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京都大学
The 21st Century COE Program for Research and Education on Complex Functional Mechanical Systems

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1. Mission and Scope of the Program
The 21st Century COE (Center of Excellence) Program is an initiative taken by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) with the goal of supporting universities in establishing international centers for education and research which are capable of becoming world leaders in their specific research areas. Our program of "Research and Education on Complex Functional Mechanical Systems" has been awarded the grant for carrying out advanced research and education as a Center of Excellence in the field of mechanical engineering in 2003 (five-year project), and is expected to be a leader in research and education both in Japan and worldwide.

Our objective in research is modeling, analysis, and control of phenomena and design theory geared specifically for complex mechanical systems, and is to form the basis of a novel field of study to be known as 'Complex Systems Engineering'. On the other hand, our objective in education is to foster and develop innovative young researchers that will become leaders in these novel fields of study. The COE program provides significant opportunities for such development on the job, promoting broad perspectives, creativity, and a strong will in preparation for the entrance of our young scientists into the global research community. To this end, we will establish high-level joint teams combining specialized scientists and engineers from the four departments of the Graduate School of Engineering (Department of Mechanical Engineering, Department of Precision Engineering, Department of Aeronautics and Astronautics, Department of Applied Physics), and the four departments of the Graduate School of Informatics (Department of Mechanical Engineering, Department of Information Science and Technology, Department of Computer Science, Department of Electrical Engineering) to conduct research, design, and education in this field.

2. Research Topics
The purpose of mechanical engineering is the analysis and design of mechanical systems, but the systems of interest are becoming increasingly complex. The ability to generate long-term weather forecasts has many socially and economically important consequences, and, at its core, this problem is governed by complex hydrodynamical phenomena arising from the interaction of different elementary processes at the atmosphere-ocean interface. Likewise, the development of robots that demonstrate autonomy in a changing environment will be of great importance to many fields. The interaction of robots with their surroundings is extremely complex and requires a modeling approach to be fully understood.

We wish to use the concepts and methodologies of complex systems science as they apply to complex mechanical systems. The combination of these fields would constitute complex systems engineering. Our specific research interests are as follows:

1. The modeling and analysis of complex mechanical systems
   (1) Derivation of a reduced order model of complex systems
   (2) Analysis of the adaptive functions of complex systems

2. Control and design of complex mechanical systems
   (1) Stabilization control of the complex systems based on the reduced order model
   (2) Development of autonomous robots
   (3) Development of novel machine interfaces with adaptive functions

3. Study of the basic mathematics of complex mechanical systems engineering
   (1) Development of new analytical methods based on stochastic calculus
   (2) Development of new model reduction methods
   (3) Study of inverse problem analysis as the basic mathematical basis of design theory

3. Education program for young researchers
One of the primary roles of the 21st Century COE Program is to develop superior young researchers in their chosen fields. In this program, we will employ Kyoto University's tradition of on-the-research training to develop young researchers with broad perspectives highly specialized skills and the ability and courage to act as trailblazers in novel fields of study. Various new systems and programs will be prepared for this purpose.

(1) Joint Interdisciplinary Research Program
To improve the research capabilities of those in the doctoral course, we will prepare and broaden a system to promote education as a joint act of the teacher and student in conducting research, examining a variety of viewpoints, and deciding upon experimental objectives and procedures. In addition to the joint research that has occurred in the past under the tutelage of a single instructor, a new system designed as the Apprenticeship is being established. In this program, a young researcher is allowed to participate in joint research unrelated to the department to which he or she belongs, including overseas research projects, for a set period of time. In addition, the student will be given opportunities to interact with instructors in other disciplines and participate in their research.

(2) Fellowship Program
Young researchers, post-doctoral research fellows and graduate school doctoral students, will be provided with comprehensive support for their research activities, including expenses for research, travels associated with joint study, and domestic and international conferences, so that they will be able to focus on their high-level research as independent researchers.

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Modeling

- Reduced order model for estimation or control
- Control Stabilization of unstable structures

Analysis

- Analysis of Adaptation response to environment
- Design of machine with adaptation function

Design

- Hard to predict or control due to unstable structures
- Adaptation response to environment by altering internal structures

Complex Mechanical Systems

- Containing Unstable Structures

Mechanical Engineering for Complex Mechanical Systems
バーミンガム大学紹介

イングランド中部のMidlandshireにあるBirmingham市が連合王国第2の都市であることにより、地理的に有利であり、大学としての地位も高いです。バーミンガム大学は、1900年に設立され、現在では約3万学生が在籍し、様々な学部や学科を提供しています。

1900年にバークヒル大学（Buckhill University）として設立され、1900年にBarber Institute of Fine Artsが開設されました。バークヒル大学は、今でも大学としての地位を保っています。

1900年にバーミンガム大学地理学研究班のレクチャーとして採用され、1998年に京都大学に高任されるまで研究と教育に携わった。中心街から約5キロ離れたEdgbastonは日本にあっては仰天するほど大きなレンガ造りの建物が建ち並ぶ街で、その一角にある定冠詞の付きのThe University of Birminghamは1900年に創立された旧制大学（Old Universities）の一つであり、学部生約17,000名、大学院生約8,000名のキャンパスが美しい総合大学である。

大学の中心にあるBritish Rail（BR）の「University」駅が、また、東南にはBarber Institute of Fine Artsと呼ばれる小さな公園があり、モネ、マネ、ロゼッティ、ゴッホなどの絵画を多く所蔵している美術館がある。その美術館に隣接している音楽科では、かつて英国の占領を皮切りにしたソノナの碑の建立が計画されている。

その隣のWatson Buildingが数学統計学科の建物である。Watson Buildingはラプラス変換法に関する「ワトソンの定理」のGeorge Neville Watson（1866-1950年）が教授をしていた。

その南にあるUniversity Centre Buildingが科学総合学科の建物である。University Centreは、地理学、社会学、政治学、経済学、歴史学、哲学科の下に置かれている。

3 Days of Memories in Japan

Nguyen Pham Hong LIEN
International Doctoral Course
Department of Urban and Environmental Engineering
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When I first arrived in Japan, I was impressed by the article of Professor Junzo Ishikawa in one of the Graduate School of Engineering’s newsletters. According to his experience in England, "International exchange, in its truest sense, is to study and understand the culture of a country different from one’s own." This is the first time for me to come to Japan but the second time for me to study abroad. So, I believe that too. Shortly after having read that article I was lucky to join a trip organized by...
the Graduate School of Engineering.

It was a cold, rainy day in the middle of November when we started our 3-day trip. Waiting for the Shinkansen train at Kyoto station, all the 30 members from different countries appeared very excited. I was glad to learn that I would be sharing a room with 3 girls from Sri Lanka, Korea and Thailand during the trip. On the train we began talking actively in groups.

Kenrokuen Park looked beautiful despite the rain. It was the first stop of our journey in Kanazawa and is one of the three most beautiful walk-around style gardens in Japan. I had never expected to see cherry-blossoms in autumn, however I was able to see them for the first time in Kenrokuen Park. Following lunch we enjoyed a gold-leaf craft class, and spent 2 hours making our own handicrafts. My Korean roommate Moonjeong appeared to be very good at this craft. As for myself, I was also happy with my ‘art product’, planning to take it back with me to my home in Vietnam.

We visited Shirakawa, a World Heritage site, and stayed one night in ‘Gassho’ houses. I particularly liked the unique style of these houses which have been maintained since the 18th century in this remote village. Surprisingly, it was very comfortable to stay in the house and learn about the Japanese traditional style of living. Outside it was raining and cold, but inside we were warmed by the charcoal fire and, more importantly, by the amicable talk among us.

On the second day, the weather was favorable for us - sunny and cool. We went to Takayama to enjoy the world of Japanese festival in Festa Forest. Later we walked around Takayama town and I realized why it is called ‘Little Kyoto’. The old streets, temples, shrines... all seemed to have been untouched by the passage of time. We had to leave at 2 pm but many of us took lunch in the bus since we just wanted to spend as much as time as we could experiencing Takayama.

Upon leaving ‘Little Kyoto’, our bus took us to the big city of Nagoya where, on the last day, we visited Nagoya Castle and had meaningful technical tours of the Toyota Plant and the Toyota Commemorative Museum of Industry and Technology. We played Bingo on the bus. Everybody won and received gifts except for me. To be the only one losing the game, I myself felt lucky since I was presented with a traditional Japanese cookie as a consolation prize. We reached Tokaien hotel after night had fallen. Everyone seemed to be hungry and it was the right time to have dinner. A well-served Japanese party in a big room welcomed us. That night, we experienced a great evening of eating and singing karaoke together. It wasn’t until the following morning that I realized that the hotel was located right on the beach. What a beautiful sunrise!

After our journey, one member of the trip kindly gave me a video clip from that special night. Now, whenever I see the pictures and the video, it always reminds me of our unforgettable trip, and the nice friends from different countries that I got to know.

Thanks to the organization of the Graduate School of Engineering and the very kind guidance of the Japanese people who traveled with us, especially Professor Toshiro and Doctor Tanaka, we could experience this trip. It was not simple like sightseeing but rather an experience of Japanese culture. Please don’t miss the chance to catch this trip if you want to enjoy ‘international friends in Japanese culture’.

Money, Sex, Fear (and why I came to Japan)

Paul James Smith
Doctor course student
Department of Urban Management
Graduate School of Engineering

I am often asked why I left Australia to come to study in Japan. Well, it is said that the three biggest motivators of human behavior are money, sex and fear. I think there is more than just a hint of truth in this wisdom. In the case of my seduction to the land of the rising sun, it would be foolish to dismiss the notions that money and sex played a role. They probably did. The Ministry of Education was at the time generously offering to support my studies, for which I continue to be extremely grateful, and it must be admitted that Japanese ladies are among the most beautiful women in the world.

But, let’s not forget, we have post-graduate financial support back in Australia, and by no means are we in short supply of gorgeous women - so no, surely money and sex were not the decisive factors. In retrospect, it was fear that was the clincher. Yes, I was scared that if I stayed in Australia for much longer that I would go stale. Australia, often referred to as ‘the lucky country’, is indeed a wonderful place to grow up and live, but it had become my comfort zone, and I knew it was time to leave to seek stimulation and challenge somewhere new, where I could continue to grow as an individual.

Japan was the obvious choice as my new playground - for this is no ordinary country, but a dynamic nation that has over the last 50 years experienced one phenomenally strange ride. Recent history has turned it into a peculiar yet fascinating land of contradictions. Japan has become a futuristically-sexy high-tech nation coordinated by a society still rooted to the traditions of the past, a land where the geisha quarters of Ginza are giving way to Starbucks cafes, a country influenced by the rigid ideals of the martial spirit and the simplicity and naturalness of traditional arts and yet fielding the blondest football team in World Cup history. Have the forces of globalization left Japan with an identity crisis? It seems only now that the country has found the time to stop and catch its breath, and is likely also wondering where this period of phenomenally rapid change has taken it. No wonder so many books have been written about Japan, it is a fascinating, if not peculiar place to be.

Japan’s future promises not to disappoint either. As the government grapples with economic problems, as society learns to cope with its aging population, as the commercial sector peers over the horizon at rapidly expanding East Asian markets, and as this country that has renounced war as a sovereign right arguably finds itself on the verge of having to choose whether or not to again become the leading military force in the region, I can’t help but wonder about what’s in store over the next half century for this amazingly intriguing society. For those of us who fear change, this rapid transformation may be disconcerting. Me, I fear constancy.

If nothing ever changed, there’d be no butterflies — unknown
日本留学フェア（韓国）&日韓共同理工系学部留学生推進フェアに参加して

田中 和人
元機械工学専攻 講師

【日本留学フェア】

日本留学フェアが2004年9月10日に豊山で、12日までに開催されました。本フェアは、2004年4月、日本教育在、日本国際教育交流会、内外学生の協力、国際交流会、関西国際交流会が合併して独立行政法人となった日本学生交流機構の主催で開催されるものであり、日本への留学を希望する韓国の高校生や大学院生などを対象にして、日本の各大学や専門学校、日本語教育機関がPRする場で、2004年11月24日に参加しました。京都大学からは、留学生センター・河合淳子先生、留学生課・辻野美里専門職員と筆者が参加しました。オープンセミナーだけでも30分以上もある盛んなイベントであり、豊山会場1328名、ソウル会場2560名の来場者があり、日本留学への関心の高さを感じました。

「どうしてうちの子供を京都大学にいれたいんです？」という親御さんから、「京都大学は国立大学だよ・は？」、「写真学科はありますか？」、「広告学科は？」、様々な方がブースを訪れましたが、皆熱心に質問されていました。聞いた内容を逆に、日本の親御さんが熱心で、日にもかかわらず何千やそろって相談にこみかみ方もおられました。ただ、熱心な方からは、「京都のHPには必要な情報が何も書いてない」と「先生さんがメールアドレスが載っていないので問い合わせがつかない」と「特別選抜の過去の試験問題を公開して欲しい」との要望がありました。国際交流を通じて、日本留学の環境を望まれるところです。メールアドレスに関しては、公開することによるメリットが慎重になるあまり、公開に対して積極的な現状を改善し、アドレスの表示を簡素化するとして積極的に公開する必要がありますと思います。また、韓国においては京都大学の名前があまり知られていないことを目的に、今後優秀な留学生を確保するためにも、留学フェアへの参加をぜひとしてPR活動を積極的に行う必要があると感じました。

【2004年度日韓共同理工系学部留学生推進フェア】

日韓共同理工系学部留学生プログラムの推進フェアが2004年10月2日に慶應大学（ソウル）で開催されました。このプログラムは2000年度から始まり、1998年、当時の金大中大使館と小泉首相による日韓共同宣言に端を発するものです。韓国の高校生を1年間の予備教育（韓国で6ヶ月、日本で5ヶ月）の後に、日本の理工系の国立大学において学部学生として受け入れ、最先端技術・知識の習得を可能にするととも、留学生交流を通じて日韓の相互理解を深める目的で進められています。現在、京都大学では、第1期生である4回生の5名をはじめ計21名が学んでおり、全国に500名程度の留学生が勉学に励んでいます。

本推進フェアでは、第6期生を含む4学部15学科の留学生が、何処の大学を希望するかを決めるため、日本の27大学から250名程度の国立大学関係者が説明に赴き場を設けました。京都大学のブースには選抜試験合格者50名うち成績の良かった者30名程度が選ばれ、工学部および農学部の各学科で学べる内容について熱心に質問されていました。特に、「成績が悪いのが、どうして京都大学に行きたいか」と説明する学生もあり、筆者は注目しながら学びたい面もありました。

国際交流日誌（2004年8月1日〜2005年1月31日）

| 9月30日（木） | ストックホルム王立工科大学 Prof. Anders Hult（Dean, Chemistry and Chemical Engineering） | 1名 |
| 10月13日（水） | 平成16年度博士後期課程総合工学特別コースガイダンス |
| 11月11日（木） | 電気系留学生パーティ開催 |
| 11月15日（月） | 中国科学技術副部長（副大臣）他3名学術に関する意見交換 |

| 11月15日（月）〜17日（水） | 特別コース見学旅行 | 1年 | 2005年 |
| 1月20日（木） | 推進大学学術交流事業VCCコーディネーター会議 | (於 クラウルブル) |
| 1月20日（木） | 推進大学学術交流事業MOEコーディネーター会議 | (於 京大) |

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