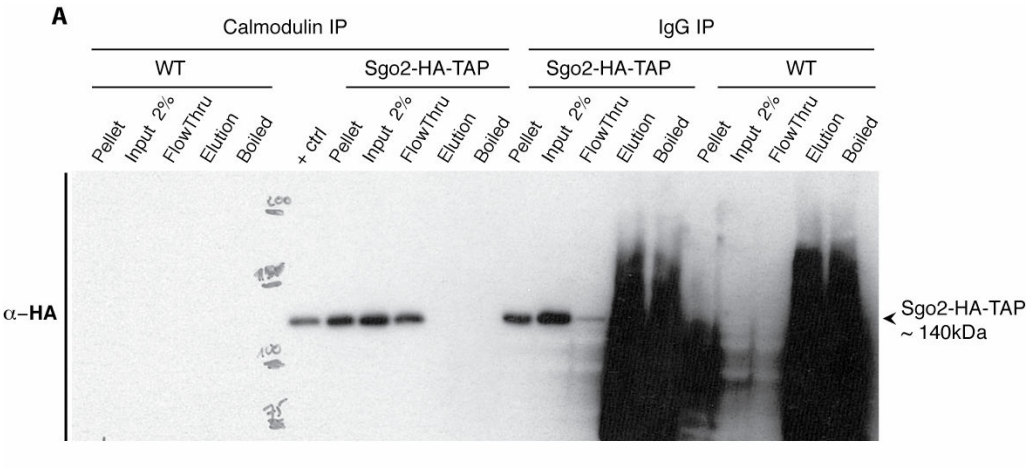


Fig. 1A&B: **Sgo2-3HA expression test by α-HA western-blot**

Conclusion: None of the stock strains PZ875 express the HA tag

Approach n#2: Sgo2-HA-TAP

- Strain PV346 frozen and grinded by Tanaka-san
- I confirmed expression and performed alternative TAP purification (**Figure 2A**):
  1) check if elution by competition with protein A was possible
  2) check if the CBP part of the tag can directly bind to Calmodulin beads
- I also tried an HA Immunoprecipitation (**Figure 2B**)



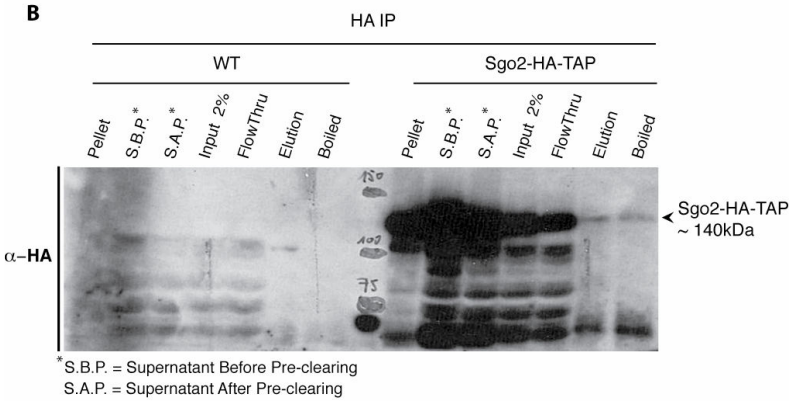


Fig. 2B: **HA (12CA5) immuno-precipitation of Sgo2-HA-TAP**

Conclusions:

- The IgG IP worked well. But the elution with the protein peptide is inconclusive. Anyway this amount of protein A in solution would compromise the Mass spectrometry analysis.
- The Calmodulin IP didn't work and the HA IP didn't work (in these conditions)

Approach n#3: Sgo2-Flag

- h90 Sgo2-Flag strains are in stock from Kitajima-san (PZ901 and PZ902)
- I built an h- Sgo2-Flag strain (checked expression by Western)

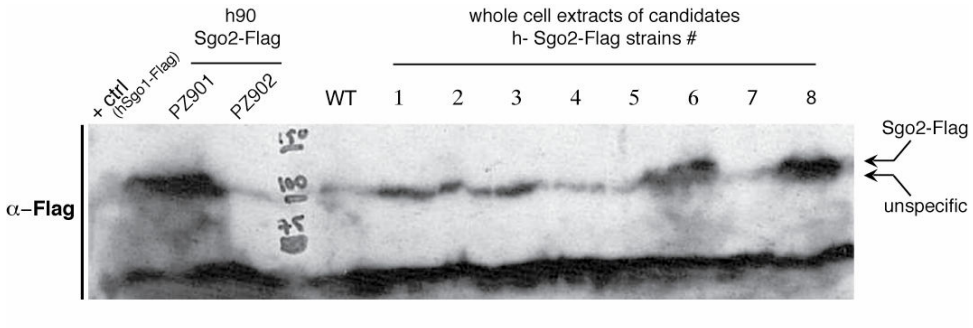


Fig. 3: **Screening for Sgo2-1xFlag expressing strains by Flag Western-blot**

Conclusion & Next step:

Strains number #6 ; #8 and PZ901 express Sgo2-1xFlag
Check solubility of the Sgo2-Flag protein & try Flag-immunoprecipitation

8. Please add your comments (if any): I had a wonderful time in the lab. All members were really nice and helpful. All in all it has been a great scientific as well as human experience. JSPS summer program makes life really simple and gives a great introduction to Japanese culture. I can only recommend people to try! A big thank you to my host researcher / laboratory (Y. Watanabe, in Tokyo University) and to the JSPS.

9. Advisor's remarks (if any): Erwan challenged and developed several methods to purify protein complexes from yeast extracts. As a results, he gained a lot of useful knowledge, which itself contributed to our laboratory substantially. In addition, he was very active in exchanging a lot of scientific and non-scientific knowledge with the lab members, which was also beneficial for us and, I hope, for him as well. All members in our lab appreciate JSPS, who gave us the chance to interact with such excellent European scientist.

RESEARCH REPORT

1. Name: Vincent Lemau de Talancé （ID No.: SP07212）

2. Current affiliation: Laboratoire "Phosphore et Matériaux Moléculaires", Groupe "Organométalliques et Matériaux Moléculaires", UMR 6226 Sciences Chimiques de Rennes - CNRS/Université de Rennes 1 - France

3. Research fields and specialties:

~~Humanities~~ ~~Social Sciences~~ ~~Mathematical and Physical Sciences~~ Chemistry ~~Engineering Sciences~~ ~~Biological Sciences~~ ~~Agricultural Sciences~~ ~~Medical, Dental and Pharmaceutical Sciences~~ ~~Interdisciplinary and Frontier Sciences~~

4. Host institution: Functional Elemento-Organic Chemistry Unit, Frontier Research System, RIKEN

5. Host researcher: Prof. Kohei Tamao

6. Description of your current research

Since a century, plastics have become one of the most used materials, due to their specific properties : hardness, flexibility, transparency... Some of them are so usual that they are produced on million-ton scale each year...

In 1976, some scientific people (A. J. Heeger, A. G. MacDiarmid, H. Shirakawa) discovered that in special conditions a certain class of plastics called *conjugated polymers* can conduct electricity like a semi-conductor, or sometimes like a conductor. For this, they win the Nobel Price of Chemistry 2000.

In 1990, the team of A. B. Holmes built the first *electroluminescent device* using this conjugated polymers. Since this time, a certain number of laboratory search for ameliorate the properties of this kind of materials, because they can be used in three main devices : the solar cells (to produce electricity), the field-effect transistors (used in electronics) and the light-emitting diodes (used for the handy screens, etc.)

My lab is currently trying to find new conjugated systems containing phosphorus atom to optimize the properties of this kind of materials, to have new materials with more light emission, less electricity consumption...

7. Research implementation and results under the program

Title of your research plan:

New Paraphenylenevinylene Analogues Containing Phosphorus and/or Silicon Atoms

Description of the research activities:

My leading target is a molecule called *diphosphene*, namely a molecule owning a double bond between two phosphorus atoms (P=P). My other targets were some molecules called *phosphasilene*, namely a molecule containing a double bond between a phosphorus and a silicon atom.

I have begun by synthesizing my starting product, a huge protecting group. This starting material is very important, to protect the double bond, which is very weak, from water and oxygen, which could destroy it. This synthesis is a well-known 4-steps synthesis on lab.

After this, I have tried with various conditions to introduce the phosphorus moiety on the starting material, and to purify the desired product. The molecule is made, but there is no way to clean it. I have tried to make with this the diphosphene, but I have succeeded just two times, perhaps due to the nature of the byproducts.

I have also synthesized the molecule owning a silicon part, with success, and finally I obtained products with yellow color, which may be containing the silicon-phosphorus double bond species.

8. Please add your comments (if any):

This program is firstly very interesting to discover the Japanese scientific culture, and the working condition on this country. It can permit to young researcher to know other researchers, and to develop new collaborations and friendship with Japanese people.

This program has permitted me too to have a significant contribution to my PhD thesis, and to discover new techniques and fields.

Finally, this program has permitted me to discover Japanese culture and Japanese country.

9. Advisor's remarks (if any):

Vincent came from the group of Prof. Réau, University of Rennes 1, France. He joined our laboratory in June 19.

His research work on this JSPS program has been focused on the synthesis of novel conjugated molecules incorporating phosphorus or silicon atoms by the introduction of innovative and versatile bulky groups derived from a fused ring system.

Vincent is very enthusiastic for his research work, and he has successfully synthesized a double bond species containing phosphorus atom.

He is also much interested in Japanese culture, language, music and foods.

Although the term of this program is limited, only two month, Vincent has made very good contribution to our laboratory.

He is very cooperative and get along very well with Japanese researchers.

For Vincent, the experience in Japan may be much interesting and exciting.

I hope this JSPS program will be fruitful for his future research and life.

RESEARCH REPORT

1. Name: Giovanni Morando （ID No.: SP07213）

2. Current affiliation: Institut de Mathématiques de Jussieu, Paris, France

3. Research fields and specialties:

Humanities Social Sciences X Mathematical and Physical Sciences
Chemistry Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: Department of Mathematics, Hokkaido University.

5. Host researcher: Prof. Naofumi Honda

6. Description of your current research

The objects of my current research are the followings.

1. Having obtained interesting results on the formal and analytic classification of linear ordinary differential equations, I am now developing them in a functorial way. Indeed the results obtained depend on some non canonical choice of some particular irregular linear differential operators.

2. In collaboration with Prof. Naofumi Honda of the University of Hokkaido, we realized the space of ultradistributions on a real analytic surface as a sheaf for the subanalytic topology of the surface. At the present moment we are studying the higher dimensional case which presents many differences with respect to the two dimensional one.

3. I am studying the properties of the subanalytic topos. In particular its space of points and its topological properties. The definition of constructible subanalytic sheaves has already been given by M. Kashiwara and P. Schapira, I am looking for some property of constructible subanalytic sheaves based on the space of points of the subanalytic topos and its topology.

7. Research implementation and results under the program

Title of your research plan:

Subanalytic sheaves and holonomic D-modules.

Description of the research activities:

In this two months at the University of Hokkaido I focused on the following topics.

1. Having obtained interesting results on the formal and analytic classification of linear ordinary differential equations, I have studied the classical litterature of B. Malgrange and P. Deligne on the subject in order to relate my results to their setting.

2. I worked jointly with Prof. Naofumi Honda. We completed a study on ultradistributions in real dimension 2 realizing them as a subanalytic sheaf. We have also started to study the higher dimensional case.

During this period in Japan I also had the opportunity to discuss and present my results to many experts in algebraic analysis. In particular, invited by Prof. N. Tose, I gave a talk at the seminairs of the University of Keio. I gave a poster presentation at the international conference in Kyoto "Algebraic Analysis and Aroud, in occasion of M. Kashiwara 60^{th} birthday". I met Prof. H. Majima at Ochanomizu University with whom I discussed my results.

RESEARCH REPORT

1. Name: Arnaud SPANGENBERG （ID No.: SP07214 ）

2. Current affiliation: Ecole Normale Superieure de Cachan

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences

x Chemistry Engineering Sciences Biological Sciences

Agricultural Sciences Medical, Dental and Pharmaceutical Sciences

Interdisciplinary and Frontier Sciences

4. Host institution: Osaka University

5. Host researcher: Associate Professor, Tsuyoshi ASAHI

6. Description of your current research

One major topic in the research field of information processing and storage is to design small sized electro- and opto-switching devices. Down-scaling of these devices to a manometer dimension requires functionalized materials that have a high-throughput response upon external preservations. Photochromic nanoparticles can be considered to such a material because their properties (magnetic, linear and nonlinear optical,...) can be reversibly changed by light irradiation. Anils (salicylidene-anilines and –aminopyridines) and diarylethenes are particulary interesting photochromic compounds, since they show photochromic reaction both in solution and in the crystalline state. On the other hand, surface plasmon resonance (SPR) of metal nanoparticles has attracted much interest, because the related electromagnetic enhancement is expected to modify the spectroscopic and optical properties of adsorbed molecules on the nanoparticles. Thus, hybrid heterostructures of metal nanoparticle and organic molecule are impacting fields such as photonics and molecular sensors. The enhanced electronic field by SPR is also interesting in designing nanometer size photo-active materials having high-throughput and fast optical responses.

The main goal of my research is to obtain photo-responsive nanocrystals, or nano-scale thin layers of photochromic molecules hybridized with metal (gold or silver) nanoparticle. To reach these goals, two methods of the preparation are examined: the first one is to construct nanoparticles and thin layers on a glass substrate by a vacuum deposition technique, and the second one is to synthesize nanoparticle colloids of photochromic diarylethenes by laser ablation in water. The photochromic properties of the prepared samples are investigated by conventional ensemble experiments and single particle spectrosocpy

7. Research implementation and results under the program

Title of research plan: spectroscopic properties of photochromic nanoparticles

Even though our research group in France has some experience in studying dynamic properties of photo- and thermo-responsive materials, it is limited to spectroscopic observation of micro-scale objects with a nano-second temporal resolution. In order to obtain the details of spectroscopic properties of photochromic nanoparticles, single nanoparticle spectroscopy using a dark-field optical microspectroscopic system is indispensable. Such equipment is available in the group of Professor Tsuyoshi ASAHI, in Osaka University

The first part of my research work in Japan has consisted in finding the best conditions to make samples In fact, in order to can detect the signal of one nanoparticle, the distribution of these particules has to be controlled carefully. So I used two methods to get my samples: one is the spin coating method, and the other one is the dropped method. The second part of my work has consisted to characterize spectroscopic and photochromic properties of the nanoparticles in a single particle level. I measured the Rayleigh scattering spectra with a dark-field optical microspectroscopy system. The photochromism of the single nanoparticles has been clearly demonstrated. Some interesting properties like size effect, anisotropy of the particles have been also demonstrated. Preliminary work on the kinetics of the photochromic reaction has been done, too.

8. Please add your comments (if any):

I would like to thank the JSPS and the CNRS for enabling me to take part in this program.

I would like to thank the Professor Tsuyoshi ASAHI, my advisor in Japan, for accepting me to join his team and for the interesting discussion about science. Thank you also to Shibata Kunihiro and Tanaka Go who have take care of me during these two months.

I have really appreciated to live in Japan, to discover new kind of life. As my concerned, I think it was a very nice opportunity to benefit from the knowledge of the host research group, and also to discover new kind of life.

I advise to everybody to do the same program.

9. Advisor's remarks (if any):

This program provides my students a good opportunity to interact with a foreign country student. They and Arnaud Spangenberg had exciting and enjoying time in daily life and scientific works. Furthermore, the present program is very timely and helpful for developing and summarizing the research collaboration with Prof. Nakatani group in ENS de Cachan, since we have collaborated for long time. Thank you very much.

RESEARCH REPORT

1. Name: Camille Morvan （ID No.: SP07215）

2. Current affiliation: LPPA, College de France

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences
Chemistry Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: LCBM Riken

5. Host researcher: Dr. Kang Cheng

6. Description of your current research

I am currently working on how the brain implements spatial stability.

Our eyes are constantly moving, either making ballistic movements called saccades (on average 3 per second) or making continuous smooth pursuit eye movements. Those eye movements introduce geometrical modifications of the retinal image. Saccades introduce high speed translation combined with dramatic position shifts of objects and pursuit induces a continuous translation of the retinal image. However, we are not aware of those self-induced retinal image modifications because correction mechanisms operate to maintain a stable and continuous perception of the world. Those mechanisms involve combining visual with extra-retinal signal. The extra-retinal is thought to encode the eye velocity and thus can be able to perdict and cancel the retinal image shift.

However, in a recent study (Morvan and Wexler, in preparation) we have shown that, in the case of pursuit, the extra-retinal signal might not encode the eye velocity estimate but only the eye movement direction. According to our results, the eye velocity estimate is derived from the retinal slip of the background.

7. Research implementation and results under the program

Title of your research plan:

Neural correlates of spatial stability during smooth pursuit eye movements

Description of the research activities:

During my stay at RIKEN I conducted fMRI experiments aiming at localizing the MT+ complex. The MT+ complex is the human homologue of the monkey areas MT/MST. The aim of my stay was to investigate the neural correlates of stability during eye movements. Stability during eye movements is achieved by combining visual image with extra-retinal information. Monkey's electrophysiological studies showed that this combination takes place in MST. So localizing the MT+ complex in human was a first and necessary step for investigating the neural correlates of spatial stability during eye movements.

8. Please add your comments (if any):

My stay at RIKEN has been beneficial on many aspects.

I had a chance to conduct pilot experiments on fMRI and interact with outstanding scientists of the field. Dr. Cheng and his collaborators have provided me material, technical support and scientific guidance during my stay. This experience will be very usefull for my futur carreer. In addition, I enjoyed very much my stay in the RIKEN academic environement. I am now considering collaborating with Dr. Cheng and coming back to work with him and his collborators.

9. Advisor's remarks (if any):

Dr. Camille Morvan went through some theoretical basics and operational practices related to MRI and functional MRI. She has conducted several pilot experiments localizing area MT and quantifying several physiological properties of this motion-related visual area. It appears that she has enjoyed being in an academic environment like RIKEN and she has expressed her interest in incorporating her experience using fMRI into her future work. If certain conditions are met, we will consider inviting her again to work on a short project in our laboratory. Overall, I think that this JSPS Summer Program is beneficial to both the participants (like Camille) and host institutes (like us).

Kang Cheng
RIKEN Brain Science Institute
Laboratory for Cognitive Brain Mapping