



工学研究科附属グローバルリーダーシップ大学院工学教育推進センター(GL教育センター)の取り組み



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平成24年4月より、榎木哲夫先生の後を受けてGL教育センター長をお引き受けした。もちろんGL教育センターの存在もその活動も知っているつもりでいたが、実際、その活動に参加し、現場を肌で感じてみると、センター業務の重要性を再認識するとともに、至らぬところも随所で感じている。

センターの活動は、多くの教員の皆さんが日常精魂を傾けておられる教育研究活動とはオーバーラップの少ない場で行われている。附属環境安全衛生センターや情報センターについては、実験の安全対策や情報通信環境の整備などで、その活動を身近に感じることができるが、GL教育センターの場合には、そうはいかない。紙面をいただいたこの機会に、ぜひセンターの取り組みをご紹介します。

工学研究科では、平成20年度に二つの大きな教育改革が実施された。その一つは、新教育プログラム(博士課程前後期連携教育プログラム)の開始であり、もう一つがGL教育センターの設置である。その背景には、研究分野の学際的な融合教育と大学院での共通教育を促進する意図があった。

各専攻では、専門教育や日常的教育研究活動により、深い専門知識・優れた実践能力をもつ人材を育成している。しかしながら、社会のニーズ、学生のニーズ、さらには工学研究科が定めたカリキュラム・ポリシーやディプロマ・ポリシーを充たすためには、大学院生を対象とした共通教育や国際化対応教育など、研究科全体として行うべき教育がますます必要になっている。GL教育センターはこのような共通教育の実施を支援し、さらに留学生支援や国際交流を推進する役割を担っている。

工学研究科には2000名以上の大学院生が在籍しており、その中の400名弱は留学生である。GL教育センターが、この巨大な数の学生全員に教育科目を提供することは明らかに無理である。しかし、これから実社会で科学技術を基盤とする研究者・技術者として活躍しようと志す諸君に対して、彼等が必要とする教育の機会を与える役目がセンターに課せられていると思う。

もう一つの観点は、教育改革・改善の実質化である。これまでに工学研究科では、文部科学省の支援を受けて、さまざまな教育改革プログラムや教育支援プログラムを実施してきた。先端技術グローバルリーダー養成プログラム、大学院教育改革支援プログラム、理数学生応援プロジェクト、さらに留学生育成のための経済産業省「アジア人財資金構想」高度専門留学生育成事業などである。しかしせっかくの改革・支援もプロジェクトの終了とともに消え去るのでは、関係者の努力も無に帰してしまうのである。これらの教育プログラムで蓄積された実績と経験から、共通教育として良いもの、必要なものを抽出し、Good Practiceとして引き継いで、しっかりと工学に定着させることがGL教育センターの大きな役割といえる。

京都大学全体として、現在、学部 of 全学共通教育や大学院の共通教

育、語学教育の充実、国際交流の促進がしきりに議論されているが、学部間の意識の違い、組織の大きさから、なかなか検討の域を出られないのが現状である。上述のように、工学では全学に先駆けて教育改革に取り組み、その結果、初年次教育のように、全学の取り組みに拡大されるケースも出てきている。GL教育センターで行うGood Practiceの実践活動が、試行で始まった教育改革・改善を実質化に導く確かな道となっている。

GL教育センターでは次のような活動を行っている。

1. 工学研究科の共通教育・語学教育の実施・支援
 - ・日本人学生・留学生を対象とする英語コミュニケーション教育
 - ・「知のひらめき」等、大学院共通教育の実施・支援
 - ・留学生向けの日本語教育(国際交流センターが実施)の支援
2. 工学部の共通教育の実施・支援
 - ・工学部共通教育「工学序論」等の企画・実施
 - ・日本人学生を対象とする英語コミュニケーション教育
3. 留学生に対する教育指導・支援活動
 - ・予備教育/入学後の研修、見学、相談、奨学金面接等
 - ・留学生のキャリア指導、就職支援等のキャリアサポート活動
4. 留学フェア、日韓理工系留学生、国際交流関連会議等への出席
5. 産学連携研究型インターンシップ等の実施と産業界との連携
6. 文部科学省国費外国人留学生(研究留学生)の優先配置を行う特別プログラムの企画・実施支援
7. 工学部・工学研究科が実施する教育研究活動情報の収集・分析への協力

GL教育センターの教員が提供しているいくつかの講義に参加してみると、英語プレゼンやディベート演習、企業から招いた講師による世界体験談、先輩OBとの交流会など、素晴らしい内容が学生に提供されている。ぜひ自分の研究室の学生にも受講させたいと思うほどであるが、残念なことに参加する受講生が少ない。GL教育センターからの情報発信、広報活動の不足を痛感している。工学部・工学研究科の教育制度委員会と連携しながら、教育内容の向上を図りつつ、より多くの学生がセンターの教育サービスを受受できるように努力を重ねていきたい。



GL教育センターのJuha Lintuluoto講師(ユハ先生)による大学院共通科目「科学技術国際コミュニケーション演習」の授業風景。主に日本人学生を対象に英語プレゼン能力、コミュニケーション能力の養成を行います。

A Bilateral Research between Hungary and Kyoto University



Jun Kawai

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Department of Materials
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The bilateral research project between Hungarian Academy of Sciences (MTA, Magyar Tudományos Akadémia) and the Japan Society for the Promotion of Science (JSPS), which I participated until March 2012 originates from 1984. Takeshi Mukoyama, now an emeritus professor, Institute for Chemical Research, Kyoto University, visited Hungarian Academy of Sciences in 1984, and discussed the possibility of joint research between ATOMKI (Institute of Nuclear Research, Hungarian Academy of Sciences, Debrecen) and Kyoto University. Debrecen is a Kyoto-like city in Hungary; the second largest city and was the capital of Hungary.

The bilateral project, on “Inner-Shell Ionization and its Application”, started in 1987, and totally eighteen Hungarians visited Japan through the JSPS at that time. Parenthetically, I visited DDR (East Germany) to attend the “13th International Conference on X-ray and Inner-Shell Processes in Atoms, Molecules and Solids”, when I was the first year doctoral course student of the University of Tokyo in 1984, I was waiting in a line in Leipzig Hauptbahnhof (main railway station) in order to exchange money (I just arrived early morning from Warsaw by way of Krakow, because I landed in Warsaw for the cheap air ticket. It took one week to arrive at Leipzig from Warsaw, staying at trains and youth hostels in Poland), I heard Kansai-district Japanese behind me in the line. It was Dr. Mukoyama. I met him for the first time there. He visited Hungary and then came to East Germany. East Germany, Poland, and Hungary, were at that time the other side of the “Iron Curtain”, which separated the Eastern and Western countries during the Cold War.

Many Japanese visited Hungary during 1992-1993 on JSPS research project on “Inner-Shell Ionization Processes and its Application” (representative was Prof. Mukoyama). The “First International Workshop on Discrete Variational $X\alpha$ Molecular-Orbital Method”, Debrecen, Hungary, was organized by ATOMKI and Kyoto University (Department of Metallurgy) in 1996. The proceedings book was published as the Vol. 29 of “Advances in Quantum Chemistry” in 1997, one of the guest editors was myself. This volume was a thick book (pp.481) published from Academic Press. Then the joint research was continued, 1998-2000, on “Chemical and Solid State Effects in X-Ray and Electron Spectroscopies”. The representative person changed to Prof. Adachi, Department of Materials Science and Engineering, Kyoto University, on an occasion of the retirement of Mukoyama, and then the project was on the “Materials Design by Quantum Chemistry”. The joint research became extensively including Osaka University as well as the International Institute for Advanced Studies (the Representative of the MTA-JSPS bilateral seminar was Prof. J. Kanamori, a former president of Osaka University). In 2005, the bilateral research between ATOMKI and Kyoto University published the second book, entitled “Hartree-Fock-Slater Methods for Materials Science” from Springer (Fig.1), editors of which were

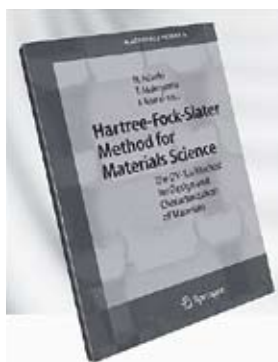


Fig.1 A book published from Springer as an outcome of our bilateral research

Mukoyama, Adachi, and Kawai. The MTA-JSPS bilateral research was once on “Molecular-Orbital Theory, Spectroscopy, and Environmental Monitoring”, and recently, it was the “Studies on Fundamental Parameter Database and Atomic Processes for High Precision Quantitative Analysis of X-Ray Photoelectron Spectroscopy”. The “fundamental parameters” mean the physical constants such as photoionization cross-sections, threshold energy, their chemical effect, angular dependency, as well as synchrotron radiation spectra for excitation. These physical parameters become important and we need more precise database including the solid state effects for the characterization of advanced materials. For this purpose, the fundamental parameters have been studied theoretically as well as experimentally using synchrotron radiation facilities in the world. Similar research project began at the same time for the fundamental parameters of X-ray spectroscopy by BAM (Federal Institute for Materials Research and Testing, Germany), PTB (Physikalisch-Technischen Bundesanstalt, Germany), LNE (Laboratoire national de métrologie et d'essais, France), and NIST (National Institute of Standards and Technology, U.S.A.). Kyoto University also joins these standard institutions. The bilateral research project between MTA and JSPS expanded to organize a workshop in Denver X-Ray Conference (DXC) at Colorado Springs, U.S.A., in 2011, and the audience was full of the room.

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Fig.2 Guest house of MTA in the Castle, Budapest

Figure 2 shows the guest house of Hungarian Academy of Science, in the castle of Budapest, where many Japanese researchers arrived in the late evening from Japan (not only from Kyoto but also from Nagoya and Waseda Universities as well as Nara Institute of Science and Technology in our bilateral research project), and started next early morning to Debrecen. Thanks are due to all these researchers and also Hungarian researchers who arrive at Seifu Kaikan after a long flight. Figure 3 shows Dr. László Kövér visited Kyoto University. Thanks are also due to MTA and JSPS for the financial support for many years to our bilateral research projects.

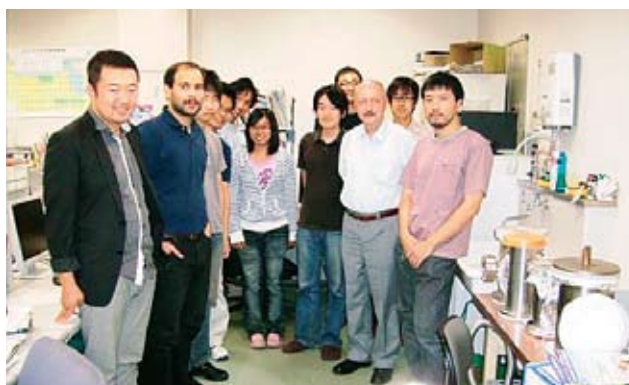


Fig.3 Dr. László Kövér from ATOMKI (second from right in the front line) and students (including from China, Bahrain, and Malaysia) in the laboratory in Kyoto University

2011年度後期にミュンヘン工科大学に 交換制度を利用して留学してまいりました



余田 拓矢

航空宇宙工学専攻 修士課程2年

留学するにあたって、その目的は人それぞれなのではないかと思えます。経験のために海外で勉強してみたいという人もいれば、研究の最前線が国外にあるという人もいます。また、日本ではあまり見かけない理由ですが、母国よりも仕事の上で有利などということもあるようです。私の場合は、「英語圏でない外国で勉強したい」と考えていましたので、知己がいたドイツ・ミュンヘンを選択しました。

現地では、ジェット推進やターボに関する授業とその演習、そして「外国人のためのドイツ語」の講義を受講しました。海外では、多くの授業が英語で行われている印象を持つ方も多いと思いますが、私が受けてきた授業はすべてドイツ語でした。大学や学科によって「どの言葉で講義を行うか」は違います。また、英語講義といっても、教科書、あるいは資料だけ英語で、講義自体は現地語で行われることもあるようですので、留学して授業を受けるのであれば、事前によく調べておくことをお勧めします。ちなみに、ミュンヘン市内ですと、大抵の場合英語で用を足すことができます。

留学した際、外国人向けの現地語の授業を取ることは非常にお勧めです。クラスメイトはお互いに留学生ということで親近感がわきやすく、すぐに友人ができます。言葉の練習をする上でも、「外国人」特有の悩み事を相談するうえでも頼りになる仲間になります。私もここで出来た友人とよくビールを飲みに行ったり、遊びに出かけたりしました。

授業を受けた印象では、日本の大学のレベルとそう大差ない印象を受けました。特筆すべきは、毎週のように専攻で講演会が開かれており、大学や研究機関の研究者や企業のエンジニアの方が来校されて、最前線に関するお話をされていたということです。私がいた専攻ですと、例えばSiemens、BoeingやAirbusといった有名企業の他、ドイツ空軍やNASAの研究者からの講演もあり、大学にいながらにして、今企業や研究者はどこに向かおうとしているのかを窺い知るいい機会になりました。

留学で初めて行く場所・環境は試行錯誤の連続になります。しかしながら、自分と全く異なる常識や考え方をを持った人と交流することで世界が広がります。多くの人が国外に出て、自分の新しい世界を切り拓いていけるといいなと思います。



ドイツ語の授業にて クラスメイト達と

The Trip for Newly Admitted Foreign Students



Si Yuan Bian

地球工学科 学部1年

On the day of April 21, 2012, a few days after the admission to Kyoto University, I had the opportunity to take part in a trip organized by the Faculty of Engineering of Kyoto University, designed for us newly admitted foreign students to provide us a better understanding of Japanese culture and fitting quickly into the society.

Gathered at the famous Tokeidai, we first attended a lecture about our destination and details of the day's schedule, things to pay attention to so that we could make sure of our safety. Later, we headed to our bus and our trip began.

The first stop was at a place where the famous "yatsuhashi" is made. We were warmly greeted by the owner and divided in groups so that we could actually make this delicious food. To be honest, I was a little surprised when there were actual materials on the table because I only expected this trip more like a touring one, and never thought that we could actually experience the whole process in real. But I was proved wrong. Before this experience, I was astonished by how delicate "yatsuhashi" is and I have always thought that the making process would be very difficult. But it turned out to be quite simple, but still difficult to make it as beautiful as the ones to be sold in the shop.

When we finished our "work", we tasted "it", still very delicious, although not very beautiful in shape. It was a joy to eat the food made by ourselves. But what's more, I felt I was part of the culture, and it was fascinating.

About half an hour later we were at our neighbor city- Uji, famous for its tea and a World Heritage site. We definitely did not come for the tea, so the Byodoin became our second destination.

The temple was originally built in 998 in the Heian period by one of the most powerful members of the Fujiwara clan. The most important building is the Phoenix Hall which is surrounded by a scenic pond. There were also museums and I was touched at the sight of the ancient culture of Japan. It was so peaceful yet with a high level of dignity and in a way, beautiful.

Just as I thought that the trip was about to get boring I was proved wrong, again. We arrived at a place more like a school, where the skills of stencil painting is taught. I personally think that it was the best part of the day. The painting was made in steps where we covered the textile and painted the uncovered part, which was cut into specific shape so that all the parts were made up a picture. I was not very good at painting so at first I was quite worried, but when I found out that no painting skills were required, I was relieved and at the same time impressed by the wisdom that made the whole thing so attractive.

The return journey needs no more words. In all, I was very impressed by the trip, one that allowed me to see, to feel, and most importantly, to be a part of it. For us foreigners, we seldom have the chance like this to be so close to the country, or people that we barely know anything about. But this trip enriched my life experience, my knowledge, and opened a door for me so that I could look deeper into the Japanese culture.

International Joint Research on High Resolution Digitization of Asian World Heritage



Ari Ide-Ektestabi

Professor
Department of Mechanical Engineering
Graduate School of Engineering

In 2009, a project sponsored by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan Special Coordination Funds for Promotion of Science and Technology, Asia-Africa Science and Technology Strategic Cooperation Promotion Program, was organized and lead by the Graduate School of Engineering, Kyoto University. The aim was to organize an international research group which would do research on the application and further development of state-of-the-art technology for digitization, analysis and displaying of two-dimensional cultural heritage. The technology would be applied on the site for the cases of the world's most important cultural assets.

The imaging techniques that were developed, which are fast and practical for digitizing large objects at high to ultrahigh resolution, can be summarized as follows:

- High to ultrahigh resolution trichromatic scanning with color difference of about 1.0-1.5 (the commercial cameras are 5-9 or worse)
- Near infrared scanning (780-1000nm)
- Monochromatic multi (hyper) spectral imaging (8 bands or more)
- Trichromatic multi (hyper) spectral imaging (15 bands or more)
- High resolution polarized light scanning for metallic and shiny surfaces
- Transmission light (and reflection light) scanning
- 3D shape and color reconstruction using a 5-axis (5 degrees of freedom) scanner



The international network and joint laboratories

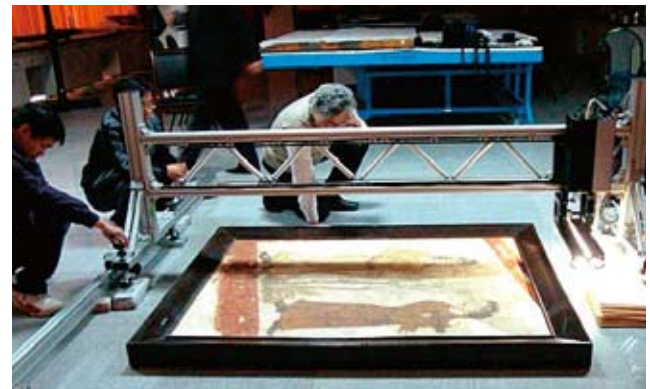
Up until the end of 2012, more than 30 systems were already developed and are being used in Japan, Europe, Asia and Africa on cultural heritage sites and museums, which include users from more than 50 universities, museums, and broadcasting organization. The large-sized cultural heritages that were documented by these technologies include a wide range of Japanese, Chinese, Egyptian, Korean and European objects. Some of the projects that have been successfully completed recently are:

1. The mural paintings of Tang Dynasty in China
2. Heritage assets in Palace Museum in Beijing
3. UNESCO world Heritage, Kannonodo, Ninnaji Temple
4. Paliotto of Pietro Pifetti in Torino
5. Collection Design Plans of Titanic in UK

To date, we have already digitized more than 6500 large objects at high to ultra-high resolutions, probably the world's biggest digital collection of large objects. At present, many of the world's important cultural heritage assets are under continuous threat of being extensively destroyed by wars, poverty, ignorance and natural disaster. This is driving all the relevant international cultural heritage agencies to be more determined in scientifically recording and preserving these human assets. As a result of this project and its sustainable activities, from 2011 our group in Graduate School of engineering has been supported by Official Development Assistance Grants for UNESCO Activities for educating and training young scientist in the field of application of state-of-the-art technology in cultural heritage in China and Philippines.



Educational program for young scientists at Xi'an Jiaotong University



Digitization of Mural Paintings of Tang Dynasty at Shaanxi History Museum

国際交流日誌 (平成24年4月1日～平成24年9月30日)

- 4月21日(土) 新入学留学生対象研修旅行実施
7月16日(月) JSPSアジア研究教育拠点事業 第3回ステアリング委員会開催(於:マレーシア・マラヤ大学)
7月31日(火) 釜山大学(韓国)工学部長一行の訪問(於:京都大学桂キャンパス)
9月2日(日) 平成24年度日韓プログラム留学推進フェア参加

The Committee for International Academic Exchange, Graduate School of Engineering, Kyoto University, Kyoto 615-8530, Japan

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