

## RESEARCH REPORT

1. Name: Vincent Aubert	(ID No.: SP06201)
2. Current affiliation: University of RENNES 1, 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: Departement of Chemistry and Biochemistry, Graduate School of Engineering, Kyushu University	
5. Host researcher: Pr M.Irie	
6. Description of your current research  <p>In recent years, much effort have been devoted to the development of photochromic molecules, that is, systems that can be converted reversibility from one form to another upon light excitation. This has been mainly motivated by their potential applications in optical switches. In particular, dithienylethene (DTE) derivatives have been of considerable interest due to their high reversibility of the forward and reverse photoprocesses triggered by irradiation with light of different wavelengths, and thermal stability of the products. Our research group is involved in the study of the non linear optical (NLO) properties of molecules.</p> <p>Our objective is now to synthesize photoswitching systems for quadratic order NLO. The NLO activity can be modulated by incorporating the photochromic unit dithienylethene into our molecule.</p>	

## 7. Research implementation and results under the program

Title of your research plan:

Luminescent activity modulated by non linear optical photoswitching

Description of the research activities:

In the first part, our objective, during the program, is to synthesize a switching system for the luminescence. The luminescent activity can be modulated by the photoswitching of the non linear optical (NLO) moiety. 2<sup>nd</sup> order NLO generates a light with doubled frequency. The NLO activity, switched by the photochromic unit dithienylethene, allows modulating the luminescence.

I have tried to synthesis the ligand. It is a multi-steps synthesis. Firstly, the dithienylethene unit is prepared, and coupled with the NLO moiety to generate the “dithienylethene-NLOmoiety” molecule. Secondly, the ligand can be prepared by condensing the functionalized fluorescent moiety with the “dithienylethene-NLOmoiety” molecule. The purification of the functionalized fluorescent moiety is not efficient to have a pure fluorescent moiety. Because of the short duration of my stay, the time does not permit to obtain the purified ligand.

I have gathered the experiences about the synthesis, the purification (GPC) and the characterization (FAB, MALDI, EI) of a functionalized dithienylethene.

In the second part, I am interested to study the photo physical properties of my current research's molecule in crystalline phase. I have learned to use different crystallisation techniques to have a crystal of a dithienylethene unit. These techniques were allowed me to prepare a crystal. Because of the small size of the crystal, it is not possible to study photo-physical properties.

## 8. Please add your comments (if any):

This program is very interesting to know the Japanese scientific culture, to know the difference between the French and the Japanese researchers. The training period in the Pr Irie's Laboratory has provided me a significant contribution for my PhD thesis. The program is also given me a chance to know the life in Japan.

## RESEARCH REPORT

1. Name: Gaëlle CHARRON	(ID No.: SP06202)
2. Current affiliation: ICMMO, Université Paris Sud	
3. Research fields and specialties: Humanities                      Social Sciences                      Mathematical and Physical Sciences ChemistryX                      Engineering Sciences                      Biological Sciences Agricultural Sciences                      Medical, Dental and Pharmaceutical Sciences Interdisciplinary and Frontier Sciences	
4. Host institution: Kitagawa Lab, Department for synthetic chemistry and biological chemistry, Kyoto University, Katsura Campus	
5. Host researcher: Professor S. Kitagawa and Associate Professor M. Ohba	
6. Description of your current research  My current research deals with grafting of magnetic material on carbon nanotube surface. This work has both fundamental and technical goals.  First, grafting isolated magnetic objects on a carbon nanotube may allow their magnetic study as unique object, by avoiding the crystal interactions to influence the magnetic properties. This is of great interest to understand phenomena like quantum tunneling of the magnetization.  Secondly, grafting magnetic materials on carbon nanotubes may influence their electrical transport properties. Injecting spin-polarized electrons with a manganite electrode in a carbon nanotube that has been functionalized by anisotropic magnetic material could lead to a conservation of the spin-polarization of the current at the other side of the nanotube. This work is therefore of great interest in the field of spintronic.	

## 7. Research implementation and results under the program

Title of your research plan:

Synthesis of metallic molecular wheel-based porous coordination frameworks

Description of the research activities:

The aim of this work is to synthesize new porous coordination polymers based on metallic wheels. A famous example of metallic wheel is the  $\{\text{Fe}(\text{OMe})_2(\text{pivalate})\}_{10}$  ring of Pr. Winpenny, in which 10 Fe(III) ions are linked together by alcoholate and carboxylate moieties.

Replacing the pivalate bridging ligand by a carboxylate presenting a function capable of hydrogen bonding could lead to the formation of a hydrogen-bonding network of metallic wheels.

My research in Pr. Kitagawa's laboratory has consisted in three parts.

I first conducted a bibliographical study of the synthetic pathways to metallic molecular wheels mainly using the publications of Pr. Winpenny and Pr. Lippard.

This bibliographic study gave me the starting conditions to synthetic experiments under atmospheric pressure, using various Cr(III) and Fe(III) salts.

In a parallel way, I performed synthetic experiments under hydrothermal conditions, starting from Cr(III), Fe(III) and Mn(II) salts. Interesting results have been obtained with the Cr(III) and the Fe(III) salts. We therefore tried to obtain single crystals under hydrothermal conditions by varying the solvent, the concentration and the counter cation. Unfortunately, no single crystal have been obtained at the end of the summer program, though microcrystalline powder have been synthesized.

## RESEARCH REPORT

1. Name: Herve FOURNIER	(ID No.: SP06203)
2. Current affiliation: PRISM Laboratory, University of Versailles Saint-Quentin en Yvelines, 45 av. des Etats-Unis, 78035 Versailles Cedex, 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: Kyoto University	
5. Host researcher: Professor Iwama	
6. Description of your current research  I work on computational complexity. This field aims at deciding the resources needed to perform some computations. I have worked on complexity over the reals, on the Blum-Shub-Smale model. This is an idealized model which is particularly suitable to study the complexity of problems arising in analysis and in geometry. Recently I have studied lower bounds for some geometric problems related to the computation of the diameter in this setting. My second line of research concerns the complexity and algorithmics of graphs problems related to the notion of arbitrarily vertex-decomposable graphs.	

## 7. Research implementation and results under the program

Title of your research plan:

Monotone complexity lower bounds for the majority function

Description of the research activities:

Proving lower bounds on the complexity of boolean functions is a very difficult problem. For explicitly defined boolean functions, the best lower bound we have is linear (whereas it has been known for a long time that most boolean functions require circuits of exponential size).

However, when we restrict the kind of circuits we may use to compute the functions, some results are known. One deep line of research is to restrict the use of negation gates. When no negation gate can be used, we speak of monotone circuits. Some exponential lower bounds are known for some explicitly defined functions in the case of monotone circuits.

We focused on the function majority. The monotone complexity of this function lies between  $n \log(n)$  and the trivial lower bound  $n$ . Our aim is to reduce this gap. For this, we chose an approach suggested in Iwama-Morizumi (MFCS 2006, to appear), which aims at defining a function easy to compute with the help of some majority gates, but for which some known techniques for proving lower bound applies. Our approach is based on the combinatorial lower bound method (Jukna 1999).

## 8. Please add your comments (if any):

The problem proposed by professor Iwama is very interesting and challenging. I am very happy with the collaboration we started here.

## RESEARCH REPORT

1. Name: Daniel Girardeau-Montaut (ID No.: SP06204)
2. Current affiliation: Telecom Paris (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: Research Centre on Landslides (DPRI, Kyoto University)
5. Host researcher: Professor K. Sassa and Associate Professor H. Fukuoka
6. Description of your current research <p>My current research deals with change detection on 3D geometrical data, such as those acquired by a ground based <i>laser scanner</i>. This rather new kind of 3D sensor is able to acquire very dense 3D point clouds representing the surrounding objects surfaces, in a very efficient and accurate way. With such data acquired at different epochs, one can compute accurate displacement maps but also conduct change detection processes on wide or complicated scenes, with rather small moving objects or slight surface movements. Such a process can be conducted very quickly if one is able to process directly the 3D point clouds generated by the scanner. However, this kind of data is rather new and is not commonly used by the image processing and signal analysis community. Therefore, new and specific algorithms need to be developed in order to deal with laser scanners output.</p> <p>Main applications of geometrical change detection have been developed for the industry (facilities monitoring, plans update, etc.), for the geo-engineering and topography community (slope or river banks monitoring, land-use or maps update, etc.) and finally for emergency management (in case of natural disaster or industrial accident, bombings, etc.). It appears that using a laser scanner and high-level data processing algorithms, generally because of the gain in accuracy and/or speed, can enhance most of these applications. The case of landslides (which is very important, as landslides can be devastating) remained still lightly studied in this point of view, and my research team and its partners had very few knowledge about it.</p>

## 7. Research implementation and results under the program

Title of your research plan:

Evaluation of the potential interests of laser scanning for landslides

Description of the research activities:

My research at RCL mainly consisted in bibliographical study, books reading and short interviews of landslides experts.

I first conducted a bibliographical study to make a synthesis of former works about laser scanning used in landslide-related applications, and also about landslide monitoring and analysis with 3D data acquired by other techniques (GPS, photogrammetry, etc.). Then I read books about landslides (a few about general theory, the others about landslides mitigation). I also asked a few questions to landslides expert from RCL to clarify some particular points. Eventually I produced a report in which I evaluate the interests of using ground based laser scanners (and also developing specific data analysis algorithms) for the main landslide-related applications (monitoring, studying, simulating, etc.).

## 9. Advisor's remarks (if any):

Dr. Girardeau-Montaut have been participating actively in the seminars and meeting of Research Centre on Landslides of Disaster Prevention Research Institute, Kyoto University since his arrival. He collects basic knowledge on landslides through numerous books and papers in the centre. Also he interviewed and questioned us about further possibility of laser scanner monitoring.

## RESEARCH REPORT

1. Name: Dr. Olivier Hermant (ID No.: SP06205)
2. Current affiliation: University Paris 6
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: Keio University
5. Host researcher: Pr. Mitsuhiro Okada
6. Description of your current research  One of the crucial problems of software engineering is safety. One can hardly imagine a program for automatic piloting airplanes with bugs. For this kind of critical programs, we should <b>prove</b> that they are correct and that they match their specification.  Proof assistants (Coq, Isabelle, PVS) are logical frameworks allowing to do this job. One of the challenges is the automation of the proof search. Since many proofs are repetitive or easy (at least, for an human being), one would like to do these proofs by the machine rather than by a human. This is the field where my research takes place (automatic proof-search).  Especially, I am interested in introducing computation into deduction. This approach has several advantages, as high mechanization (deduction means that one has to guess whereas computation is blind execution).  One of the ways to do so is the Deduction Modulo, which is a recent, modular and powerful embedding of rewriting into logic. I am studying the logical properties of this framework. In this purpose, I am developing semantic tools to prove the good properties of the calculus (mainly, <b>cut redundancy</b> , that implies all the other ones). I am also looking forward to an efficient implementation of a proof search algorithm.

## 7. Research implementation and results under the program

Title of your research plan:

Rewrite rules and non logical axioms in Linear Logic

Description of the research activities:

I did the major part of my research in collaboration with prof. Mitsuhiro Okada, and many results are common results.

First, I exposed (in a series of 3 talks at Mitsu Okada's Laboratory) my previous work, on embedding rewrite rules into a logical framework. Rewrite rules considered are computation rules of the shape " $0 + x \rightarrow x$ " (and more complicated ones).

From a theoretical point of view, this can be expressed by a specific **cut rule**. A **cut rule** is a deduction rule of the shape: "If from one side can prove proposition  $A$ , and if from another side supposing  $A$  I can prove proposition  $B$ , then I can prove proposition  $B$  without supposing  $A$ .". The cut rule is a very nasty rule for automatic proof search: when a computer searches a proof of  $B$ , he has no hint about the proposition  $A$  to introduce.

So, rewrite rules is more fitted for computers and cut rules for humans, and rewrite rules can be transformed into cut rules. Our first aim was to understand the different kind of cut rules we can obtain from the rewrite rules, and to determine if they are all equivalent. The conclusion is negative, and we have a draft paper about this topic, showing a hierarchy between the different kinds of cut. Also, we tried to make use of the rewrite rules only bottom-up, yielding a close relationship with non-logical axioms.

In a second time, we interested ourselves in higher-order Linear Logic with intensionality. Linear Logic (LL) has been introduced by J.-Y. Girard. It is a very nice framework, that appears useful to treat many resource-limited problems, for instance process calculus, Petri nets or complexity problems. This is why it is now broadly studied around the world. This work takes its roots both in Mitsu Okada's work (he is a specialist of LL) and my previous work. In particular, we were able to show the redundancy of the cut rule in this system. A paper is written about the topic, and should be submitted to a journal soon.

As a byproduct of the work, we obtained a strange result in Linear Logic: some connectors (namely, the additive ones) seems to be definable by means of other connectors, in the higher-order LL. This is a well-known result in classical logic (called impredicative connector encoding), but the result is new and unexpected here. This remains yet a work in progress and we surely will continue our collaboration on this topic with Prof. Okada.

8. Please add your comments (if any):

JSPS's summer fellowship was for me an excellent opportunity. Although I only partially fulfilled the scientific objectives we fixed initially, we worked on many other topics and achieved results beyond expectation. We did excellent job with my host researcher and my host laboratory was very friendly. I am almost sure to work with them again.

## RESEARCH REPORT

1. Name: Manon Lafouresse	(ID No.: SP06206)
2. Current affiliation: University of Bristol, United Kingdom	
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: University of Kyoto	
5. Host researcher: Professor Y. Fukunaka	
6. Description of your current research <p>In Bristol, I am studying the surface roughness of electrodeposited copper films. As the copper films get thicker, their roughness follows a very simple scaling law and only two pre-factors and three exponents are necessary to predict the roughness of a film of any thickness. Two of the exponents do not depend on the experimental conditions while the third one, the local roughness exponent, <math>\beta_{loc}</math>, is strongly dependent on them. My PhD research focuses on this local roughness exponent whose values can greatly vary and on which parameter influences its value. This work is especially important for the electronics industry where nowadays copper is greatly used. If the films are too rough then this can impair their physical properties. Therefore if one is able to understand how a film gets rough, one can chose the optimum deposition conditions to get films as smooth as possible.</p> <p>Films are electrodeposited from a copper sulphate electrolyte onto Au substrates using a Rotating Disc Electrode (RDE), which allows to change the mass transport conditions and to analyse separately the influence of a range of parameters on the value of <math>\beta_{loc}</math>. Films were then imaged using an Atomic Force Microscope (AFM) and their roughness was calculated from the images.</p> <p>It has been found that the potential of deposition is the one most important parameter that controls the value of <math>\beta_{loc}</math>. The more negative is the potential, the larger is the value of <math>\beta_{loc}</math>. The value of <math>\beta_{loc}</math> saturates at about 0.5. The potential controls how far the adatoms can moved before being incorporated into the film. The more negative the potential, the less the atoms can move. This result is particularly interesting because it means that aspects proper to electrodeposition (e.g how the ions are brought to the surface) are not important</p>	

for films of small thickness.

## 7. Research implementation and results under the program

Title of your research plan:

Study of the roughness of thin copper films electrodeposited under the influence of a magnetic field.

Description of the research activities:

The use of a magnetic field changes the conditions under which the copper ions are brought to the electrode surface (mass transport). If the magnetic field is applied parallel to the electrode surface then the mass transport is greatly increased due to the Lorentz force. This was checked by recording cyclic voltamograms for a range of B values. For a magnetic field of 5T, the limiting current density was increased about three times. This is an effect similar to the one that happens in the case of a Rotating Disc Electrode. In the case of a magnetic field applied perpendicular to the electrode surface, the limiting current density was also increased about three times.

Then, films were electrodeposited onto Au substrates under the influence of a 5 T magnetic field, orientated parallel to the electrode surface. The thickness of the films ranged from 200nm up to 3.2 microns. The films were then imaged using an AFM and their roughness calculated from images of size 5×5 microns.

In the case of Iron, the magnetic field has a great influence on the morphology and the scaling of the surface roughness of the films. However in the case of copper, no significant morphological change has been observed for the deposition conditions used (0.3 M CuSO<sub>4</sub>, 1.2 M H<sub>2</sub>SO<sub>4</sub> electrolyte,  $E = 0$  V vs NHE,  $j = 25$  mA.cm<sup>-2</sup>).

Moreover, the roughness of films electrodeposited with 5T magnetic field (both parallel and perpendicular to the electrode) and with no magnetic field is similar. These results confirmed the results obtained with RDE, namely that the mass transport does not have any effect on the roughness for small thickness films.

The data obtained during my stay in Japan will be further analysed in Bristol. In particular, the value of the exponent  $\beta_{loc}$  will be calculated. The results will be presented at the next electrodeposition conference and are expected to lead to a publication.

I had an opportunity to give two talks while in Kyoto: one for a seminar in the group and another one in Karuizawa for the materials tailoring conference. Each PhD and master students in Professor Fukunaka's group also gave a short presentation during the weekly seminar so that I could get acquainted with the group main research activities.

8. Please add your comments (if any):

This experience in Japan has been extremely valuable to me. The research interests of Professor Fukunaka's group are very stimulating. I would like to thank Professor Fukunaka for being particularly welcoming to me and his students for being such great friends.

I hope I will have an opportunity to come back to Japan in the very near future as a postdoctor in Professor Fukunaka's group in order to investigate other aspects of my current research and to prolongate the collaboration that was started during the JSPS summer program.

9. Advisor's remarks (if any):

We were very happy to have such an active French student. We hope she will join our group again and we think this program was a very good start for the collaboration between our Kyoto group and the Bristol group.

## RESEARCH REPORT

1. Name: LEBRET Valerie	(ID No.: SP06207)
2. Current affiliation: CNRS, Universite des Sciences et Techniques du Languedoc, Montpellier, France.	
3. Research fields and specialties: Humanities                      Social Sciences                      Mathematical and Physical Sciences X <chem>Chemistry</chem> X <chem>Engineering Sciences</chem> Biological Sciences Agricultural Sciences                      Medical, Dental and Pharmaceutical Sciences Interdisciplinary and Frontier Sciences	
4. Host institution: Department of Materials Engineering, Graduate School of Engineering, The University of Tokyo - Professor Kataoka's Laboratory.	
5. Host researcher: Dr. Akihiro Kishimura	
6. Description of your current research:  Synthesis of functionalized nanoparticles for multiphotonic bio-imaging of tumoral cells.  Key words : silica nanoparticles – chromophore synthesis – biphotonic fluorescence – organic graftings – biological tests.	

7. Research implementation and results under the program

Title of your research plan:

PICsomes (block copolymer vesicles) membrane permeability study.

Description of the research activities:

Most of the work consists in observations with two different types of microscopes (Dark Field Microscope (DFM) and Confocal Laser Scanning Microscope (CLSM)).

8. Please add your comments (if any):

Difficulties of communication in this laboratory. Most of the researchers do not speak English properly, which implied different kinds of misunderstandings. It is an important laboratory, with a large number of students, and not much time to take care of the summer students. I felt like doing almost nothing in two months. Kind of a waste of time. Otherwise, quite convenient for enjoying Japan... If I would have to, I probably will not recommend this laboratory as a host institution for the years to come.

9. Advisor's remarks (if any):

No remarks.

## RESEARCH REPORT

1. Name: Nicolas MANSARD	(ID No.: SP06208)
2. Current affiliation: NRIA / IRISA – RENNES – FRANCE	
3. Research fields and specialties: Humanities                      Social Sciences                      Mathematical and Physical Sciences Chemistry <b><u>Engineering Sciences</u></b> Biological Sciences Agricultural Sciences                      Medical, Dental and Pharmaceutical Sciences Interdisciplinary and Frontier Sciences	
4. Host institution: Intelligent System Research Institute – National Institute of Advanced Industrial Science and Technology (AIST)	
5. Host researcher: Kazuhito Yokoi – Olivier Stasse	
6. Description of your current research  Our research activities are concerned with visual servoing, and more specifically the integration of visual-servoing schemes into real robot applications. This research topic is between the fields of robotics, automatic control, and computer vision.  Our current researches focus on tasks sequencing to realize complex robotic tasks by a robust and reliable approach. Instead of using some powerful but heavy algorithm such as path planning, our approach rather combines and sequences adequately several close-loop tasks, providing thus a very accurate control of the part of the robot which requires to be controlled, and a great liberty for the remaining robot degrees of freedom which is useful to take other constraints into account such as moving obstacles or robot joint limits.  Mainly, we proposed a <b>high-level execution controller</b> that enables or disables some parts of the global control law to ensure global convergence and obstacle avoidance. Far from any obstacle, the robot moves according to a full task constraining all its degrees of freedom. When it comes closer to a configuration to avoid, the higher-level controller removes one constraint. The DOF obtained can be used to avoid the obstacle.  The major advantage of this approach is the ability to deal with several constraints at the same time by the use of the redundancy formalism. In this way, these results could be apply with very appealing perspectives to complex robots such as mobile manipulator or humanoid robots.	

## 7. Research implementation and results under the program

Title of your research plan:

Task sequencing for visual servoing on the humanoid robots HRP-2 – Application to vision-based object grasping while walking.

Description of the research activities:

The proposed research is about the Humanoid Robot HRP-2 available at AIST-Tsukuba. This robot is a highly redundant humanoid mobile robot. It has several sensors for closed-loop control, including cameras. Two arms with hands enable it to perform complex task such as object grasping. Complex executions such as door-opening have already been realized using this robot. The current solution uses a 3D-reconstruction system to map the robot environment, and then an open-loop motion generator to drive the robot to its goal. Although this system provides a complete solution, it can be greatly improved in term of robustness to noises in the detection process and to environment changes by the use of a reactive closed-loop control such as task sequencing. We propose thus **to adapt and implement the task sequencing formalism to the Humanoid Robot HRP-2 for complex tasks**, such as object grasping. On a practical point of view, the objective was to realize the implementation of a task of grasping based on vision, while walking.

The first part of the work has been to realize the implementation of several elementary tasks that are necessary for object grasping. This part was mainly a transfer and a rewriting of what have been done during my PhD. These tasks could be classify in several groups:

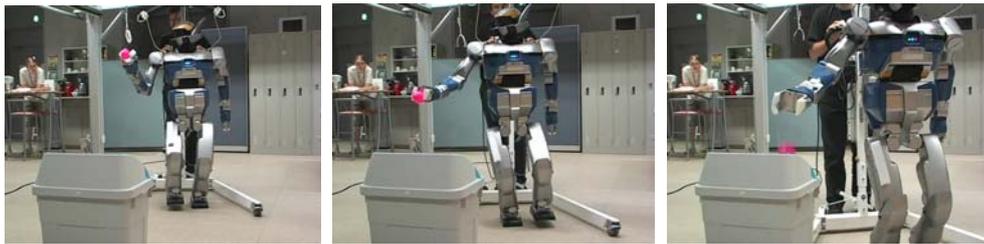
- Vision tasks: 2d ball detection in the images coming from the two cameras of the robot head, 3d ball localization using the stereo head, both realized at 30Hz frequency; realization of a kalman filter to predict these informations at 200Hz frequency, as required by the robot control frequency.
- Elementary tasks for global-task achievement: centring task, used to keep the object in the image while realizing the others tasks; grasping task, using the six degrees of freedom (DOF) of the right arm; walking task, using the reference leg positions produced by the pattern generator of Olivier Stasse.
- Constraint tasks: implementation of tasks that locally ensure that the constraints of the robot are respected: joint limits avoidance, joint velocity.

The second part of the work has been to realize the adaptation of the sequencer controller proposed during my PhD for the specific task of grasping. This controller should ensure that the robotic task is realized within the imposed constraints. Several

rules have been written for the automatic sequencing of the elementary tasks at the behaviour level. The first one extends the available joint space of the neck by using if necessary the two articulations of the chest. Indeed, the chest joints are difficult to use because they widely disturb the robot balance while walking. Using the sequencing rule allows a wider work area for the camera orientation control, and in the same time does not disturb the robot balance, allowing the realization of the task while walking. The second controller triggers the final part of the grasping (arm extension) only when the robot is close enough from the object. This improves the general behaviour by avoiding a well-known singularity of the robot arm, and by shortening the time period where the extending arm is disturbing the balance.

At the end of the summer-program stay, we were able to propose a general implementation for realizing visual servoing tasks in the tasks-sequencing framework. We also realize the implementation of an object grasping while walking. This is a typical example of a task that required close-loop control, since manipulating while walking requires a fast and precise control, robust to the perturbations induced by the walk (slidings, oscillation, etc).

This work will be submitted to the ICRA conference in September.



8. Please add your comments (if any):

This two-month stay in the ISRI Laboratory was a great research opportunity. First, for my own PhD work, it gives me a chance to demonstrate the validity of my work on a highly redundant robot. It was also of great scientific interest to work with Dr. Stasse, Pr. Yokoi or Dr. Neo, that all are recognized scientific in my domain. Finally, I think I have been of some helps to establish a visual-servoing framework on the HRP-2 platform.

## RESEARCH REPORT

1. Name: MUSSARD Windy	(ID No.: SP06209)
2. Current affiliation: Université de Montpellier II Sciences et Techniques du Languedoc	
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 of Industrial Sciences(IIS), University of Tokyo	
5. Host researcher: Pr. ARAKI Koji	
6. Description of your current research <p>The title of the current research is the design of novel biosensors and specific graftings on silicon wafers. This research is based on the “photolithography by direct irradiation” process. With this method, steps of surface activation could be minimized and the secondary products generated during the irradiation could be eliminated by a simple washing (clean process).</p> <p>By this way, after having synthesized coupling agent with “X-R-Si(OCH<sub>3</sub>)<sub>3</sub>” structure ( X = photoremovable protecting group and R = long carbon chain) and generating a self-assembled monolayer of these molecules on a silicon wafer (support), an irradiation at a precise wavelength by using a mask could deprotect specific areas on the support. So these newly reactive areas could fix, through a second reaction, different organic moieties on the support.</p> <p>Finally, by this process, we have the possibility to fix entities, which give different properties to the support, at specific places in a precise order.</p>	

## 7. Research implementation and results under the program

Title of your research plan:

Functional design of supramolecular polymer materials

Description of the research activities:

The project is aimed to develop novel functional supramolecular polymer materials with fluorescent properties. These materials combine:

- supramolecular properties: through the reversible formation of intermolecular hydrogen-bond (non-covalent bond), macroscale supramolecular structures are self-assembled into 1-dimensional fibrous or 2-dimensional stacked films.
- luminescence properties: this phenomenon is ensured by specific fluorescent molecules, which compose the main structure of these materials. By altering the mode of molecular packing of these units without chemical reaction (heat-mode interconversion), the luminescence could be controlled.

The present research would open the way for the development of tunable luminescent solids (i.e. that can be switched on and off by external thermal stimuli) with a highly organized architecture.

## 8. Please add your comments (if any):

In the laboratory, I've discovered a new part of Chemistry: Supramolecular Chemistry that I've always wanted to study. This Chemistry is as difficult as other chemical fields. But I've discovered too how the Japanese daily life is. Thanks to all people in the laboratory, my stay was really interesting and formidable and I've experienced Japanese culture . I'm really grateful to them all! Specially to Pr. Araki for all his help.

## RESEARCH REPORT

1. Name: Pautrat Yan	(ID No.: SP06210)
2. Current affiliation: Université Paris-Sud, France.	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Research Institute in the Mathematical Sciences, Kyoto.	
5. Host researcher: Ojima Izumi.	
6. Description of your current research	
<p>My recent research is centered around quantum statistical mechanics. Statistical mechanics in general aim at describing the laws that rule the macroscopic behavior of large ensembles of particles, from the microscopic description of these particles. For example it allowed to describe the laws of thermodynamics or of electrical currents: temperature and pressure in one case, intensity and potential differences in the other are just macroscopic quantities that can be interpreted at the microscopic level. In the classical (non-quantum) setting, these laws were obtained empirically before the atomic nature of matter was understood. In the case where the quantum nature of the particles comes into play, however, no empirical description was obtained, and even the relevant concepts have not been identified. Yet such results would be of great importance in the construction of nanodevices.</p> <p>My most recent success in this field gives the relevant algebraic structure that describes the fluctuations of quantities like heat flows or electric currents in nanodevices (Jaksic-Pautrat-Pillet, to appear). The fact that a clean-cut and general result could be obtained seems to imply that an important concept has been identified.</p>	

## 7. Research implementation and results under the program

My original plan was to study questions related more closely to thermal quantum field theory in non-equilibrium situations. However, the recent discovery of the above quoted result shifted Professor Ojima's interest, and mine, to a further study of this result. Therefore, a new title should probably be "General algebraic structure of fluctuations in quantum systems".

Description of the research activities:

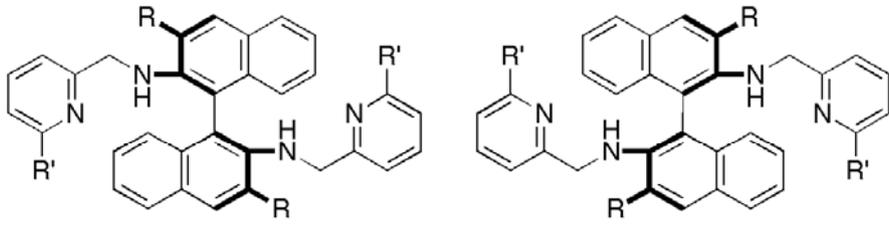
The main problem with the above quoted result is its very technical combinatorial proof, which does not help to shed light on the (mathematical) mechanisms implied. I met Professor Ojima every week, working for a full day on the past week's progress. We found out that the objects at hand were related through harmonic analysis to the spectral properties of a given operator. From there on, Professor Ojima's opinion was that the combinatorial phenomena were the expression of a group duality property and that the result obtained should be related to harmonic analysis on a given (noncommutative) group. We worked on identifying the relevant group. We have probably succeeded and our common work will lead to a joint paper, and continue our collaboration. I also gave a seminar at Kyoto University on that subject.

During my stay in Japan, I also visited Kyushu University for a two-day collaboration with Professor Matsui, who has been working on related results about fluctuation algebras and non-commutative central limit theorems. We discussed the above result, as well as Professor Matsui's more recent results on Bose-Einstein condensation for lattice spin systems. I also spent a week in Tokyo University, for a collaboration with Doctor Ogata, who is already a co-author (Jaksic-Ogata-Pautrat-Pillet, two articles to appear) and with whom collaboration is still going on.

8. Please add your comments (if any):

I hope to visit Japan again, if possible for longer term collaborations.

## RESEARCH REPORT

1. Name: <b>SONGIS Olivier</b>	(ID No.: SP06211)
2. Current affiliation: LAPP Laboratoire des aminoacides peptides et proteines Université Montpellier II	
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: Research Center for Materials Science (RCMS), Nagoya University	
5. Host researcher: Pr. Masato Kitamura	
6. Description of your current research <p>My research has been focused on the establishment of systematic synthesis of a series of new nitrogen-based chiral ligands, particularly <math>sp^2N/sp^3N</math> combined ligands, which are designed on the basis of the donor-acceptor bifunctional catalyst originated from Kitamura's DAIB-Zn chemistry. The concept has been significantly demonstrated in the hydrogenation of simple ketones using BINAP-Ru(II)/diamine/base ternary catalytic system in the Noyori group. Many other groups all over the world have intensively extended the chemistry, and the general consensus obtained so far is that phosphorus atom is essential for attaining high reactivity and high enantioselectivity and that no universal catalyst usable for any ketonic substrates exists. To expand the scope of asymmetric hydrogenation and to exploit new asymmetric reactions, Professor Kitamura has designed new type of non-phosphorous ligands. All of the ligands utilize the <math>sp^2N</math> planarity to make the efficient chiral circumstances.</p>	
 <p>(R)-R-BINAN-R'-Py                      (S)-R-BINAN-R'-Py</p>	

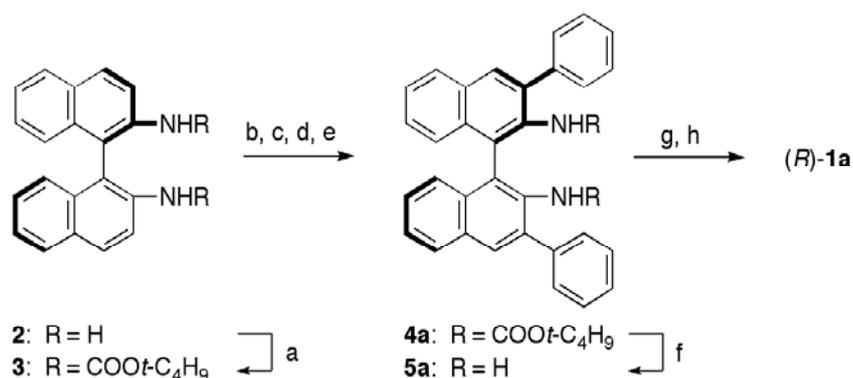
## 7. Research implementation and results under the program

Title of your research plan:

Systematic Synthesis of A Series of New Chiral N4 Ligand R-BINAN-R'-Py

Description of the research activities:

C(3) and C(3') substituents of the binaphthyl skeleton often improve chiral induction, resulting in higher enantioselectivity in some catalytic reactions. Ph-BINAN-H-Py (**1a**) has been taken as the standard target ligand, and synthesized in a straightforward and practical manner as shown below, which starts from easily available (*R*)-1,1'-binaphthyl-2,2'-diamine ((*R*)-BINAN, **2**). After diBOC-protection followed by ortho-lithiation of (*R*)-**3** using *t*-C<sub>4</sub>H<sub>9</sub>Li in ether, the C(3)Li was trapped by I<sub>2</sub> to give mixtures of mono and diiodide ranging from 6:1 to 2:1. Suzuki-Miyaura coupling with C<sub>6</sub>H<sub>5</sub>B(OH)<sub>2</sub> using Pd(P(C<sub>6</sub>H<sub>5</sub>)<sub>3</sub>)<sub>4</sub> catalyst yielded phenylated C(3). The diBOC-protected Ph-BINAN **4a** was obtained by repeating this same process. Deprotection of the amine by CF<sub>3</sub>COOH treatment of **4a** afforded 3,3'-diphenyl-substituted BINAN **5a** in 60% total yield from **2**. Compound **5a** was converted to (*R*)-Ph-BINAN-H-Py ((*R*)-**1a**) in 65% yield after imine formation with pyridine-2-carboxaldehyde followed by reduction with NaBH<sub>4</sub>. This sequential synthetic protocol can be used to diversify the ligand library by variation of the three components, **2**, ArB(OH)<sub>2</sub>, and the aldehydes. Changing the Ar moiety in the second step potentially enables the synthesis of a variety of unsymmetrical C<sub>1</sub> chiral ligands.



**a:** 4.4 mol amt NaHMDS, 2.2 mol amt (*t*-C<sub>4</sub>H<sub>9</sub>OOC)<sub>2</sub>O ((BOC)<sub>2</sub>O), THF, 0 °C–rt, 3 h. **b:** 5 mol amt *t*-C<sub>4</sub>H<sub>9</sub>Li, 3.5 mol amt I<sub>2</sub>, ether, –78 °C–rt, 12 h. **c:** 1.5 mol amt C<sub>6</sub>H<sub>5</sub>B(OH)<sub>2</sub>, 0.03 mol amt Pd(P(C<sub>6</sub>H<sub>5</sub>)<sub>3</sub>)<sub>4</sub>, NaHCO<sub>3</sub>, 2:1 dimethoxyethane–H<sub>2</sub>O, reflux, 20 h. **d:** 5 mol amt *t*-C<sub>4</sub>H<sub>9</sub>Li, 3.5 mol amt I<sub>2</sub>, ether, –78 °C–rt, 12 h. **e:** 1.5 mol amt C<sub>6</sub>H<sub>5</sub>B(OH)<sub>2</sub>, 0.03 mol amt Pd(P(C<sub>6</sub>H<sub>5</sub>)<sub>3</sub>)<sub>4</sub>, NaHCO<sub>3</sub>, 2:1 dimethoxyethane–H<sub>2</sub>O, reflux, 20 h. **f:** CF<sub>3</sub>COOH, CH<sub>2</sub>Cl<sub>2</sub>, rt, 12 h, 60% total yield from **2**. **g:** 3 mol amt pyridine-2-carboxaldehyde, MS4A, toluene, reflux, 2 weeks. **h:** NaBH<sub>4</sub>, CH<sub>3</sub>OH, rt, 3 h, 65% yield.

8. Please add your comments (if any):

My stay in Professor Kitamura laboratory has been very beneficial. I could learn new techniques and improve my manipulation skills especially for handling very air- and moisture-sensitive material. I could work on an organic chemistry field I had never seen before. I could also attend to very high quality seminars and I was impressed by the excellence of Japanese students and researchers.

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. Songis Olivier has been involved in one of my main projects, synthesis of a series of new nitrogen-based chiral ligands, particularly a new chiral N4 ligand R-BINAN-R'-Py. His role has been establishment of the systematic synthesis of the ligands. Irrespective of his very short stay here and of his first experience for manipulation of highly air- and water-sensitive organometallics, he has not only successfully synthesized the key ligand but also supplied the ligand derivatives in a large scale. The result will certainly make the project close to the goal. The success is apparently due to his diligent, critical, and constructive attitude toward the given project, that has made me feel intuitively his highly promising future as a world-standard scientist. More important is that he has an excellent sense of association with his colleagues. Mr. Olivier has made a significant influence to many Japanese, Indian, and Chinese researchers in my group. All of them have enjoyed learning both of French Culture and French Chemistry from him. I am sure that such a human relationship he has established in Japan is extremely important for both countries to develop new chemistry in this century. We all hope that his experience in Nagoya will be certainly valuable for his future research and social activities in the world, realizing international collaboration between Japan and French.

Masato Kitamura

Professor

## RESEARCH REPORT

1. Name: Delphine TALBOT	(ID No.: SP06212)
2. Current affiliation: University of Toulouse II - FRANCE	
3. Research fields and specialties: X Humanities-ART      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: University of the Ryukyus - Okinawa	
5. Host researcher: Jun KATAOKA	
6. Description of your current research  “Relations between East Asia and Europe in terms of tendencies in fashion design”  In particular, I focused on the impact of socio-cultural differences in the formation of fashion trends in East Asian and European markets. Japan and Japanese aesthetics are the primary influences in my creative and written work. I am presently focusing on social sciences in the arts, particularly anthropology. A part of my research concerns the weaknesses of persisting notions of the <i>bureaux de style</i> 's creation process and a move towards a new process. I use an anthropological approach and focus on colors intrinsic to a certain environment or, <i>couleurs matières</i> : traditional and natural textile techniques in my artistic creations. Through this “appropriation of color”, my objective is to promote anthropological methods of research in <i>bureaux de style</i> . My main objective in Japan and Ryukyus Islands is to carry out ethnographic investigations (photographs, sound recording, colored materials collection) coupled with professional experience through internships.  At least, going to some islands this summer was an opportunity to find out some specific methods of natural dyeing: to take some seeds, plants and textiles, to define their name in Latin, to list them (names in different languages and the color(s) obtained) and to learn -as good as possible- some dyeing recipes. The wealth of this kind of work is specially due to the fact that some colors are just made with one plant only in one island, as a real specific chromatic identity.  Moreover, this interest is much contemporary, according to the new Western interest for natural colors in an ecological way. It is such some precious color materials we need to preserve and to give back to them their primordial importance.	

## 7. Research implementation and results under the program

Title of your research plan:

Natural dyeing and specific color's identities of Japan and the Ryukyus islands.

Description of the research activities:

◆ To list:

- the places to visit, according to the dye-producing plants' names and,
- to define (as good as possible) their name in Latin, Japanese and, sometimes, in the Island's dialect; and the color obtained.

◆ To visit the islands, to define/collect the specific dye-producing plants and textiles, as following:

Hachijoujima:

- Kihachijo Workshop - Meyu Kooboo (Studio); Yamashita Orimono Kôbô (Atelier of weaving & dyeing); Yoshihiro Saijoo (dyer); and Isezaki Kayomi (weaver).
- Plants: Kobunagusa 小鮎草 (*Anthraxon hispidus*), Tabu no Ki たぶの木 (*Persea thunbergii*), Shii マテバシイ (*Pasania edulis*).
- Specific textile-dyeing: Kihachijou-kusakizome (specific golden yellow).

Kumejima:

- Kumejima Center of Nature and Culture; Kumejima Tsumugi Center.
- Plants: Fukugi 福木 (*Garcinia subelliptica*); Sotetsu ソテツ (*Cycas m.*); Sharinbai 車輪梅 (*Raphiolepis umbellata*); Okinawa Sarutori ibara グール (*Smilax china*); yamamomo ヤマモモ (*Myrica rubra*).
- Specific dyeing: Dorozome 泥染め (Mud mordanting).

Nago City:

- Seisho Inoha (cultivator & maker of Ryukyu Ai 琉球藍 - *Strobilanthes cusia*); Okishige Maeshiro (dyer-specialist of new process of making indigo paste & weaver-kasuri / ikat).

Miyakojima:

- Miyako Joufu Center; Shinzato Reiko (dyer & weaver); Sunagawa Takeshi (Kinuta uchi-to beat the textile for obtaining a patina); Michiko Nakasone (dyer & weaver-special contemporary design making); Sunagawa Mieko (cultivator of Indo Ai イント藍 (*Indigofera tinctoria* L.), dyer-very good specialist of dyeing with indigo & weaver).
- Specific textile: Miyako Joofu (dyed with indigo, special pattern, greased, beaten).

8. Please add your comments (if any):

All the objectives could be achieved with the graceful help of Kataoka Jun sensei, concerning the Ryukyus islands and Okinawa.

Only Hachijoujima had to be visited and studied by my own. It was the first experience of this type of investigation this summer. Specifically difficult because of absolutely no one english speaker there (even in the tourism's office).