EKC2010

EU-Korea Conference on Science & Technology 2010

29-31 July 2010 Vienna, Austria
The Imperial Riding School Renaissance Vienna Hotel

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Message from EKC2010 Chair

Dr. Man-Wook HAN

President
Korean Scientists and Engineers Association in Austria

Dear distinguished guests and participants of EKC 2010 and members of Korean Scientists and Engineers Association in Europe, Welcome to Vienna and EKC 2010!

On behalf of Korean Scientists and Engineers Association in Austria and organizing committee, it is my honor and pleasure to welcome you to EKC 2010 in Vienna. After the successful EKC 2008, Heidelberg in Germany and EKC 2009 Reading in UK, EKC 2010 is held in Vienna from July 29 to July 31, 2010. EKC 2010 will give an opportunity to build a network amongst Korean Scientists and Engineers in Korea and Europe. About 250 scientists and engineers participate in EKC 2010 to foster the collaboration between Korea and EU and to exchange their expertise. Vienna, of Austria is a profound city of art and music boasting in its long tradition of theatre, opera and arts. However Austria is also noted for its science and technology. One of the most exported products from Austria to Korea is a passenger car. Most ski lifts and cable cars are designed and produced in Austria. In the beginning of the establishment of POSCO, the Austrian company VOEST was involved. There are famous Austrian Scientists and Engineers, like Erwin Schrödinger, Sigmund Freud, Viktor Kaplan, Meissner and others. According to the statistics of World Bank in 2009 Austrian GDP is USD 46,020 which means 7th place in the world. The European Innovation Scoreboard which measures the innovation performance of 27 EU member states ranks Austria 6th place in 2009. Based on the solid foundation Austria tries to become one of the innovative economies.

The headline of the EKC 2010 is **"(SCIENCE + TECHNOLOGY) x CULTURE"**. In EKC 2010 we are aiming to combine science and technology with culture. Also we try to appeal the Austrian Science and Technology to contribute the development of Korean Science and Technology. After three plenary talks a panel discussion with plenary speakers takes place. Also a special lecture on science and technology with culture is also planned. Onwards sessions, like Green Technology for sustainability, Bio/Health Technology, Physics/Nano Science, Information and Communication Technology, Science and Technology in Culture and also forums, like Energy Environment, Women in Science, Engineering and Technology in Europe, Medical & Dental students, and Young Generation are held. Gangwon Technopark and City Daegu will promote the technology partnering. Last year Dr. Sung Ja Chang gave an excellent speech we invite her for an encore speech. During the EKC2010, the Korean Federation of Science and Technology Societies (KOFST) will host symposiums entitled ñUltra-Programò with topics Environment & Energy and Bio-Science. There is a variety of expert presentations ranging from basic science to advanced technology at the EKC2010, giving you plenty of opportunities to exchange information and to become aware of current issues. I want to express my sincere thanks to organizing committee members, especially, Ki Jun Lee, President of KOFST and Soo Sam Kim, Vice-president of KOFST, Joon Woen Seok, President of VeKNI, Joung Hwan Lee, President of KSEAUK, and Chang Hoon Jun, President of AsCOF and to members of local organizing committee in Austria. To sponsors and supports of EKC 2010, I would like to give my cordial thanks. Without contribution and support of all parties concerned it is not possible to make this event successful. The Korean Scientists and Engineers Association in Austria (KOSEAA) is trying to do its best to make EKC 2010 a memorable event. I hope that you enjoy the conference and the stay in Vienna.

Thank you very much.

Man-Wook HAN
President of KOSEAA
Korean Scientists and Engineer Association in Austria

Welcoming Address from the President of the KOFST

Ki Jun LEE

President
The Korean Federation of Science and Technology Societies

President Seok Joon Weon of Korean-German Scientists and Engineers Association
President Lee Joung Hwan of Korean-British Scientists and Engineers Association
President Jun Chang Hoon of Korean-French Scientists and Engineers Association, and
President Han Man Wook of Korean-Austrian Scientists and Engineers Association

On behalf of the Korean Federation of Science and Technology Societies, and as co-chairperson of the EKC-2010 conference, I express my deepest gratitude to all distinguished guests and participants from Korea and from countries of Europe for attending this conference.

Ethnic Korean Scientists and Engineers!

Even it was regarded as a latecomer given its inception in 1998, the Korean-Austrian Scientists and Engineers Association has successfully served as a role model by introducing various, ongoing academic programs and activities. In addition to organizing the academic conference twice a year, the Association has garnered huge support and credence from the ethnic Korean community for its program that introduces Korean S&T to students at the Korean Schools. I would like to take this opportunity to appreciate the Association for playing such a significant role in promoting S&T cooperation between Korea and Austria.

All the ethnic Korean Scientist and Engineers!

One of the most important missions of the KOFST, the Korean Federation of Science and Technology Societies, is to bring strengths and abilities of ethnic Korean scientists and engineers together. I expect this EKC-2010 conference in Vienna, the third following the ones in Germany 2008 and in the UK 2009 will be an invaluable opportunity for scientists and engineers not only to share ideas and experties but to explore ways of cooperation in science and technology. While Europe needs to facilitate exchanges with the S&T human network of Korea, Korea is in need of promoting its outstanding capacity in science and technology to Europe. To this end, I hope this conference will serve as a platform that encourages mutual understanding between Korea and Europe, and every one of you will play a pivotal role in more active collaboration between the two.

As a co-host of the EKC, the KOFST will make its utmost effort to facilitate the science and technology development and collaboration among the Korean societies. Now the festival for Korean scientists and engineers in Europe is begun, and I hope that there will be lively exchange of ideas and expertise on various fields of mutual interest. Finally, I would like to convey my gratitude to president Han Man Wook, and all the staffs of Korean-European Scientists and Engineers Association, for their endeavors in organizing such a meaningful event. I sincerely hope that all distinguished guests and participants will have a memorable time in this conference.

Thank you

Ki Jun LEE
President of
The Korean Federation of Science and Technology Societies

Ambassador's congratulatory and welcoming remarks

Yoon-joe SHIM

Ambassador
Korean Embassy in Austria

It is my great pleasure to welcome the Korean scientists and researchers based in the European Union countries to Vienna on the occasion of the third EU-Korea Conference on Science and Technology (EKC). I would first like to extend my sincere gratitude to the organizers for their hard work and support, as well as to the scientists and researchers whose ideas and projects will be presented here, and the members of industry in attendance.

Since its inception in 2008, the EKC has served as a venue for European-based Korean scientists and local industry to exchange ideas and network with one another in order to contribute to the development of Korean scientific expertise. As the EKC has led to the blossoming of many relationships between European and Korean scientists so far, I hope that this year's conference will build on past achievements, further expanding EU-Korean friendship and cooperation in science and technology.

The theme of this year's conference is ***(Science + Technology) x Culture.*** The inclusion of a cultural aspect to the conference, I believe, is a perfect fit for Vienna. When we think of Austria, we immediately associate it with its cultural legacies: Mozart, Strauss, Freud, and perhaps even Falco, the famous Austrian pop musician. Austria's renowned cultural and musical offerings have drawn many young Koreans to this country in order to study music, among other things.

Austria, however, boasts comparative advantages in other areas as well. Its centralized location in the heart of Europe has led Austria to become a hub of international diplomacy and regional integration, as attested to by the large number of international organizations which have their headquarters here. Since the end of the Cold War and the expansion of the European integration project, Austria's strategic position as a gateway to Eastern Europe has also been strengthened.

More importantly, Austria has made major contributions to science and technology. With a long tradition of scientific innovation and technological development, Austria is one of the leading countries to grapple with the challenges of the 21st century. Austrian solar thermal firms are world leaders in their industry and the country has a progressive green energy policy. Renewable energies already constitute around 28% of Austria's total domestic energy consumption, with biomass power plants using local energy sources, for example, growing rapidly.

Capitalizing on its long and rich achievements, Austria's expertise has also found its way into strong bilateral science and technology cooperation with Korea. The relationship in the steel industry between Austrian VOEST Alpine and Korean POSCO dates back several decades. This robust collaboration between Korean and Austrian industry continues to bear fruit. For instance, most of the ski lifts at Korean ski resorts are imported from Austria and, Andritz Hydro, a Viennese firm, is significantly involved in Korea's Sihwa Tidal Energy project. Based on their strong ties, Korea and Austria have much to benefit from each other, both scientifically and culturally, and this event promises to tie the two together.

I hope that over the next three days the conference participants will not only develop new contacts, exchange ideas and learn from one another, but will also leave with a deeper mutual understanding of another's culture in order to herald a new period of cooperation– bilaterally, regionally and internationally.

SHIM Yoon-joe
Ambassador
Republic of Korea
Vienna

Conference Organizing Committees

Conference Chair:

Dr. Ki Jun LEE, KOFST President

Dr. Man-Wook HAN, KOSEAA President

Honorary Chair

Dr. Chang Shik CHUNG (former president of KOSEAA)

International Organising Committee

KOFST Vice President (Korea): Prof. Soo Sam KIM (Chair)

VeKNI President (Germany): Dr. Joon Weon SEOK

KSEAUK President (UK): Dr. Joung Hwan LEE

ASCoF President (France): Dr. Chang Hoon JUN

KOSEAA President (Austria): Dr. Man-Wook HAN

Program Committee

DI Chul Woo HYUN

Dr. Youn Joo HYUN

Dr. Myung Joo KANG

Dr. Jehyun LEE

Local Organising Committee

Mr. Gi Won CHUNG

Dr. Hye Suk CHUNG

Mr. Bo Sung KIM

Ms. Eun Young LEE

Dr. Gak Hee LEE

Dr. Sylvia LEE

DI Hongjoon LIM

Dr. Yu Song MOSCH-KANG

Dr. Yoo Jin OH

Dr. Jong Mun PARK

Dr. Hanna SHEU

Programme and Schedule

Day 1. 29 July 2010 (Thursday)		
hh	mm	**Ground Floor (Restaurant and Garden)**
15	00	Registration (at the registration desk, ground floor, next to the reception) and Room Check-in
17	00	
19	00	Registration (continued at the registration desk on the ground floor) / Welcome Reception
20	00	
21	00	Networking Night & KOFST and Associationsô Presidents (Green Technology, Bio and Health Technology, Physics and Nano Technology, ICT and MME, Science and Technology in Culture)
22	00	

Day 2. 30 July 2010 (Friday) 1st Floor Conference Halls								
hh	mm	**Rechte Pirouette**	**Linke Pirouette**	**Grosse Reitschule**	**Kleine Reitschule**	**Haute Ecole**	**Levade**	**Courbette**
8	00	Registration (1st floor, entrance of the conference main hall)						
9	00	Opening Ceremony				Exhibition & Recruiting Desks		
	30	Plenary Talk I: Dong-Pil MIN						
	55	Plenary Talk II: Matthias WEBER						
10	20	Plenary Talk III: Sunggi BAIK						
	45	Coffee Break (main hall)						
11	00	Panel Discussion				Exhibition & Recruiting Desks		
11	35	Special Lecture: Werner GOEBL						
12	00	Group Picture						
	15	Lunch (ground floor and garden)						
13	20	Green Technology for Sustainability I	Bio & Health Technology I	Round table meeting with Korea Science and Technology Leaders	Physics & Nano Science I	Exhibition & Recruiting Desks	Information & Comm. Technology	Gangwon Techno Park: Technology Partnering I
	40							
14	00							
	30			Coffee Break (main hall)				
15	00	Coffee Break (main hall)		Ultra Program I (Environment & Energy)	Coffee Break (main hall)			
	20	Young Generation Symposium	Bio & Health Technology II		Physics & Nano Science II	Exhibition & Recruiting Desks	Korean Scientistsô Assembly in EU I	Gangwon TP: Technology Partnering II
	40							
16	00							
	20							
	40	Coffee Break (main hall)						
17	00	(banquet setting)		Ultra Program I (Environment & Energy)	Physics & Nano Science III	Exhibition & Recruiting Desks	Korean Scientistsô Assembly in EU II	Gangwon TP: Technology Partnering III
	20							
	40							
18	00							
	30	Statements, Preview of EKC2011, and Best Paper Awarding						
19	00	Banquet						
20	00							
21	00							

Programme and Schedule

Day 3. 31 July 2010 (Saturday) 1st Floor Conference Halls								
Time		Rechte Pirouette	Linke Pirouette	Grosse Reitschule	Kleine Reitschule	Haute Ecole	Levade	Courbette
8	00		GT for Sustainability II			Exhibition & Recruiting Desks		
9	00				Encore speech			
	30	Science & Technology in Culture	GT for Sustainability III	Ultra Program II (Bio Science)	WiSETiE Forum		Mechatronics & Mechanical Engineering	
10	00							
	20							
	40							
11	00	Coffee break (main hall)						
	20	Young Generation Forum	Energy Environment Forum	Ultra Program II (Bio Science)	Medical & Dental Students Forum	Exhibition & Recruiting Desks	WiSTiE Networking	
	40							
12	00							
	20	Closing (ground floor)						
12	40	Lunch (ground floor and garden)						
14	00						KOSEAA general assembly	

Plenary Talk I

Chair (I-III) : Chang Hoon JUN (President of ASCoF, France)

Sharing Benefits of Knowledge for the Future of Humanity

Dr. Dong-Pil MIN

Chairman,
Korea Research Council of Fundamental Science and Technology (KRCF)

Korea started to take up the challenge of serious research and development in nuclear energy back in 1959. Thanks to the accumulated efforts of KAERI to develop its own nuclear technology in the 1980s and 1990s, Korea establishes its own peaceful technologies proficiently enough to become an exporter of nuclear power plants.

Today, our world is busy searching for new sources of energy. Since nuclear energy does not emit greenhouse gas, it presents us with a viable and a rather attractive alternative, except for the thorny problem of nuclear waste. Therefore, to use nuclear energy, we obviously need to search for more creative ways to generate nuclear power that is more effective and radiation-free. The demand for accurate nuclear data for more isotopes for a wider range of energy is higher than ever before.

Along this line of research, the Korean government launched an ambitious plan for an 'International Science & Business Belt (ISBB)' to encourage innovation in basic science. The plan includes the construction of a Rare Isotope Accelerator at a half a billion dollars. This accelerator will make possible investigation of the properties and usages of not only stable heavy ions but also unstable rare isotopes, enabling us to move into hitherto uncharted territories in nuclear science. The environment at the ISBB will be multi-cultural, and diversity of not only people but also intellectual quest will be celebrated.

However we are not yet well prepared to solve the global issues such as the diminition of CO_2 emission. We should improve the design of our global funding program as we work together for a common future, especially to share the benefits of knowledge around the world and to solve such global issues. This will help us come up with more efficient ways of utilizing our limited financial resources as we together seek sustainable socioeconomic development and answers to global problems.

In this talk, an establishment of the international platform called ‘Common Technology Platform’ is suggested to improve the structure of funding to research activities on the global issues.

Plenary Talk II

Success factors for the upgrading of a national research and innovation system

Institutional reform and innovation performance in Austria after the crisis

Dr. Matthias WEBER

Head of Business Unit,
Research, Technology & Innovation Policy
Austrian Institute of Technology (AIT)

Since joining the European Union in 1995, Austria has made major efforts to improve the performance of its national research and innovation system. This led to the introduction of a first generation of well-conceived policy initiatives in the second half of the Nineties. These efforts have been reinforced since the turn of the millenium, with a particular emphasis being put on institutional reform and simplification, a strong emphasis on quality in research and a sustained effort to increase both public and private R&D expenditures.

Apart from a major reform of the university system in 2002, the scattered agencies for applied research funding were brought together under the roof of the Austrian Research Promotion Agency (FFG) in 2004, and public research funding was not only significantly expanded, but also put on a more stable foundation. In addition, a number of new policy instruments were introduced, and existing ones revised. In particular, a tax credit system was introduced in 2002 and the successful competence centres programme was renewed in 2006. In order to exploit emerging opportunities in generic technologies and to deal with societal challenges in areas like mobility, sustainable development and energy supply, several targeted thematic funding programmes were established, both in generic technologies (e.g. ICT, nanotechnology, biotechnology, clean production) and in key problem-driven areas (e.g. energy, transport, environment, security). The initiatives at Federal level have been complemented by measures of several of the regional governments, mostly focusing on support to innovation. Currently, a revision of the national RTI policy strategy is being debated, aiming to ensure that Austria positions itself firmly among the innovation leaders in Europe after the end of the current crisis.

Overall, and in particular in comparison with many other European countries, Austria has been clearly a success story. This is not the least reflected in the expansion of domestic and in particular also foreign firms R&D investments in Austria. In general, research and innovation have also become more prominent in public debates, and the importance assigned to it for maintaining wealth creation and a sustainable lifestyle has been increasingly recognised.

Against the background of recent institutional and instrumental changes, the reasons for this apparent success need to be assessed with much caution, and in particular the role played by government policy in achieving this. Although Austria managed to improve its performance in terms of input and output indicators, several challenges remain to be tackled and are currently on the policy agendas. The most important of these future challenges concern the availability of qualified human resources in particular in S&T, the need to ensure that research and innovation help solving some of the most pressing societal challenges the country is currently confronted with, and finally to further improve the effectiveness and efficiency of the research and innovation system, for instance by making better use of public procurement, by achieving a better balanced portfolio of policy instruments, and by re-orienting the mission and strategy of the public research organisations.

Plenary Talk III

Talents and Creativity

Dr. Sunggi BAIK

President,
Pohang University of Science and Technology (POSTECH)

Science has brought civilization and advancement of human society, providing high quality of life to mankind. As the technology development and the demand for even further improvement snowballs in a circle, the need for well educated scientists and engineers has become a pressing concern. The scientists and engineers of the 21st century are faced with many issues affecting all world citizens alike, due to the strong forces of globalization. Therefore, the universal challenge of this era is to reconcile with these global issues by achieving sustainable growth through scientific and technological innovation. As the breeding ground of innovation, universities have turned to fostering *global* leaders of science fit to take on the global challenge, as well as putting more weight on research leading to inspiring breakthroughs. The speaker elaborates on the essential qualifications of global leaders in science and technology: talent, creativity and mastery of fundamentals. He also emphasizes the need to redefine the role and responsibilities of research universities. Some of the educational reforms on-going at POSTECH are introduced, including the opening of a gateway to the arts, which has successfully contributed to the Universityôs pursuit of providing a well-rounded education resulting in firm foundation of the fundamentals and comprehensive intellectual capacity. Many efforts are also made to add to the betterment of the regional community, the nation and ultimately, the mankind, by extensively collaborating with research and industry sectors to generate innovative findings and inventions.

Special Lecture

Expressive music performance under scrutiny: Computers help us understand a creative art

Dr. Werner GOEBL

University of Music and Performing Arts

What actually do famous pianists when they perform a musical masterwork? How do they shape the timing of the individual notes of the musical score to bring life to it and add their specific emotional meaning? In this talk, I will demonstrate the scope of novel computational approaches to the art of music performance and guide the audience on the exciting path from measuring CD recordings to visualizing individual music expression in an animated display (the ñPerformance Wormò) and teaching computers to automatically learn the intrinsic style of renowned pianists such as Vladimir Horowitz.

Did you know...?

National Flag

Coat of arms

- The official name of Austria is the óRepublic of Austriaô.
- Austria is situated in Central Europe and spreads over an area of approximately 83,858 sq km.
- Majority of the population in Austria is Roman Catholic, followed by Protestants and Muslims.
- The official language of Austria, followed through the country, is German. The other official languages are Slovene (official in Carinthia), Croatian (official in Burgenland) and Hungarian (official in Burgenland).
- The German name for Austria is Österreich, which means óEastern Empireô, referring to the time when Austria was a part of the Holy Roman Empire.

Green Technology for Sustainability

- Green Technology for Sustainability I (30.July, 13:20 ~ 15:00)
Chair : Jung-sik KIM (Loughborough University, UK)

1. **Wireless House: Energy Self-sufficient Building Solutions** *(keynote speech)*
   Robert WIMMER

2. **A Study on the Treated Sewage Water Source Two-Stage Screw Heat Pump**
   Young Soo LEE, Young Jin BAIK, Ki Chang CHANG

3. **Feasibility Assessment of Renewable Energy Systems for a Low Carbon City**
   Jaemin KIM

4. **Field report for renewable energy installation on household power needs in Germany**
   Doo-Bong CHANG

- Green Technology for Sustainability II (31.July, 08:00 ~ 09:00)
Chair : Doo-Bong CHANG (AR&T, Applied Robot & Technologies ltd., Germany)

1. **A Study on TiO_2 Nanoparticle-supported Mn_2O_3 Catalyst for Indoor Air pollutants - Ozone and VOC decomposition reaction**
   Jongsoo JURNG, Sungmin CHIN, Eunseuk PARK

2. **Process for Climate Change Vulnerability Assessment and Adaptation Strategies in Korea**
   Woo-Kyun LEE, Hyun-Ah CHOI, Sungjin YOO, Sungho CHOI, Han-Bin Kwak, GuiShan CUI

3. **Anthropogenic climate change in the zero-carbon era**
   Chihak AHN and Nick EB COWERN

- Green Technology for Sustainability III (31.July, 09:30 ~ 11:00)
Chair : Doo-Bong CHANG (AR&T, Applied Robot & Technologies ltd., Germany)

1. **Design of LCL filter for renewable energy sources using Bacterial Foraging Optimization**
   Jae Hoon CHO, Dong Hwa KIM

2. **Development of sustainable bioenergy recovery process by anaerobic treatment systems: anaerobic digestion, biohydrogen and bioelectrochemical system**
   Jung Rae KIM, Giuliano C. PREMIER

3. **Environmental Impacts of Facility Sharing Based on a Life Cycle Approach**
   Dowon KIM

4. **Determining Potential Areas for Mitigation of Climate Change Risks in Ho-Chi-Mihn City**
   Kiduk MOON

5. **Challenges to Reduce Climate Model Errors**
   Wonsun PARK

- Energy Environment Forum (31.July, 11:20 ~ 12:30)
Chair : Jung-sik KIM (Loughborough University, UK)

1. **Introduction of KNCPC (Korea National Cleaner Production Center)** *(keynote speech)*
   Jong Ho LEE, SungDuk KIM, JongMin KIM

Keynote Speech

Wireless House: Energy Self-sufficient Building Solutions

Dr. Robert WIMMER

Managing Director,
Center for Appropriate Technology (GrAT)
Vienna University of Technology

After decades of development and marketing efforts, passive houses have finally reached the mass market, especially in Central Europe. Following the successful demonstration of the passive house technologies and application of renewable materials for building, the research focus of the Center for Appropriate Technology (GrAT) has been expanded to the vision of ñwireless (energy self-sufficient)ò buildings. Along with the drastically reduced energy demand for the operation of passive houses, energy autonomous and self-sufficient building solutions have become technically and economically feasible.

The market of small-scale stand-alone renewable energy supply solutions is growing, which include PV modules, small and micro wind turbines, or power blocks. However, these systems in areas without grid connection are costly and often combined with lead acid batteries. The ñWireless Houseò project aims at the development of small scale systems for self-sufficient solar housing. The whole system is heat driven and therefore avoids conversion losses by directly addressing thermal energy services. The utilized technologies for power supply include concentrated solar power (CSP), medium temperature (MT) storage and biomass backup solutions. Thermal energy is being used for cooling and cooking, and electricity generation. Generated heat (~300°C) will be stored to be flexibly used for different energy services. If this concept proves its practical feasibility, it will be an important step in the development of affordable solar housing solutions succeeding the current passive house trend. Currently the implementation of the concept is being prepared e.g. for the demonstration project "Zero Carbon Village".

A Study on the Treated Sewage Water Source Two-Stage Screw Heat Pump

Young Soo LEE, Young Jin BAIK, Ki Chang CHANG

Department of New and Renewable Energy, Korea Institute of Energy Research, Daejeon, Korea

Since the temperature of treated sewage water is about 5℃ lower in summer and 5~10℃ higher in winter than ambient air, it can be used as a good heat source for a heat pump. In this study, a treated sewage water heat source HFC-134a two-stage compression heat pump, which has a rated capacity of 100 RT, was developed and installed in a sewage disposal plant. In order to design a system, steady-state simulations were carried out. The simulation model contains a high-stage compressor, a non-economized low-stage compressor, an economized low-stage compressor, expansion valves and heat exchangers. A high-stage compression was considered as a polytropic process, while a condenser, an evaporator, an intermediate heat exchanger and an economizer were modeled by UA-LMTD method with a counter-flow assumption. Operation results showed that the systemôs cooling and heating performance is higher than that of an air-source heat pump.

Feasibility Assessment of Renewable Energy Systems for a Low Carbon City

Jaemin KIM

Strathclyde Univ., UK

When adopting energy supply systems containing renewable energy technologies in a city, identifying demand/supply match and the best combination of the mixed energy systems is a challenging issue in terms of energy efficiency and carbon emission reduction. This paper presents an approach for the city-scale energy planning on the basis of demand/supply profiles. Statistical data and simulated data are used to predict energy demand profiles (e.g. electricity, heating/cooling, domestic hot water) of buildings and non-buildings in the city. Various renewable supply options such as biomass-fired CHP, new solar electricity/heating system, wind turbine, ground source heat pump etc. are deployed in a multi-utility complex. system optimization is carried out to find the best combination of systems.

Field report for renewable energy installation on household power needs in Germany

Doo-Bong CHANG

AR&T, Applied Robot & Technologies ltd., Germany

As recent topic, now, all of us, we are talking about energy, especially green energy. Green energy is a term describing what is considered to be environmentally friendly, some sources may use it interchangeably with renewable energy. In fact, most renewable energy power plants have less environmental impact than fossil and nuclear power plants . But what really scare the humankind is that the existing oil, fossil resource is decreasing rapidly down und the demand of energy because of new economical power countries like China or India is increasing exponential.

The power source like sun or wind has not problems like air pollution or exploitation of natural oil, gas or other earth power resource. If every household is able to supply their own demand themselves, the power utilities have big problem and new intelligent power technology will replace the existing power utilities.

In Germany the government controls and lead the power policy to this direction and the company AR&T offers three or four different kind of renewable energy like solar cell, solar thermo, wind and water or in combination of wood and oil technology.

This presentation shows the experience for the installing the solar power and wind power for individual house and, how the normal individual people accept, motivate themselves and realize the green energy in daily life. The technical innovation begins from small scale, namely our daily life and house. This report will be important not only for scientifical aspect but also for our future in all area of human kind.

A Study on TiO_2 Nanoparticle-supported Mn_2O_3 Catalyst for Indoor Air pollutants - Ozone and VOC decomposition reaction

Jongsoo JURNG[1,*], Sungmin CHIN[1], Eunseuk PARK[1,2],

1. *Environment Division, Korea Institute of Science and Technology (KIST), Seoul, Korea*
2. *Graduate School, University of Seoul, Seoul, Korea*

The catalytic conversion of toluene on MnO_x/TiO_2 catalysts was examined in the presence of ozone. The MnO_x/TiO_2 catalysts were prepared by a wet-impregnation method. A set amount of manganese acetate was dissolved in distilled water. The TiO_2 nanoparticles, as the support materials in this study, were synthesized by a thermal decomposition process. The generation of TiO_2 nanoparticles by the thermal decomposition of titanium tetraisopropoxide (TTIP) was carried out in an electric tune furnace. The TiO_2 nanoparticles were characterized by X-ray diffraction, Brunauer-Emmett-Teller measurements and transmission electron microscopy. Compared to the commercial photocatalyst (P25), the TiO_2 nanoparticles prepared at 900ęC had a small particle size (10.5 nm), pure anatase phase and a high degree of crystallinity with a dense polyhedral structure. The concentration of toluene was varied in the range of 20-100 ppm and the ozone to toluene ratio was increased from 1.0 to 15.0. The reaction temperature was controlled between 25-100ęC and the space velocity was fixed at 20000 h^{-1}. The CO_x selectivity was enhanced considerably by the catalyst supported on TiO_2 (thermal decomposition process) after injecting ozone. The activity of the catalyst depended mainly on the support used. The catalyst synthesized by the thermal decomposition process was found to be the most active support.

Process for Climate Change Vulnerability Assessment and Adaptation Strategies in Korea

Woo-Kyun LEE[1] , Hyun-Ah CHOI[1], Sungjin YOO[1],Sungho CHOI[1], Han-Bin KWAK[1], GuiShan CUI[1]

Division of Environmental Science and Ecological Engineering, Korea University, Seoul, Korea

Climate change has impacted various social and natural sectors as ecosystem, water resources, public health, natural hazard and disaster. Such impacts on various sectors should be assessed for preparing adequate adaptation strategies and measures to climate change. So far impact assessment has been performed separately by sectors, what keeps government from preparing integrated adaptation strategies and measures.

Climate change impact is bound to uncertainty in terms of time, place and form. This uncertainty should be solved by a model-based approach which employs same assessment criteria for all sectors and spatio-temporal information.

In order to enable central and local government to prepare adaptation strategies and measures and solve the uncertainty problem of climate change impacts, a GIS based spatio-temporal model for assessing vulnerability to climate change was developed and applied to whole Korean peninsula and a local area. We employed the same vulnerability assessment criteria as vulnerability was assessed by exposure, sensitivity, and adaptability for various sectors. And for quantifying the criteria, indicators were prepared by various sectors with the help of GIS-based saptio-temporal data set which is integrated in to raster data format.

Using the vulnerability assessment model, vulnerability of various sectors as forest ecosystem, water resources, public health (Malaria symptoms), natural disaster (forest fire, land slide, flood) to climate change was assessed for Korean peninsula and a local government. And adaptation strategies and measures could be suggested with the help of the prepared climate change vulnerability map (Figure 1).

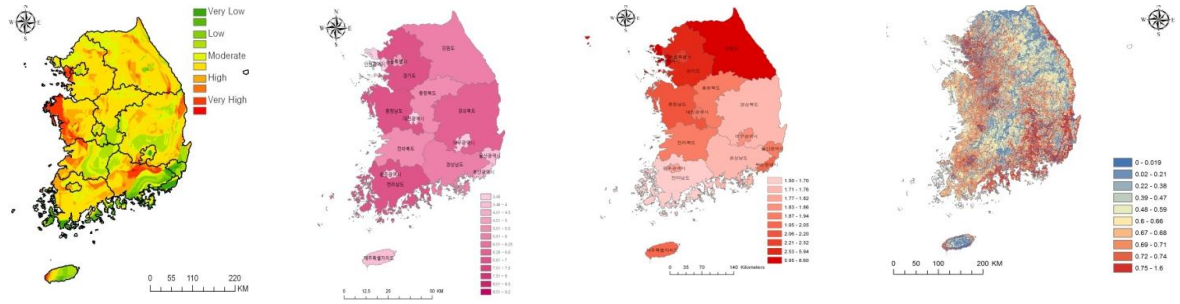

Fig. 1. Climate change vulnerability map
(a: forest ecosystem, b: water resources, c: Malaria symptoms, d: forest fire)

Anthropogenic climate change in the zero-carbon era

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Global warming is a result of ótemperature forcingô, the net imbalance between energy fluxes entering and leaving the climate system and arising within it. At present humanity introduces temperature forcing through greenhouse gas emissions, agriculture, and thermal emissions from fuel burning. Up to now climate projections, based on projected GHG emissions and neglecting thermal emissions, typically foresee maximum forcing at a date occurring from midcentury onwards, followed by a slow decline due to elimination of carbon emissions. However, under reasonable scenarios of growth in primary energy use, even if we switch completely to generation by zero-carbon fuel burning (nuclear or fossil with carbon capture) temperature forcing will be sustained and even increase through the second half of the century as a result of the additional heat injected into the climate system. A potential solution to this problem is to develop energy generation technologies that remove heat from the climate system, or as a temporary solution ódumpô heat in the deep ocean. Two such technologies, both relying on solar energy, are discussed in this paper.

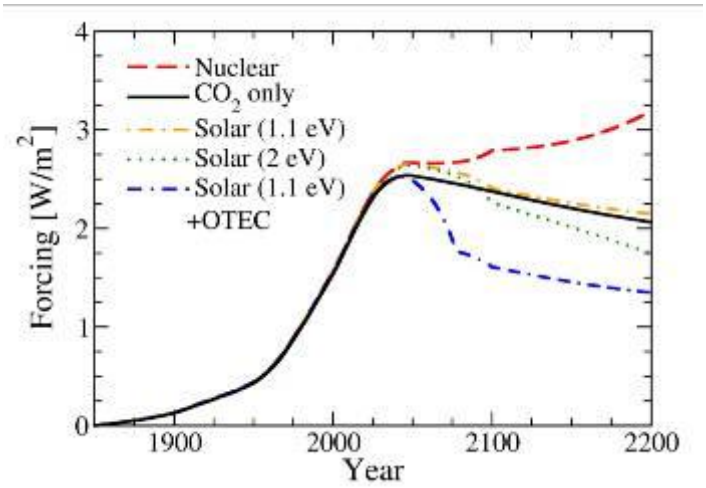

Fig. 1. Global temperature forcing versus time as a result of CO_2 emissions (black solid curve), CO_2 emissions plus thermal effects from solar generation using reflective thin-film PVs with bandgaps of 1.1 eV (orange chained curve) and 2 eV (green dotted curve). For the 1.1 eV bandgap value, collector albedo is 0.21, slightly below our assumed terrain albedo of 0.3, leading to a small positive forcing contribution. However, for the 2 eV bandgap, collector albedo is 0.54 thus introducing a negative temperature forcing contribution once PV becomes the dominant contribution to energy generation. Finally, we show the impact of ocean thermal energy conversion, assuming the same growth rate as solar up to a maximum of 20 TW (blue chained curve). In this case, temperature forcing is approximately halved over the 100 years following peak forcing, substantially reducing the magnitude of the forcing 'impulse' leading to long-term global warming.

Design of LCL filter for renewable energy sources using Bacterial Foraging Optimization

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As the traditional resources have become rare, renewable energy sources are developing quickly. The grid connected renewable sources is one of the most importance problem in smart grid fields. To reduce harmonic in

this grid, many filter techniques have been developed. Compared traditional L filter, a LCL filter is more effective on reducing harmonic distortion at switch frequency. So, it is important to choose the LCL filter parameters to achieve good filtering effect. In this paper, a design method of LCL filter by bacterial foraging optimization is proposed. Simulation result and calculate data are provided to prove that the proposed method is more effective and simple than traditional methods.

Development of sustainable bioenergy recovery process by anaerobic treatment systems: anaerobic digestion, biohydrogen and bioelectrochemical system

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The present wastewater treatment system has widely used aerobic process which consumes electrical energy for treatment. The aeration system has been concerned as energy price rise and produce solid waste in the form of sludge that need secondary disposal such as landfill and ocean dumping. Anaerobic treatment systems such as anaerobic digestion (AD), dark fermentation and bioelectrochemical system, however can convert organic contaminant in wastewater into useful energy including methane, hydrogen and direct electricity. The anaerobic systems using bacteria also can reduce the solid waste production by 10-50% in treatment, therefore reduce environmental impact and disposal costs. Anaerobic digestion has been commercialized in the form of centralized wastewater treatment system or decentralized agricultural and industrial waste reuse system. Dark fermentation can produce sustainable hydrogen for fuel cell by blocking methanogenesis. Microbial fuel cells (MFCs) directly convert biodegradable organic matter to electrical energy using a biofilm on the electrode as the biocatalyst. It has recently been shown that waste-to-energy technology based on MFC can treat organic contaminant in domestic or industrial wastewater and simultaneously produce electricity up to 1.6 kW/m^3. Bioelectrochemical systems have been applied into various areas such as bioelectrolysis, biosensor and desalination. The integration and combination of anaerobic systems reduce the energy consumption, and increase energy recovery of wastewater treatment systems, therefore increase energy sustainability of treatment process

Environmental Impacts of Facility Sharing Based on a Life Cycle Approach

Dowon KIM

University of East Anglia, UK

Although eco-industrial development (EID) is attracting increasing attention worldwide as one of the emerging alternative approaches to sustainable industrial development, the environmental benefits from EID have not been proved sufficiently. This study has been undertaken to explore quantifying the environmental impacts of inter-firm collaborations based on a life cycle approach. A life cycle approach enables all the environmental benefits and costs from cradle to grave to be integrated quantitatively and consequently diverse options can be compared for decision making. More specifically, this study focuses on facility sharing as one of

typical types of inter-firm collaboration based on two collaboration cases in Korea. Although facility sharing is considered to be economically beneficial to businesses due to its clustering effect, it has not been clear whether the clustering effect can reduce energy and material use. In addition to the quantified environmental impact of facility sharing, key implications from the analysis to improve the environmental benefits of inter-firm collaboration are also discussed.

Determining Potential Areas for Mitigation of Climate Change Risks in Ho-Chi- Minh City

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Ho Chi Minh City´s (HCMC) settlements are integrated in an urban system that is affected by a number of internal and external pressures. Therefore the impacts of climate change on the city, its settlements and infrastructure should be assessed in the context of this complexity. Vulnerability to climate change will vary considerably from settlement to settlement and even within settlements. The location, urban structure, dominant building type, socio-economic characteristics and institutional capacity are key factors that affect vulnerability and adaptive capacity of a settlement in the mega-urban region. The consequences of climate change and the build-up area development of the city will be influenced by the economic, social and technological conditions, which will for HCMC be very different from those of today. These conditions will have an effect on the vulnerability of HCMC´s future settlement structure to climate change impacts, by influencing the future óadaptive capacityô ï the ability of the biophysical urban structure to adapt to climate change impacts by increasing their resilience to climate change effects. Climate change-related urban adaptation decisions require a rational characterization of urban structural landscapes according to risk relevant features. An 'urban typology' provides a uniform methodological and spatial framework for the different tasks within the multi-criteria network of the research project. The Urban Structure Typology approach originated through the utilization of remotely sensed imagery to capture the urban physical form and its comprising building structures for the field of urban morphological analysis. It defines primarily an urban block of homogeneous appearance, which may or may not comprise varying building typologies. The block size and form is dependent upon the transportation or surface water networks that frame the block, as well as the formal or informal nature of the building typologies. Here the urban infrastructure exerts a dominate role. Other differentiations are based upon land uses, orientation, structure of density and sealing material. The typology approach ensures that data integration of different sources with their original specific spatial/temporal resolutions and thematic contents can be operationally integrated into the GIS environment. Different resilience and exposure indicator, environmental impact indicators and energetic / climatic efficiency indicators of Urban Structure Type (UST) provides a refined land use Pattern on the Polygons of official Land Use Map (LUM) at a scale of 1:25000. The proposed concept based on the comparing of UST and LUM. According to the features of USTs, the real-using of LUM (Plan) can be distinguished. Therefore results also expects to assess the status of planning, which of most Planning department annoyed or neglected. The arrangement of the UST designations against the LUM then provides a matrix. The analyzing of matrix will provide insight in two ways: First, the priority for the prevention of effects through legislative, regulatory and policy measures (e.g. planning policies that take account of climate change; amending design standards for more resilient building structures and (re)location of housing away from high risk areas or from ecological area which is of important to prevent. Second, prevention of effects through combined structural and technological measures (e.g. the construction of resilient buildings and housing structures, possibilities to adapt renewable energy Source, increase in the water storage capacity of new urban developmentôs, possible

Combination of Building Types to avoid heat island effect etc).

The results will show that the temporal comparison of the spatial balance can highlight the development trends.

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Challenges to Reduce Climate Model Errors

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Climate models are key tools for future climate projection and are routinely used for natural climate variability study. Climate model is often called as a coupled atmosphere-ocean-sea ice model that represents physical climate system, and is now being expanded as Earth System Model by joining other components of the Earth system, e.g. atmosphere chemistry, land vegetation, ice sheet, ocean biogeochemistry, etc. State-of-the-arch climate models in the world, however, show very similar systematic biases, i.e. model errors. Strong cold sea surface temperature (SST) bias in the central Tropical Pacific Ocean, reversed SST gradient in the tropical Atlantic, and strong warm SST bias in coastal upwelling areas are the examples. We present overview of such model errors in climate models and describe ways of solving the problems. Also limitation of the observations that can be compared with the model simulations will be introduced.

Keynote Speech

Introduction of KNCPC (Korea National Cleaner Production Center)

Dr. Jong Ho LEE

Director,
Korea National Cleaner Production Center (KNCPC)
in Korea Institute of Industrial Technology (KITECH)

KNCPC is a non-profit organization established in 1999 under the support of the Korean Ministry of Knowledge Economy (MKE). We became a member of UNIDO/UNEP NCPC Network in 2001; hosted and conducted lots of international symposiums and projects so far. Our organization consists of 4 offices as the figure below.

Our major roles are to develop and manage projects, comply with global environmental regulations, and plan national key R&D projects.

For improving resource productivity, we have conducted ñUrban Mine projectò which is to collect-separate-select-smelt-refine valuable metals from wastes, ñRe-Manufacturing projectò which is to collect- disassemble-clean-inspect-repair the end-of-life products, and ñEco-Industrial Parkò which is industrial complex increasing resource efficiency and minimizes pollution through exchanging the waste.

For expanding green management nationwide, we have conducted ñGreen Partnership projectò which is enterpriseôs cooperation in its supply chain to achieve economic and environmental profits, ñRegional Eco-Innovation projectò, which is cooperation based on regional authorities, businesses and consultants, and ñChemical Management Service projectò which is CMS provider manages all processes from purchase and usage to disposal of chemicals treated at business sites

To comply with global environmental regulation, we made REACH Business Service Center(ó09. May) and hosted REACH Expo 9th(08, Feb), and joint promotion team for responding REACH(08. May). We are establishing Global Environmental Regulation on Tracking D/B for education and consulting part.

Moreover, we have prepared national key R&D projects likewise ñNew Growth Engine in Energy & Environments Partò, ñGreen Ocean 100 Specific Technology Plansò, and ñGreen Growth Plan for Development of Industry through Knowledge Innovationò.

Finally, we have provided ñCP-NETò by web that is about Cleaner Production D/B.

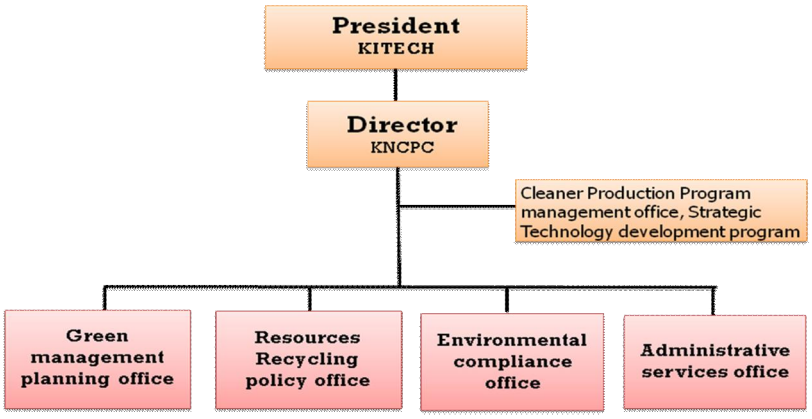
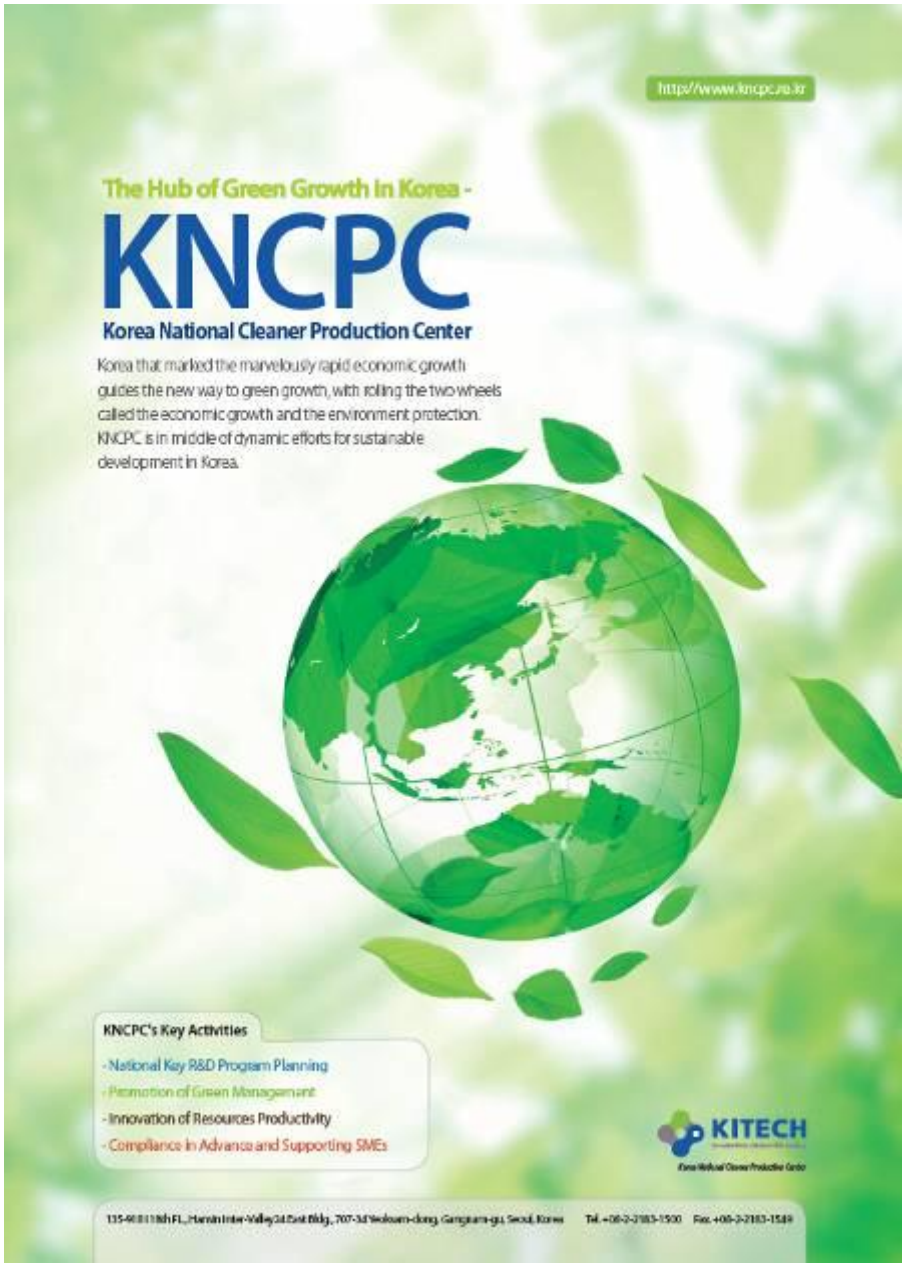


Figure. KNCPC organization



Bio & Health Technology

Chair : Hanna SHEU (Krankenhaus der Barmherzigen Schwestern, Austria)

- Bio & Health Technology I (30.July, 13:20 ~ 15:00)

1. **Introduction of Daegu-Gyeongbuk High-Tech Medical Cluster** *(keynote speech)*
   Tae Woon KIM

2. **Electrophoretic deposition process: Applications**
   Juhyun YOO

3. **Permeability of small molecules through poly dimethoxy siloxane (PDMS): Quorum sensing in bacteria and Protein crystallization**
   Jung-uk SHIM, Santosh PATIL, Wilhelm HUCK, Chris ABELL, Florian HOLLFELDER

4. **WOX8 determines apical-basal axis by directly activating auxin efflux carrier PIN7 during early embryogenesis of Arabidopsis.**
   Chulmin PARK and Thomas LAUX

5. **Time resolved absorption study of soluble guanylate cyclase and nitric oxide sensors**
   Byung-Kuk YOO, Isabelle LAMARRE, Jean-Louis MARTIN, Pierre NIOCHE, and Michel NEGRERIE

6. **Modeling an Active Peptide Conformation and Design a Competitive Inhibitory Peptide for HMG-CoA Reductase**
   Valeriy V. PAK, Vladimir N. SHIN, Lyubov YUN

- Bio & Health Technology II (30.July, 15:20 ~ 16:20)

1. **AMPK and its upstream regulators and their effects in MIN6 pancreatic β-cells**
   Joe LEE

2. **Overexpression and Unique Rearrangement of VH2 Transcripts in Immunoglobulin Variable Heavy Chain Genes in Ankylosing Spondylitis Patients**
   Yeon Joo KIM, Nayoung KIM, Min-Kyung LEE, Hyo-Jin CHOI, Han Joo BAEK, and Chang-Hoon NAM

3. **Syndecan-2 Regulates the Migratory Potential of Melanoma Cells**
   Jung-hyun LEE, Haein PARK, Heesung CHUNG, Sojoong CHOI, Younghwa KIM, Hyun YOO, Tae-Yoon KIM,Hoo-Jae HANN, Ikjoo SEONG, Jaesang KIM, Kathleen G. KANG, Inn-Oc HAN, and Eok-Soo OH

4. **Breast Cancer related Facts: Comparison between Korea and Austria**
   Hanna SHEU, Ali TAHAMTANI OMRAN

Did you know...?

- Austria has 7 Novel prize winners in Medicine
  - Robert Bárány (1914), Julius Wagner-Jauregg (1927), Karl Landsteiner (1930), Otto Loewi (1936), Karl von Frisch (1973), Konrad Lorenz (1973), Eric R. Kandel (2000).
- Ignaz Semmelweis, Hungarian physician known for introducing hand disinfection standards, in obstetrical clinics has studied law in University of Vienna, and later switched to medicine, worked in Vienna General Hospital (Allgemeines Krankenhaus der Stadt Wien, AKH).

Keynote Speech

Introduction of Daegu-Gyeongbuk High-Tech Medical Cluster

Tae Woon KIM

Secretary,
City Daegu

The Korean government is establishing a High-tech Medical Cluster in order to promote the medical industry as a future core strategic industry to become a new force for national growth. As the nation's largest government-run project(5.6 billion) for developing a high-tech research and development cluster aimed at fostering the domestic medical industry.

The Daegu Gyeongbuk High-Tech Medical Cluster was appointed as a foot-hold area for High-Tech Medical industry by government, ranking first out of 14 candidate cities and provinces(August 10, 2009) This will be developed in a 1,030,000㎡ area in the Daegu Innovation City.

It is a national project sponsored by the government and local municipality. $5.6 billion will be invested in the project which will last from 2009 to 2038. It will possess the infrastructure to nurture new medicine and medical devices from late discovery to clinical trials.

This will be built to from Asia's leading medical R&D hub combing the necessary personnel and material infrastructure for High-tech Medical industry

Electrophoretic deposition process: Applications

Juhyun YOO

Korea Institute of Science & Technology, Germany

This paper presents electrophoretic deposition process (EPD) for several applications. Recently a great deal of interest has arisen in the field of electrophoretic deposition (EPD) of ceramic particles. This method has attracted huge attention in recent years as it provides a cheap, fast and easy alternative to form both thick and thin ceramic films and products with any geometry. In this presentation, I will introduce the applications on optical switch, biofuel cell, interconnect for SOEC and SOFC.

1. IT related application: Piezoelectric tubes for optical switch
Submicron PZT powder were electrophoretically deposited on the graphite filament. After burning the graphite core out, the obtained micro tubes were sintered. By the variation of current density and deposition time, the thickness of the micro tubes could be controlled. Microstructure of the PZT tubes and the circular uniform cross-sections of the micro tubes were examined using SEM.

2. ET related application: Micro tubular SOFC

- Å Fast Starting
- Å Reduce operating Temperature (450 ï 600℃)
- Å High efficient small cell stacks
- Å Robust for rapid temperature control
- Å Minimized Thermal gradients
- Å Heat-shock resistance under frequent starting up and shutting down

- Å Decreasing material degradation and prolong stack life time.
- Å Tubular design reduces the sealing problems associated with ceramic fuel cells
- Å Increased surface area (10 times higher efficiency)
- Å Stability and reliability of materials and components of SOFC systems

3. BT related application: Biofuel cell (BFC)
   - ☐ Fast electronic transfer
   - ☐ Low electric resistivity
   - ☐ Immobilization

Permeability of small molecules through poly dimethoxy siloxane (PDMS): Quorum sensing in bacteria and Protein crystallization

Jung-uk SHIM, Santosh PATIL, Wilhelm HUCK, Chris ABELL, Florian HOLLFELDER

University of Cambridge, UK

The microfluidics is a very powerful and efficient methodology capable of manipulating picoliter fluids in order to perform physical, chemical and biological assay. Microdroplets in microfluidics, which prevents diffus ion of information and cross-contamination, provide a well defined reactor encapsulating molecules and cells, and to study reactions. It can be used for high throughput screening by varying the chemical condition on each droplet. In order to carry out multiple reactions such as decoupling nucleation and growth of protein crystals it is required to control the droplet condition after the formation. As aqueous droplets are emulsified in an immiscible carrier fluid, the condition is not conveniently controlled on the down stream. A few trials have been done using droplet coalescence and osmosis such as droplet-droplet coalescence aided with the electric field or combine a continuous flow and droplet, which is partially controllable. We have a poly (dimethylsiloxane) (PDMS) microfluidic device that can store droplets and maintain or control water contents. The device is designed to be able to store droplets in storage wells. The microfluidic device is also constructed to have reservoir, which is separated from the wells by PDMS membrane. This multi-layered device enables transporting permeates of PDMS across the membrane from reservoir to stored droplets thus able to control conditions therein without breaking or fusing droplets. We demonstrate that, when the solutes, macromolecules and cells encapsulated in droplets are impermeable to the carrier fluid and PDMS, the chemical condition can be controlled by delivering organic solvents or small hormone-like molecules to the droplets. The ability to control the droplet condition enables crystallizing a model protein by changing the solubility, and triggering the gene expression in cells by delivering auto-inducer.

WOX8 determines apical-basal axis by directly activating auxin efflux carrier PIN7 during early embryogenesis of Arabidopsis.

Chulmin PARK and Thomas LAUX

Institut für Biologie III and Freiburg Institute of Advanced Studies, Albert-Ludwigs-Universität Freiburg, Freiburg, Germany

Apical-basal axis formation is an important developmental event in the higher multicellular organism. In Arabidopsis, apical-basal axis is established by asymmetric division of the zygote which produces a small embryonic apical cell and a large extraembryonic basal cell. Auxin efflux carrier PIN7 plays critical roles for the establishment of apical-basal axis. PIN7 is expressed and polarly localized in the basal cell, and makes auxin maximum in the apical cell. This difference of auxin concentration makes different developmental program

between apical and basal cell lineages. However, the mechanism that activating PIN7 only in the basal cell lineage is completely unknown. Here, we provide evidence that WUSCHEL RELATED HOMEOBOX protein WOX8 is a direct transcriptional activator of PIN7. Like PIN7, WOX8 is expressed in the basal cell and wox8 wox9 double mutant has developmental defects not only basal cell lineage but also apical cell lineage implying non-cell-autonomous function of WOX8 and WOX9. PIN7 expression in basal cells is significantly reduced in wox8 wox9 double mutant and ectopically expressed in apical cells in the plant which express WOX8 ectopically. In addition we found that WOX8 binds to the promoter of PIN7. Polar auxin transports by auxin efflux carrier PINs are intensively studied in various developmental stages and tissues. For the correct functions, the transcription of PINs must be regulated cell-type specific manner. However, cell-type specific transcription factors of PINs are unknown until now. In this work, we found WOX8 is a direct transcriptional activator of PIN7 and this is the first known cell-type specific transcriptional activator of all PIN genes.

Time resolved absorption study of soluble guanylate cyclase and nitric oxide sensors

Byung-Kuk Yoo[1], Isabelle Lamarre[1], Jean-Louis Martin[1], Pierre Nioche[2], Michel Negrerie[1]

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The binding of diatomic gaseous molecules (NO, CO, O_2) to heme proteins is an essential event of many biological functions. Among these diatomic molecules, NO is a freely diffusible intercellular agent and it functions as a signaling molecule since the discovery of NO as the endothelium-derived relaxing factor.[1] Our research focuses on signal transduction by NO, which includes the generation of NO (by NO synthase) and its detection by the enzyme soluble Guanylate Cyclase (sGC).[2] sGC is a heterodimeric protein consisting of two homologous subunits Ŭ and ɓ. sGC with NO is involved in several physiological processes and pathologies. Including sGC, NO sensors are the proteins which bind NO and are able to translate this binding into a signal for mammal cells as well as in bacteria.[3] The endogenous sGC has been an important pharmacological target of great interest but the mechanisms of activation, deactivation and regulation are still unknown.[4] The aim of our research is to obtain both a functional model and an allosteric kinetics (activation, deactivation). Our report includes both a biochemical approach (enzymological assay measurements) and a spectroscopic (picosecond absorption spectroscopy) and structural (molecular modeling) approach. We purified sGC protein from beef lung using HPLC and performed kinetic measurements with appropriate amounts of protein. We introduced two chemical activators (BAY 41 2272 and YC-1) into the purified sGC. Our kinetic results show the effect of allosteric activators which do not bind to the heme (active site for NO) of sGC. The increase of its enzymatic activity by NO-independent activators was detected and demonstrated. By measuring the transient absorption of sGC with CO under the influence of such non-heme activators, we found that the cleavage of Fe-His bond by CO in synergy with activation. We also compared the dynamic properties of sGC to those of bacterial NO sensors that share sequence homology and structural similarity with sGC because these sensors consists of only ɓ subunit of the whole sGC. These NO sensors are therefore an excellent model for studying the mechanism of activation of the human sGC. To understand how NO-sensors interact with NO and control its reactivity, it is essential to probe dynamics and interactions when NO is present within protein core where NO can be photo-dissociated from heme by the ultrafast femtosecond laser pulse. Time-resolved transient absorption spectra on sGC and NO-sensors with or without two activators were recorded in picosecond to nanosecond time scales and both kinetics and yields of geminate recombination are governed by protein structure. Our results of dynamics provide a model for regulation and mechanism at molecular level in NO-sensing function of human sGC.

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Modeling an Active Peptide Conformation and Design a Competitive Inhibitory Peptide for HMG-CoA Reductase

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3-Hydroxy-3-methylglutaryl CoA reductase (HMGR) is a major rate-limited enzyme in cholesterol biosynthesis. An elevated cholesterol level is well recognized as a major risk factor in atherosclerotic diseases and coronary heart diseases in many people. Thus, HMGR is the primary target enzyme of many investigations that aim to treat high cholesterol and reduce the risk of hypercholesterolemia.

In previous works, the two hypocholesterolemic peptides (LPYP and IAVPGEVA) were found by analyses of a digested soy glycinin using trypsin and pepsin (respectively). An alignment of the amino acid composition of soy 11S-globulin with the IAVPGEVA sequence revealed another IAVPTGVA sequence with inhibitory activity against HMGR. A conformational analysis of those peptides confirmed that a ñturnò structure, which includes P-residue as a conformational constraint in the recognized motif, is a bioactive conformation of these peptides.

The design of a competitive inhibitory peptide for HMGR with a constrained structure based on the recognized VPTG sequence has been described in our previous work. As a continued research, this study presents an approach that can be used to search for lead peptide candidates, including unconstrained structures in a recognized sequence. This approach was performed using the design of a competitive inhibitor for HMG-CoA reductase (HMGR). In a previous design for constrained peptides, a head-to-tail peptide cycle was used as a model of linear analogy in searches for lead peptides with a structure close to an active conformation. A principle component analysis (PCA), which is projected multidimensional data on low-dimensional subspace, was applied to evaluate a head-to-tail peptide cycle as a model of linear analogy. Analysis of the conformational space occupied by the peptides suggests that an analogical approach can be applied for finding a lead peptide with an unconstrained structure in a recognized sequence via modeling a cycle using fixed residues of the peptide backbone. Using the space obtained by an analysis of the bioactive conformations of statins, eight peptide cycles were selected for a peptide library based on the YVAE sequence as a recognized motif. For each cycle, the four models were assessed according to the design criterion (V) applied for constrained peptides. Three peptide cycles (FGYVAE, FPYVAE and FFYVAE) were selected as lead cycles from the library. The linear FGYVAE peptide (IC_{50} = 0.4 ε M) showed a 1200-fold increase the inhibitory activity compared to the first isolated LPYP peptide (IC_{50} = 484 ε M) from soybean. Analysis of the peptide conformations and the modeled peptide structures confirms the appropriateness of the proposed approach for the modeling of active conformations of peptides.

The peptide models with fixed residues based on the design of a suitable library of flexible molecules allows the examination of the conformational behavior of members of the library in accordance with the recognized features of the peptides. The assumed correlation between the conformational behaviors of the models of the

cyclic peptides obtained by MD simulation and the restricted flexibility of the peptides in the binding site is effective in searching for lead compounds. In this aspect, a recognized sequence, which includes a constrained structure, can be seen as a special case of the presented approach. Modeling an active backbone for peptides with different peptide lengths and substituted residues is a good opportunity to create an active peptide with adjusted properties that may be applied to ligands in order to investigate peptide-protein interactions, especially in the case, when the spatial information for the target is not available.

AMPK and its upstream regulators and their effects in MIN6 pancreatic β-cells

Joe LEE

Imperial College London, London, UK

AMP- activated protein kinase (AMPK) is an energy sensor expressed throughout the body, but with specific functions within pancreatic ɓ-cells mainly involving insulin and its secretion. The upstream kinases of AMPK, calmodulin-dependent kinase kinase ɓ (CamKKɓ) and LKB1, have only recently been discovered and the role of each in the regulation of AMPK activity remains to be determined. The aim of this study was to investigate the effects of each AMPK upstream kinase using low (3mM) and high (20mM) glucose and KCl (depolarising agent) with/without STO-609 (CamKKɓ inhibitor). Phospho-AMPK (thr172) (active form) was measured by western blot and here we demonstrate that in the presence of KCl and high glucose, STO-609 significantly reduces phospho-AMPK (pAMPk) levels. Comparatively, the non-significant decrease in pAMPK in the low glucose and KCl condition indicates interference from LKB1, which we conclude, seems to dominate or override the inhibition of the CamKK pathway. This study demonstrates the role of CamKKɓ in AMPK activation caused by increased intracellular Ca^{2+} and a possible theory of LKB1 precedence in AMPK regulation.

Overexpression and Unique Rearrangement of VH2 Transcripts in Immunoglobulin Variable Heavy Chain Genes in Ankylosing Spondylitis Patients

Yeon Joo KIM[1,*], Nayoung KIM[1,*], Min-Kyung LEE[2], Hyo-Jin CHOI[2], Han Joo BAEK[2], and Chang-Hoon NAM[1]

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To identify immunoglobulin (Ig) variable heavy chain (VH) gene usages in Korean ankylosing spondylitis (AS) patients, expression level of VH2 genes from peripheral blood mononuclear cells (PBMCs) of 8 AS patients and 9 healthy donors was analysed by quantitative real-time PCR (Q-PCR). Q-PCR results demonstrated VH2 genes were overexpressed in AS patients (Relative amount of mRNA of VH2 genes to a housekeeping gene, 7.13±7.77 vs, 0.68±0.55; $p<0.0001$). The sequence analysis revealed the majority of them contained CDC42 binding protein kinase beta (CDC42 BPB) genes.
The insertion of CDC42 BPB gene was confirmed by PCR with primers corresponding CDC42 BPB and CH genes. Our study revealed VH2 overexpression and unique rearrangement in Ig VH genes from peripheral blood of AS patients. This may imply aberrant immunoglobulin gene rearrangement in B cell occurs in Korean AS patients, which requires further investigation.

Syndecan-2 Regulates the Migratory Potential of Melanoma Cells*

Jung-hyun LEE[1], Haein PARK[1], Heesung CHUNG[1], Sojoong CHOI[1], Younghwa KIM[2], Hyun YOO[3], Tae-Yoon KIM[3],Hoo-Jae HANN[4], Ikjoo SEONG[1], Jaesang KIM[1], Kathleen G. KANG[5], Inn-Oc HAN[6], and Eok-Soo OH[1]

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Syndecan-2, a transmembrane heparan sulfate proteoglycan, is a critical mediator in the tumorigenesis of colon carcinoma cells.Weexplored the function of syndecan-2 in melanoma, one of the most invasive types of cancers, and found that the expression of this protein was elevated in tissue samples from both nevus and malignant human melanomas but not in melanocytes of the normal human skin tissues. Similarly, elevated syndecan- 2 expression was observed in various melanoma cell lines. Overexpression of syndecan-2 enhanced migration and invasion of melanoma cells, whereas the opposite was observed when syndecan-2 levels were knocked down using small inhibitory RNAs. Syndecan-2 expression was enhanced by fibroblast growth factor-2, which is known to stimulate melanoma cell migration; however, _-melanocyte-stimulating hormone decreased syndecan-2 expression and melanoma cell migration and invasion in a melanin synthesis-independent manner. Furthermore, syndecan-2 overexpression rescued the migration defects induced by _-melanocyte-stimulating hormone treatment. Together, these data strongly suggest that syndecan-2 plays a crucial role in the migratory potential of melanoma cells.

Breast Cancer related Facts: Comparison between Korea and Austria

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Background: Epidemiological data show that breast cancer is the most common cancer in women worldwide [1]. In Korea breast cancer still ranks behind stomach, lung, colorectal, liver, gallbladder cancer as a cause of death in women. Epidemiological features suggest that the breast cancer incidence rate in Korea will increase [2]. Although the incidence of malign breast tumor in Korea is significantly lower compared to western countries, the rising number of breast cancer patients in Korea is alarming [3]. Austria is one of the leading nations in breast cancer research [4].

Objective: This Summary of breast cancer related epidemiological facts and studies should provide information to a broad collective of scientists of different specializations at the Europe Korea Conference 2010. This paper should line out the difference of breast cancer related epidemiological facts between Korea and Austria and give basis for discussion concerning public health issues. Methods: Online research using Pubmed and Google as search tools relevant papers and statistics were collected and summarized.

Conclusion: The comparison of the epidemiological data indicates that the breast cancer incidence rate in Korea will reach the incidence rate in Austria in the future. Since Austria plays a leading role in the fight against breast cancer, the Austrian breast care standards could play a role model for the benefit of Korean public health.

Global R&D Hub of Medical Industry
Daegu-Gyeongbuk High-Tech Medical Cluster

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Mission

"Integrated Network to Accelerate Value Creation"

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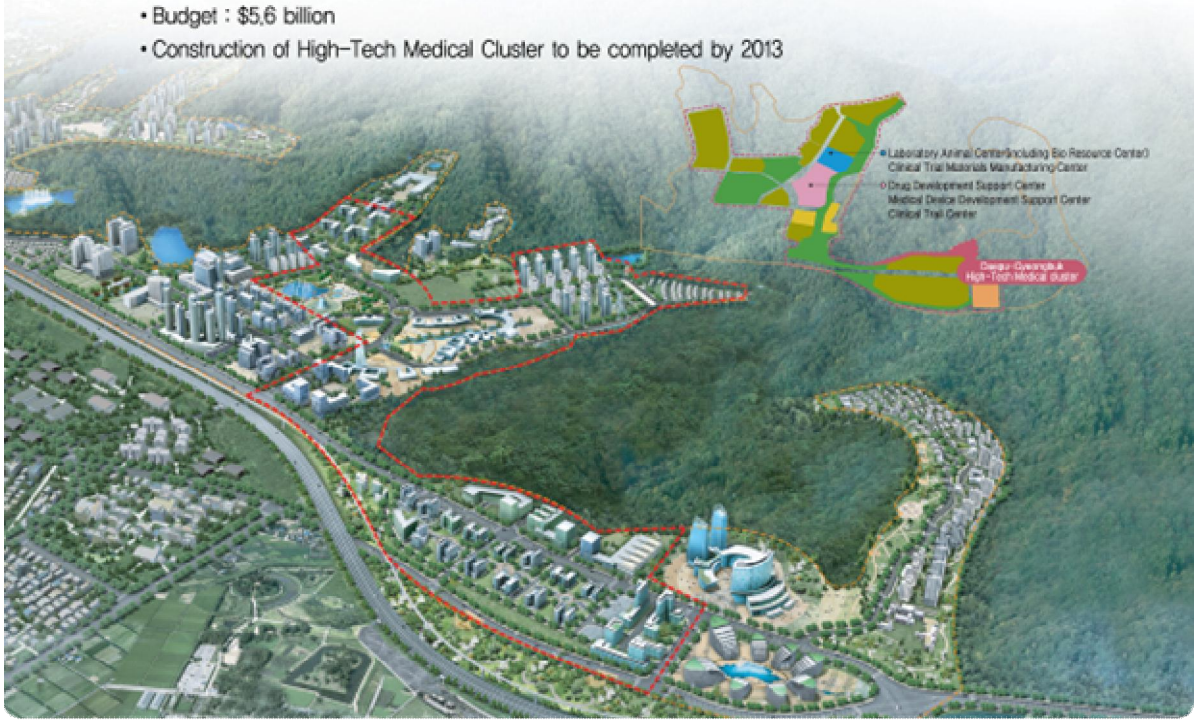
- "IT/BT Convergence Excellence in Medical Device Development"
- "Reliable & Economical Center for Clinical Trials"

Project Outline

- Size : 1,012,000㎡
- Location : Sinseo Innovative City in Daegu Metropolitan City
- Project period : 2009 ~ 2038 (30years)
- Budget : $5,6 billion
- Construction of High-Tech Medical Cluster to be completed by 2013



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Physics & Nano Science

- Physics & Nano Science I (30.July, 13:20 ~ 15:00)
Chair : Yun-Ki BYEUN (RWTH Aachen, Germany)

1. **Single Molecule Recognition Force Spectroscopy and Recognition Imaging** *(keynote speech)*
   Peter HINERDORFER

2. **Non-leptonic two-body decays of the B_c meson**
   Ho-Myeong CHOI and Chueng-Ryong JI

3. **Inverters based on Individual Carbon-Nanotube Transistors with Switching Frequencies above 1 MHz on Glass Substrate**
   H. RYU, D. KÄLBLEIN, U. ZSCHIESCHANG, O. G. SCHMIDT, H. KLAUK

4. **High-frequency electromagnetic dynamics properties of THP1 cells using scanning microwave microscopy**
   Yoo Jin OH, Markus HOCHLEITNER, Hans-Peter HUBER, Memed DUMAN, Bianca BOZNA, Markus KASTNER, Martina RANGL, Ferry KIENBERGER, and Peter HINTERDORFER

5. **Epitaxtial silicon layer growth on silicon nanowires for photovoltaic cells**
   Jinyoun CHO

6. **Analysis of Combustion Processes in Spark-Ignition Engines Using a Measurement Approach Based on Optical-Fibre Technique**
   Kyung-Man HAN

- Physics & Nano Science II (30.July, 15:20 ~ 16:20)
Chair : Yun Joo HYUN (Vienna University of Technology, Austria)

1. **Real Nanotechnology: From Hype to Hope** *(keynote speech)*
   Heinrich KURZ

2. **Fabrication of Piezoelectric Microcantilever Array with a Large Initial Deflection and Application to Energy Harvest**
   Jeung Sang GO, and Masayoshi ESASHI

3. **TiO_2 Nanotubes for Dye-Sensitized Solar Cells**
   Doohun KIM, Patrik SCHMUKI

4. **Ink-jet printing: from droplets to organic electronic devices**
   Sungjune JUNG

Physics & Nano Science

- Physics & Nano Science III (30.July, 17:00 ~ 18:30)
Chair : Young-Hyang PARK (Muséum National d'Histoire Naturelle, France)

1. **Novel electron injection layers (EIL-AZO) for inverted organic solar cells**
   Hyunchul OH, Johannes KRANTZ and Christoph BRABEC

2. **Analytic Twist Angle Measurement in Homogeneously Aligned Cells**
   Chang-Hun LEE, P. S. SALTER, S. J. ELSTON and E. P. RAYNES

3. **Superhydrophobic and superoleophobic surface**
   Hyuneui LIM and Wandoo KIM

4. **Characterization of photonic crystal resonant modes in the visible region by scattering spectroscopy**
   A.Avoine, C. Vion, J. Laverdant, C. Schwob, S. Bonnefont, O. Gauthier-Lafaye, L. Coolen and A. Maître

5. **Study of Rainbow hydrothermal site using deep-sea three components magnetometer**
   Jérôme Dyment, CHOI Yujin, Florent Szitkar and the MOMARDREAM Scientific Party

6. **Recent Warming in the Western North Pacific Caused by Rapid Changes in the Siberian High and Aleutian Low Pressure Systems**
   Young-Hyang PARK

Did you know...?

- A mummified body from the Stone Age was found in the ice of the Otztal Alps, between Austria and Italy, in 1991. (ñÖtzi the Icemanò)
- Gregor Johann Mendel, who established the basis of modern genetics, was an Austrian, along with Alfred Adler, who contributed to the foundations of modern psychology: Korean Embassy is located at Gregor-Mendel gasse (Gregor-Mendel Avenue).
- Großglockner, the highest mountain in Austria, is also the second most prominent mountain in the Alps.
- The Austrian Alps boast of being home to the Pasterze Glacier, one of largest glaciers in Europe.
- The Semmering Railway, between Gloggnitz and Simmering, built over mountains, was one of the greatest civil engineering works of 19th century.
- The sewing machine was invented by Josef Madersperger, an Austrian.
- Tiergarten Schönbrunn of Vienna, founded in 1752 is the oldest zoological garden in the world.
- The ñDoppler effectò was discovered by an Austrian, Christian Andreas Doppler (1803-1853).
- Ludwig Bolzman, one of the greatest physicists in 19th century was also Austrian. When he was a professor of the University of Graz, he has supervised Svante Arrhenius (Nobel prize winner in Chemistry, 1903) and Walther Nernst (Nobel prize winner in Chemistry, 1920). He gave lectures not only on physics but also philosophy. Ludwig Wittgenstein was the student of his philosophy class. In 1906, he committed suicide by hanging himself. His famous equation on entropy $S = k \cdot \log q$ is written on his tombstone.
- Austria has 22 Novel prize winners and 11 of them are in field of Physics and Chemistry
- Austria has 5 Novel prize winners in Physics
  - Philipp Lenard (1905), Erwin Schrödinger (1933), Victor Franz Hess (1936), Isidor Isaac Rabi (1944), Wolfgang Pauli (1945)
- Austria has 6 Novel prize winners in Chemistry
  - Richard Adolf Zsigmondy (1925), Fritz Pregl (1923), Richard Kuhn (1938), Leopold Ruġiļka (1939), Max Ferdinand Perutz (1962), Walter Kohn (1998).

Keynote Speech

Single Molecule Recognition Force Spectroscopy and Recognition Imaging

Dr. Peter HINTERDORFER

Professor,
Johannes Kepler University Linz

In molecular recognition force microscopy (MRFM), ligands are covalently attached to atomic force microscopy tips for the molecular recognition of their cognitive receptors on probe surfaces. Using an appropriate tip surface chemistry protocol, the ligand density on the AFM tip is sufficiently dilute for the allowence of single molecule studies. Interaction forces between single receptor-ligand pairs are measured in force-distance cycles. A ligand-containing tip is approached towards the receptors on the probe surface, which possibly leads to formation of a receptor-ligand bond. The tip is subsequently retracted until the bond breaks at a certain force (unbinding force). In force spectroscopy (FS), the dynamics of the experiment is varied, which gives insight into the molecular dynamics of the receptor-ligand recognition process and yields information about the binding pocket, binding energy barriers, and kinetic reaction rates. Applications on isolated proteins, native membranes, viruses, and cells will be presented.

We have also developed a method for the localization specific binding sites and epitopes with nm positional accuracy by combining dynamic force microscopy with single molecule recognition force spectroscopy. A magnetically driven AFM tip containing a ligand covalently bound via a tether molecule was oscillated at 5 nm amplitude while scanning along the surface. Since the tether had a length of 8 nm, the ligand on the tip was always kept in close proximity to the surface and showed a high probabilty of binding when a receptor site was passed. The recognition signals were well separated from the topographic signals arising from the surface, both in space (z ~ 5 nm) and time (half oscillation period ~ 0.1 ms). Topography and recognition images were obtained simultaneously using a specially designed electronic circuit. Maxima (U_{up}) and minima (U_{down}) of each sinusoidal cantilever deflection period were depicted, with U_{down} driving the feedback loop to record a height (topography) image and U_{up} providing the data for the recognition image. In this way, topography and recognition image were gained simultaneously and independently with nm lateral resolution.

Non-leptonic two-body decays of the B_c meson

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2. *Department of Physics, North Carolina State University, Raleigh, NC, USA*

We study exclusive nonleptonic two-body B_c Ÿ $(D_{(s)}, \bar{q}_c, B_{(s)})$ +F decays with F(pseudoscalar or vector meson) factored out in the QCD factorization approach. The nonleptonic decay amplitudes are related to the product of meson decay constants and the form factors for semileptonic B_c decays. As inputs in obtaining the branching ratios for a large set of nonleptonic Bc decays, we use the weak form factors for the semileptonic B_c Ÿ $(D_{(s)}, \bar{q}_c, B_{(s)})$ decays in the whole kinematical region and the unmeasured meson decay constants obtained from our previous light-front quark model. We compare our results for the branching ratios with those of other theoretical studies.

Inverters based on Individual Carbon-Nanotube Transistors with Switching Frequencies above 1 MHz on Glass Substrate

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2. *Faculty of Electrical Engineering and Information Technology, Chemnitz University of Technology, Chemnitz, Germany*

Nanoscale field-effect transistors (FETs) based on individual semiconducting carbon nanotubes are of interest for logic circuits with high integration densities that can be manufactured on inexpensive, transparent, large-area substrates, such as glass or flexible plastics. There are many reports of FETs based on individual carbon nanotubes with excellent static performance, including transconductance up to 30 µS [1], ON/OFF ratio as large as 10^7 [2] and subthreshold swing near the room-temperature limit of 60 mV/decade [2,3]. However, the realization of integrated circuits based on carbon-nanotube FETs with good dynamic performance remains a challenge. Bachtold et al. reported a signal delay of 30 msec for a unipolar ring oscillator [4], Javey et al. measured a signal delay of 750 µsec for a complementary ring oscillator [5], and Chen et al. achieved a record 1.9 nsec for a complementary ring oscillator based on carbon-nanotube FETs [6].

Here we report on a process to fabricate arrays of FETs based on individual carbon nanotubes and load devices based on thin, patterned amorphous carbon films on glass or plastic substrates. To integrate the FETs and load resistors into logic circuits with good static and dynamic performance, an on-chip metal interconnect layer was realized.

First, an array of probe pads was defined by electron-beam lithography, Ti/AuPd evaporation, and lift off. Next, gate electrodes were defined by electron-beam lithography and deposition of 30 nm of aluminum. The Al gates were briefly exposed to an oxygen plasma to create a 3.6 nm thick AlOx layer, and a molecular monolayer of octadecylphosphonic acid (2.1 nm thick) was then allowed to self-assemble from solution. The total thickness of the AlO_x/SAM gate dielectric is 5.7 nm, and it has a capacitance of 700 nF/cm^2. Carbon nanotubes produced by the arc-discharge method were then deposited from a liquid suspension. Using scanning electron microscopy, an individual nanotube was located on each gate, and a pair of AuPd source/drain contacts was defined by e-beam lithography for each device. The channel length is typically 300 to 400 nm.

The best transistors we have obtained have a transconductance of 6 µS, an ON/OFF ratio of 10^7, and a subthreshold slope of 100 mV/decade. Based on the gate capacitance (50 fF) and the transconductance, a cutoff frequency of 20 MHz is projected for these FETs.

To realize logic circuits, load resistors are fabricated by depositing a thin layer of amorphous carbon by thermal evaporation in vacuum and lithographic patterning. Depending on the geometry and the film thickness, resistances between 10^5 and 10^8 Ω can be designed, and the resistors have excellent linearity. Circuits are completed by connecting FETs and resistors with a dedicated metal interconnect layer defined by e-beam lithography. Inverters composed of a carbon-nanotube FET and an amorphous-carbon load resistor have full output swing and small-signal gain up to 10, and they show good switching characteristics at frequencies up to 2 MHz. This frequency is limited not by the FETs, but by the load resistance (1.2 MÝ). To estimate the dynamic performance of the carbon-nanotube FETs, we have extracted the time constants from the measured output-signal transitions. When the FETs switched from the OFF-state to the ON-state, the time constant is about 12 nsec, which suggests a maximum frequency above 10^7 Hz.

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2. J. Appenzeller et al., *Phys. Rev. Lett.* 2004, *93*, 196805
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5. A. Javey et al., *Nano Lett.* 2002, *2*, 929
6. Z. H. Chen et al., *Science* 2006, *311*, 1735

High-frequency electromagnetic dynamics properties of THP1 cells using scanning microwave microscopy

Yoo Jin OH[1], Markus HOCHLEITNER[1], Hans-Peter HUBER[1], Memed DUMAN[2], Bianca BOZNA[2], Markus KASTNER[2], Martina RANGL[2], Ferry KIENBERGER[3], and Peter HINTERDORFER[1,2]

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Microwave measurements combined with scanning probe technique is a novel tool to elucidate high-localized mechanical and electrical properties of materials such as complex permittivity and permeability by detecting slight variations with an incident microwave signal. Here we report the high-frequency dependence of the electromagnetic dynamic characteristics in human monocytic leukemia cells (THP1) through local measurements by scanning microwave microscopy (SMM). The difference between amplitude and phase images was shown to depend on the applied resonance frequency. While the amplitude yields information about the resistivity determined by the water and the ionic strength, the phase information reflects the dielectric losses arising from the fluid density. Our results show considerable variations in the dielectric properties of biological cells at different resonance frequencies.

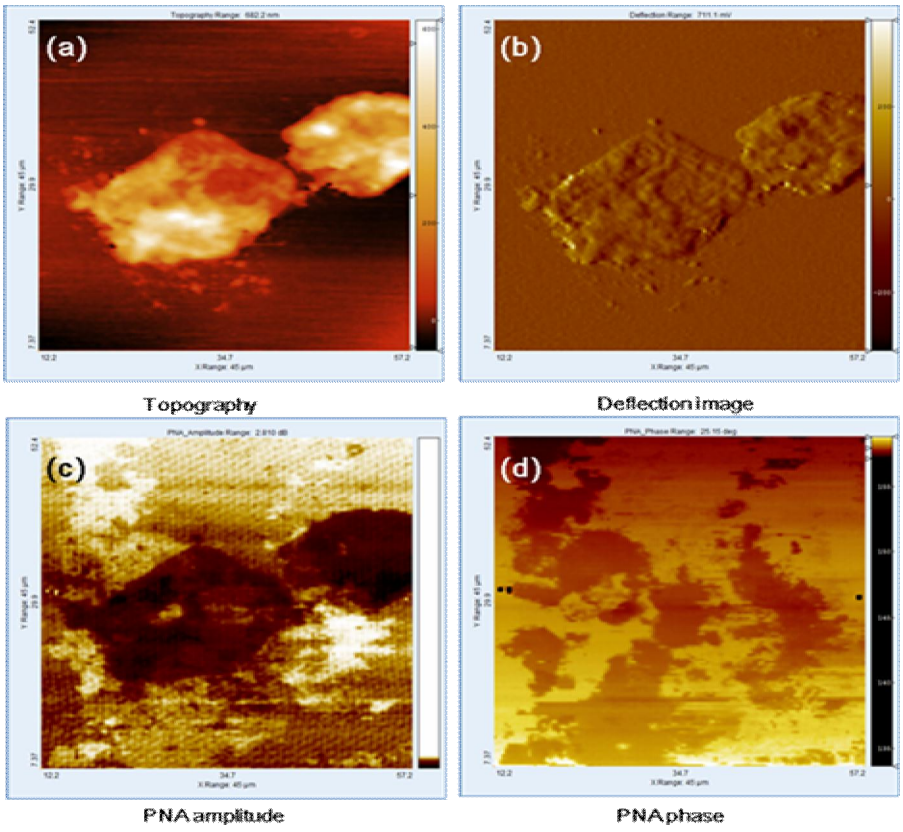

Fig. 1. THP1 cells attached on gold substrate. (a) Topography, (b) deflection image, (c) PNA amplitude image, and (d) PNA phase image. All images are 45 × 45 µm^2 in area.

Epitaxtial silicon layer growth on silicon nanowires for photovoltaic cells

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Silicon nanowires(SiNWs) have attracted significant attention in the last few years in terms of the fundamental and applied studies. The nanoscale dimensions lead to quantum mechanical effects like a quantum confinement. On the applied studies, silicon nanowires have a optimistic prospect for field effect transistors, photovoltaic cell, nano electric power sources and etc. In the photovoltaic cell, silicon nanowires have many merits.

The first publication on silicon wire growth is from Treuting and Arnold in 1957. The term of nanowire had changed from whisker, nanorod to wire. One of the most common metods for the synthesis of nanowires in the vapour-liquid-solid method(VLS), in which a metal seed catalyst is required. The mechanism of VLS will be explained in the next chapter. For growing the nanowires, there are many catalyst like a gold, tin, gallium, indium, aluminum and etc. Each catalyst has a different characteristic for growing nanowires.

To obtain high quality intrinsic layers of photovoltaic cells, epitaxial growth was tried after optimization of the deposition conditions in order to obtain εc-Si:H films on glass substrates. Between the growth of the nanowires and the epitaxial growth silicon layer on SiNWs, a 2nd hydrogen plasma process was conducted for etching the amorphous phase which existed around silicon nanowire core. Finally, the epitaxial growth was checked using a 3rd hydrogen plasma treatment. Hydrogen plasma etches selectively the a-Si:H phase and therefore can be used to test if the film deposited on the SiNWs is amorphous or crystalline, by performing SEM measurements before and after the etching process. The result of the epitaxial silicon layer growth suggest that the second hydrogen plasma treatment time was not enough to fully remove the a-Si:H shell around the SiNWs and therefore the growth was not epitaxial but rather a mixed phase material (a-Si:H plus crystalline). Therefore, we increased the 2nd hydrogen plasma etching time up to 30 minutes. In this case, SEM measurements indicate that the epitaxial layer is fully crystallized, with a smooth surface. Moreover results of Raman scattering measurement show that the epitaxial layer is fully crystallized.

Experimental

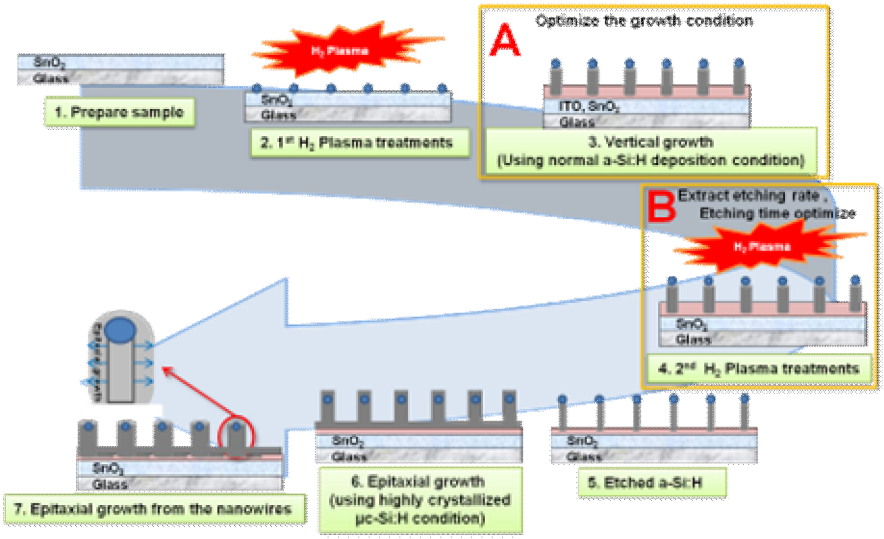

Figure 1. Process scheme for epitaxial growth on silicon nanowires

To achieve epitaxial growth, there are three main parts.

To apply to epitaxial growth step, high crystallized condition is needed. Silicon layer were deposited on the corning glass under various by varying the silane-hydrogen mixture gas ratio, the substrate temperature and the rf-power. The crystallinity of the thin silicon films was characterized by RAMAN measurement and their thickness were measured through ellipsometry. To optimize the SiNW growth condition, (**Fig.1 A**) the samples is prepared in normal a-Si:H deposition condition and εc-Si:H deposition condition which show highest crystallinity on corning glass. Then to eliminate amorphous phase around silicon nanowire core (**Fig.1 B**), hydrogen etching (2^{nd} hydrogen plasma) is done using varied time at same growth condition.

The shape of silicon nanowires will be observed through SEM measurement.

Analysis of Combustion Processes in Spark-Ignition Engines Using a Measurement Approach Based on Optical-Fibre Technique

Kyung-Man HAN

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The efficient and responsible use of remaining fossil energy resources keeps being one of the most important challenges for the next decades. In times of fast growing energy costs the need for effective solutions is evident. In this context, further development of internal combustion engines together with alternative fuels shall contribute to achieve higher thermal efficiency and thus lower fuel consumption. In Europe, Diesel engines had experienced a renaissance due to turbocharging and high pressure common-rail fuel injection. Nowadays, a very similar trend seems to emerge also for spark-ignition engines. The keyword in this context is "downsizing", which means reducing engine displacement while operating the engine at higher mean effective pressures. In conjunction with variable valve trains and fuel direct injection, part load operating points for spark-ignition engines can be dethrottled.

One of the main problems with high compression ratio and turbocharging in gasoline engines is abnormal combustion due to self-ignition of the fresh charge. The present paper describes the optical analysis of irregular combustion phenomena in gasoline engines that occur prior to the desired ignition timing which is defined by the electrical spark. This kind of abnormal engine behaviourï apart from the well known engine knockï has been observed recently by a large number of European car manufacturers within the scope of highly supercharged direct-injection gasoline engines. Combustion cycles with this type of premature ignition are very likely to cause severe engine damage as a result of extreme cylinder pressures and temperatures. An enhanced understanding of the origin of premature ignition is needed to increase the extent of downsizing for future spark-ignition engines and to tap the full potential of reducing both fuel consumption and exhaust emission.

In this regard, a new measurement technique is presented that is able to visualise flame propagation as well as irregular combustion in engine cylinders. The visualisation system is based on the transmission of flame light by optical-fibre endoscopes and subsequent detection using photo-electric devices. Three single visualisation systems were connected and synchronized by a common pressure indicating system to simultaneously measure the combustion process from different viewing angles. The resulting two-dimensional images provide a starting basis for the numerical reconstruction of the three-dimensional flame geometry. A volume intersection technique was implemented in the analysis software to carry out a so-called backprojection of the 2D contour lines of the flame radiation images. By this means, a complete three-dimensional study of the combustion behaviour has been achieved. One benefit for researchers and development engineers in using the new analysis technique is to get detailed information about local combustion activities. Consequently, measures in terms of e.g. in-cylinder flow field or cooling can be adapted more effectively to the development task in hand. For this

purpose, the quantitative evaluation of the crank-angle dependent flame volume on the one hand and the spatial determination of the centre of gravity for the combustion flame on the other hand can be calculated with the developed analysis software. The paper demonstrates the application of the measurement technique as well as analysis results by showing several examples with different engine types.

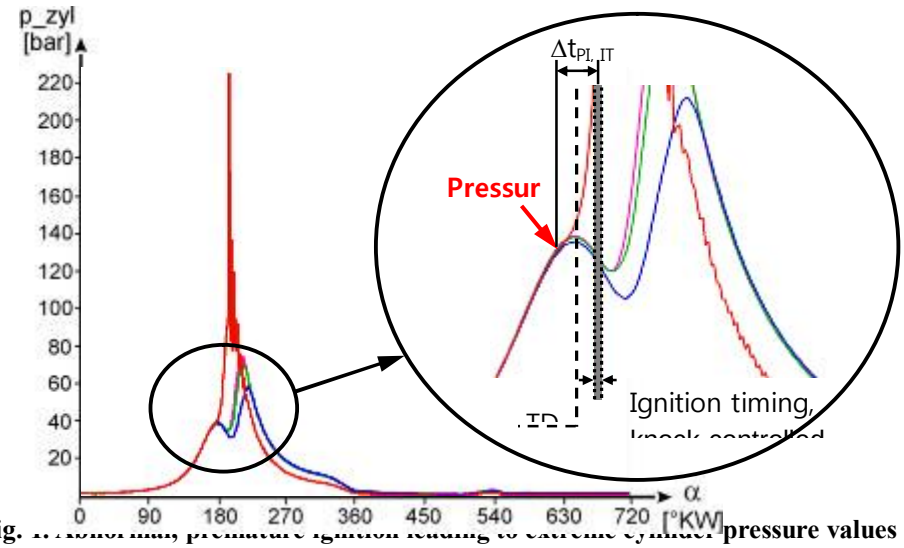

Fig. 1: Abnormal, premature ignition leading to extreme cylinder pressure values


A little faith makes the world
a wonderful place
An unknown tenor nervously
makes his stage debut when
the star can't make the concert.
Although he sings with passion,
the hall is awkwardly quiet when
he finishes his first song. Suddenly,
a child's voice rings out,
"Papa! Bravo! Bravo!" Then after
a brief moment of reflection,
the audience rises one-by-one to give
him a standing ovation.
A little faith makes the world
a wonderful place.
Just another simple lesson that
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Keynote Speech

Real Nanotechnology: From Hype to Hope

Dr. Heinlich KURZ

Professor,
RWTH Aachen University

More than ten years ago massive national initiatives for nanotechnology has been launched advocated in the most cases by high level political circuits.

Mediated rather by science fiction press than by solid scientific grounds the hype went through any reasonable roof of rationality misguiding a large effort in funding and human resources.

After one decade of disillusions in perspectives but hard work and progress in Nanoscience a far more clearer picture of the real potentials of Nanotechnology becomes visible. The decisive milestones and critical points in this transition from hype to hope will be discussed.

In this talk the most prominent examples of real implications for innovations in ICT, Energy and Environment as well as in Life science are summarized and the critical crossings between invention and innovation in these areas are addressed:

The convergence of photonics and electronics for future ICT developments, the bridge between inorganic semiconductor world and organic nanocosmos for Life science and finally the large potentials expected from defined nanostructures in semiconductors for the development of third generation photovoltaic and thermoelectric cells.

FABRICATION OF PIEZOELECTRIC MICROCANTILEVER ARRAY WITH A LARGE INITIAL DEFLECTION AND APPLICATION TO ENERGY HARVEST

Jeung Sang GO[1,2], and Masayoshi ESASHI[3]

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3. *WPI Advanced Institute for Materials Research, Tohoku University, Japan*

Microcantilevers have been employed for physical sensing and actuation. Its diverse applications have been explored in the heat transfer enhancement [1], the measurement of acceleration [2], the liquid and gas flow sensing [3], energy harvest [4] and so on. Most of them use the mechanical vibration in principle. Specifically in the presence of a fluid flow, the initial deflection of the microcantilever plays a key role in obtaining the flow-induced vibration.

In this work, we compare the fabrication methods of the initially deflected microcantilever array by using the wet and dry etching process of a sacrificial layer. To bent microcantilever initially, the distribution of the different built-in residual stresses in multi-layer is controlled. The proposed method can provide a large deflection. Finally, the feasibility of the electrical energy harvest is examined.

Fig. 1 shows the schematic view of the multi-layered microcantilever. It is consisted of the top layer of parylene-C and Pt/PZT/Pt. The PZT is used to harvest the electrical energy from vibration. The thermal residual stress is generated due to the difference of thermal expansion coefficient of each layer. By considering the thermal expansion coefficient and material properties, the initial deflections were calculated numerically. Fig. 2 shows the initial deflection for the increasing length of the microcantilever.

The fabrication starts with the thermal growth of 1 ㎛-thick silicon dioxide (SiO_2) followed by the deposition of 1500 Å silicon nitride. The poly silicon layer of 2500 Å is deposited. The 0.5 ㎛-thick PZT layer with top and bottom Pt electrode is again deposited on adhesion enhancing layer of tantalum. Finally, the parylene-C is added for the electrical isolation and etch barrier.

The conventional method is to remove the poly-silicon positioned under the bottom electrode of Pt as sacrificial layer by using the xenon di-fluoride etcher. Fig. 3 shows the SEM image of the initially deflected microcantilever array. The proposed method is to etch the sacrificial layer of Ta of 200 Å in BOE etching solution. To control the initial deflection of microcantilever, the parylene is also etched with O_2 plasma asher of 300 W for 120 seconds. Much larger initial deflection was obtained (Fig. 4). Compared with the conventional removal of the sacrificial layer, it is very simple and fast. It is also possible to obtain the large initial deflection effectively.

We measured the power generated from the vibration of the PZT microcantilever array. Fig. 5 shows the experimental setup to obtain the electrical energy. It was displaced on the PZT vibrator. By sweeping the vibrating frequency, the vibrating displacement of microcantilever array was measured by a Laser Doppler meter and converted to the electrical signal. It was compared with the generated electrical output from the PZT microcantilever array specimen. The electrical power was measured in the network analyzer. Fig. 6 displays feasible harvest of the nano-watt energy at the various frequencies of vibration, higher than the noise level (Fig. 7). As the length of micro-cantilever increases, the larger power is generated.

The simple and effective fabrication method of the PZT microcantilever array with the initial deflection was successfully shown. Compared with the conventional dry etching, the large deflection was obtained. The feasibility of energy harvest was also experimentally evaluated. For further study, the possibility of the energy generation in the presence of the flow-induced vibration will be examined.

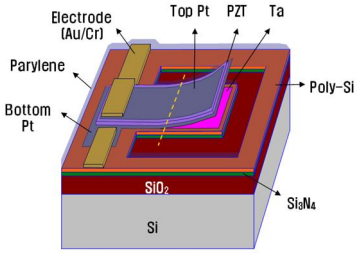

Fig. 1. Multi-layered piezoelectric microcantilever

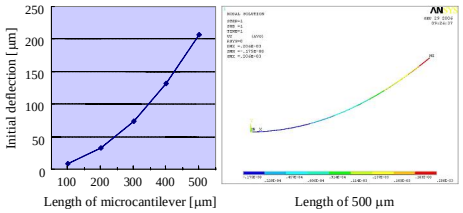

Fig. 2. Numerical analysis of the initial deflection

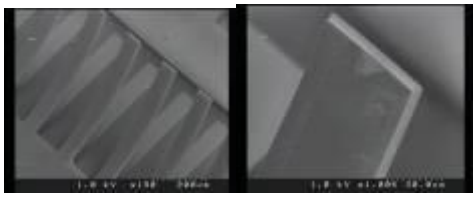

Fig. 3. SEM image of the microcantilever array obtained by the xenon di-fluoride etching of polysilicon.

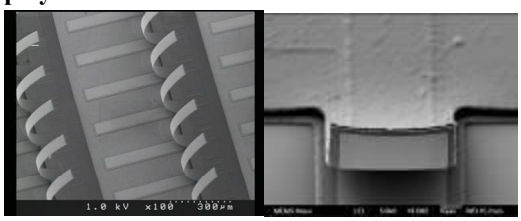

Fig. 4. SEM image of the microcantilever array obtained by the Ta etching and O2 plasma ashing of parylene-C.

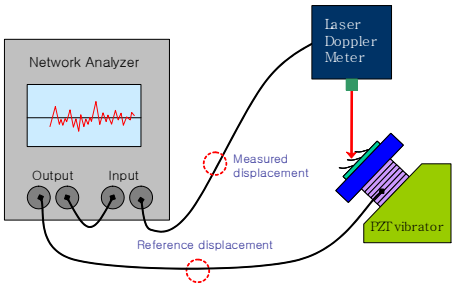

Fig. 5. Experimental setup of energy generation.

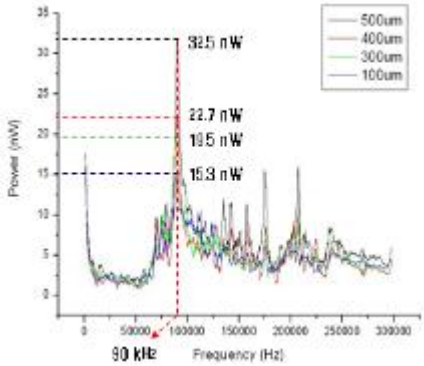

Fig. 6. Measured powers for increasing lengths.

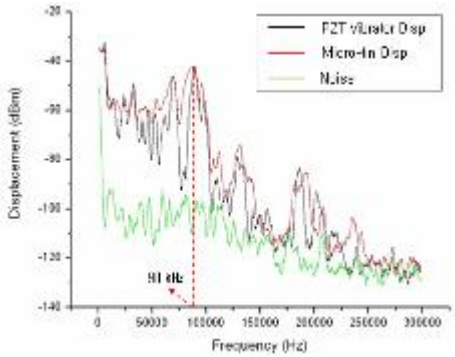

Fig. 7. Comparison of signal outputs to noise.

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TiO_2 Nanotubes for Dye-Sensitized Solar Cells

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In the presentation, we demonstrate that self-organized TiO_2 nanotubular layers are a highly efficient material for dye-sensitized solar cells. We replaced the nanocrystalline TiO_2 particles in the DSSCs system with anodic TiO_2 nanotubes made by electrochemical anodization in fluoride containing electrolytes. Furthermore, we optimised the system with different tube morphologies, crystallization and dye-sensitisation processes. Exploiting TiO_2 nanotubes significantly eliminates the grain boundary and random wall effects and hence can significantly enhance the light conversion efficiency.

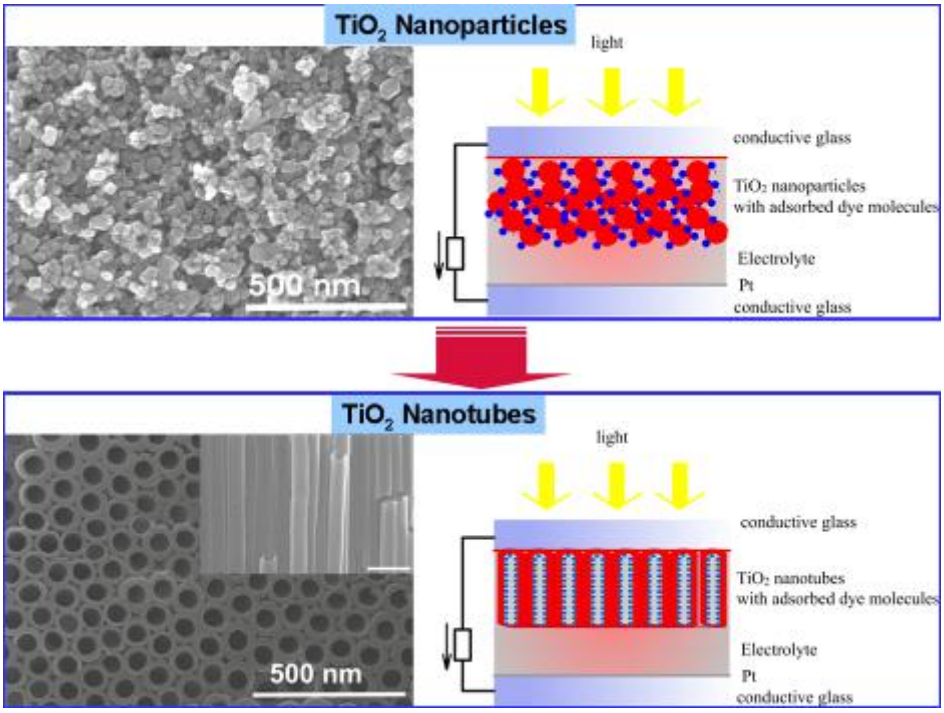

Fig. 1. Schematic representation of dye-sensitized TiO_2 solar cells, based on nanoparticle (NP), and nanotube (NT).

Ink-jet printing: from droplets to organic electronic devices

Sungjune JUNG

Inkjet Research Centre, Institute for Manufacturing, University of Cambridge, UK

Inkjet printing is familiar to us as a method of printing text and images onto papers at small offices and home. It has been also developed for many industrial applications including product date codes, mailing shots and large-format graphics. More recently, over a last decade Inkjet printing has been considered to be a key technology in the field of controlled polymer deposition. Its applications involve from manufacturing multicolour organic light-emitting diode (OLED) display and organic transistors to the fabrication of 3-D products. These non-graphical applications require more accurate drop positioning, higher reliability and better resolution. The spreading and drying of ink droplets on the substrate must be carefully controlled in order to deposit the droplets at the desired position and the desired structure. The comprehensive understanding and control of jet formation and droplet deposition behaviour on a substrate requires physical studies into materialôs rheological properties at high shear rate, instabilities of jets, drop formation and the role of polymers in jet breakup and drop deposition. This article presents an introduction to inkjet printing technology and a brief overview of some of the promising applications. Drop formation and deposition behaviour of viscoelastic fluids are also discussed with recent work at the Cambridge Inkjet Research Centre.

Novel electron injection layers (EIL-AZO) for inverted organic solar cells

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Inverted bulk-heterojunction solar cells have recently captured high interest due to their environmental stability as well as compatibility to mass production. This has been enabled by the development of solution processable n-type semiconductors, mainly TiO_2 and ZnO. However, the performance of device is very dependent on the property of interfacial materials, and here specifically to their crystallinity, their surface states as well as to their stoichiometry. In this study, we synthesized aluminum-doped zinc oxides (AZO) and investigated their properties as electron injection layers for inverted bulk-heterojunction solar cells.

The performance of the AZO based cells is compared to the one with intrinsic ZnO as well as TiOx. The metal oxides are characterized with respect to their transmittance, absorbance, conductivity and their band-gap. Further, we build the correlation between the doping level of the AZO and the device performance and discuss Voc and FF losses in the picture of a 1-d numerical model.

Analytic Twist Angle Measurement in Homogeneously Aligned Cells

Chang-Hun LEE, P. S. SALTER, S. J. ELSTON and E. P. RAYNES

Department of Engineering Science, University of Oxford, Parks Road, Oxford, OX1 3PJ, United Kingdom

Recently, we suggested a practical method (Simulation method) to measure a small twist angle by comparing peak-shaped unique voltage-transmission curves obtained in both simulated and experimental studies, which allows us to determine the twist angle less than 1° to an accuracy of 0.02°. But simulation work should always be accompanied with this method. In this paper, therefore, analytic method -a direct method without simulation work- is described to determine the small twist angle of homogeneously aligned cells.

The twisted LC layer with thickness *d* can be decoupled into two untwisted LC layers with thickness *d/2* when a high enough voltage is applied to the cell and the overall transmission of the cell can be derived from the Jones matrix method. If 0° is the direction to bisect the twist angle of the cell, the transmission equation of T_0 and T_{45} are obtained when the polariser axis is placed to be 0° and 45°, respectively. From the transmission ratio (T_{45}/T_0), simple equation containing only twist angle (α) and measured transmission is derived as below.

$$\alpha = \left(\sqrt{T_0}/T_{45}\right)\left(1+\sqrt{1-T_{45}}\right)$$

According to this equation, without any additional simulation work, small twist angle can be determined directly from the measured transmission values. 10 cells (5 Fredericksz-cells and 5 Pi-cells) were measured by this direct method and compared with former results obtained by ôSimulation methodô. From these results, it is proved that this direct method is also accurate. This simpler method with its accurate results would be very useful especially for the LCD manufacturers to improve electro-optical properties of the cells such as a contrast ratio.

Superhydrophobic and superoleophobic surface

Hyuneui LIM* and Wandoo KIM

Department of Printed Electromechanical Systems & Nature Inspired Mechanical Systems, Nano-mechanical systems Research Division, Korea Institute of Machinery and Materials

In this work, we report the superhydrophobic and superoleophobic surface fabricated using the electrospinning method. The superhydrophobic and superoleophobic surfaces have a lot of attentions from researcher and industrial engineers. Until now, the surfaces repel the water, a representative liquid of high surface tension, are studied by so many researchers. The superhydrophobic surface shows the apparent water contact angle over 150° and low sliding angles. The main factors of superhydrophobic surface are the surface composition of low surface tension and the surface roughness. These surfaces are founded well in nature because the nature is made up of hierarchical structure.

However, the superhydrophobic surfaces cannot have the repellency for the low surface tension liquids such as oil. To stand the oil, the structure has the third factor, re-entrant curvature. The large energy barrier of re-entrant morphology prevents the wetting of the low surface tension liquids on the surface. The webs or textiles are consisted of these curvatures originally. Among the various fabrication method, electrospinning is a good candidate method to form the re-entrant structure.

Here, the superoleophobic nanofiber webs are demonstrated using the electrospinning of PTFEMA(poly(2,2,2-trifluoroethyl methacrylate)). Generally, electrospinning of fluorocompounds is very difficult due to their low viscosity and surface tension. Therefore, electrospinning method is followed with the chemical deposition of fluorocompounds to make the superhydrophobic or superoleophobic surface. However, emulsion polymerized PTFEMA is electrospun easily with traditional process methods. And their resulting webs repel the water and hexadecane droplets without additional process.

Characterization of photonic crystal resonant modes in the visible region by scattering spectroscopy

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2. *CNRS, UMR7588, INSP, Paris, F-75015 France*
3. Laboratoire dôAnalyse et dôArchitecture des Systèmes, CNRS, 7 avenue du Colonel Roche, 31077, Toulouse, France.

In the last years, large efforts have been put into the research of photonic crystal designs in order to confine light efficiently in crystal defects. Such cavities present resonant modes in the infrared region, with remarkable quality factors of the order of one million. Despite the interest raised by cavities possessing resonant modes in the visible region, the study of such cavities has long been restrained by the technologic challenge they represent, as the typical structures size has to be as small as a few hundreds of nanometers. Today this technology becomes mature and even if materials transparent in the visible offer index contrast of less importance, photonic crystal cavities with quality factors of around one thousand have been designed.

We present an original optical characterization technique of photonic crystal cavities (Fig 1). Contrary to classical methods (internal source photoluminescence, evanescent coupling with a waveguideé), this method doesnôt require any specific preparation of the sample and can be used very easily on photonic crystals. We apply this method on L3 type photonic crystal cavities (3 vacant holes) made of silicon nitride and possessing resonant modes between 700 and 830 nm. In our experimental setup, the sample is illuminated on the edge and the light is guided and scattered through the photonic structure. It is then collected over the sample and analyzed by a spectrometric microscope that allows a polarized analysis of the modes.

We measure the spectrum of the light scattered by a cavity. It presents peaks between 700 and 830 nm corresponding to the resonant modes of the cavity. Polarization-resolved measurements allow us to discriminate clearly modes polarized on the x axis (axis of the cavity) from modes polarized on the y axis (axis perpendicular to the cavity). We observe typically 2 well separated y-polarized modes, and 2 or 3 very close x-polarized modes (Fig 2). The results obtained are in agreement with the calculated spectra (FDTD), the geometrical properties of the cavity being taken from AFM measurements.

We use this method to study the influence of geometrical parameters of the cavity (size of holes, shift of the edge cavity holes etc.). These parameters can be used to shift the modes spectrally and improve their quality factor. Quality factors up to 300 are measured.

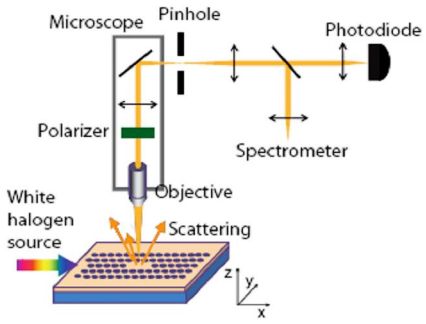

Fig.1. Experimental setup

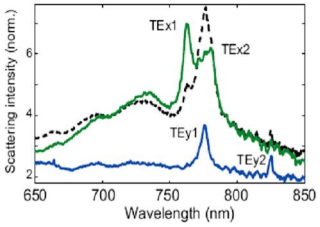

Fig. 2. Experimental polarization-resolved cavity scattering spectra for a polarization analysis parallel (x-axis) and perpendicular (y-axis) to the cavity axis. The non polarized spectrum is in dotted lines.

Study of Rainbow hydrothermal site using deep-sea three components magnetometer

Jérôme Dyment, CHOI Yujin, Florent Szitkar and the MOMARDREAM Scientific Party

Laboratoire de Geosciences Marines, IPG Paris, Centre national de la recherche scientifique (CNRS), France

Due to the rarefaction and increasing price of land-extracted ore, many countries are looking to the oceans as a potential provider of new mineral resources. Polymetallic nodules, manganese crusts, and sulfide deposits at active or fossil hydrothermal sites are all considered as possible mining targets for Ni, Cu, Co, and Mn; Co, V, Mo, and Pt; and Cu, Pb, Zn, Au, and Ag, respectively. Among them, hydrothermal sites have been the focus on many studies to better understand their processes of formation, their characteristics, and derive methods to detect them and exploit them at a reasonable cost.

Hydrothermal sites and vents are observed at mid-ocean ridges, i.e. diverging plate boundaries where new oceanic crust forms, and in other volcanic environments as well. The heat associated with these environments generates a pervasive hydrothermal circulation, using seawater infiltrated through the many faults and fissures commonly encountered in these extensional areas. This hydrothermal fluid dissolves metallic compounds present in the oceanic crust. Ultimately, this fluid reaches the surface and is suddenly cooled at the seawater temperature ï generally close to 2-5°C at these abyssal depths. The dissolved compounds suddenly precipitate and form solid chimneys and clouds of lighter mineral dust which looks like ñsmokeò ï hence the term ñblack smokersò to characterize these hydrothermal vents. The chimneys fall down and new chimneys grow, generating an accumulation of metallic sulfides ï a seafloor massive sulfide (SMS) deposit.

Finding such SMS deposits has become an important goal for geological oceanographers. The most usual way to detect hydrothermal sites is to find the associated water plume enriched in manganese, methane, hydrogen, and helium 3. Such a method, how efficient it has been, is however limited to the search of active hydrothermal vents. These places, which on one hand are still very hot and would damage more rapidly the mining tools, and on the other hand host a fragile and precious ecosystem, are therefore difficult to mine. Methods to find fossil hydrothermal sites (i.e. colder and devoid of specific ecosystem) include systematic rock sampling ï a very tedious endeavour ï and high resolution, near seafloor geophysical surveys. Existing magnetic surveys on basalt-hosted, peridotite-hosted and sediment-hosted sites have revealed different types of signatures, which reflect the magnetizations of the host rock and the ore deposit, among others. Basalt-hosted sites exhibit a negative magnetic anomaly ï i.e. a deficit of magnetization ï due to the hydrothermal alteration of the highly magnetic basalt, whereas both peridotite-hosted and sediment-hosted sites show positive anomalies ï i.e. an excess of magnetization ï clearly associated with the magnetization of the ore deposit. Magnetics is therefore able to help detection and characterization of the sites, and evaluate their mining potential.

We will present results from the recent cruise MOMAR-DREAM onboard R/V LôAtalante using ROV (Remotely Operated Vehicle) Victor of IFREMER on the peridotite-hosted, high temperature hydrothermal site Rainbow on the mid-Atlantic Ridge. Both active and fossil sites in this area exhibit a strong positive magnetic anomaly, a signature which confirms the potential of high resolution, deep-sea magnetic investigations for discovering new mineral resources in the abysses.

Recent Warming in the Western North Pacific Caused by Rapid Changes in the Siberian High and Aleutian Low Pressure Systems

Young-Hyang PARK

Muséum National d'Histoire Naturelle, Paris, France

The causes of the recent strongest sea surface warming in the western North Pacific (Fig. 1) are examined by analysing the relationship between sea surface temperature (SST) anomalies and different atmospheric and oceanic forcing factors in winter, such as the East Asian winter monsoon intensity, surface turbulent fluxes in the western North Pacific, and Sverdrup transport across the midlatitude North Pacific basin. The observed westward intensified strong upward SST trend in the western North Pacific is likely to result from the combined effects of the abrupt weakening of the East Asian winter monsoon due to the unprecedented decline of the Siberian High and the increasing oceanôs role with the lateral advection of SST anomalies by mean currents and the delayed response via Rossby waves of the western boundary current region to the rapidly changing atmospheric circulation of the Aleutian Low pressure system.

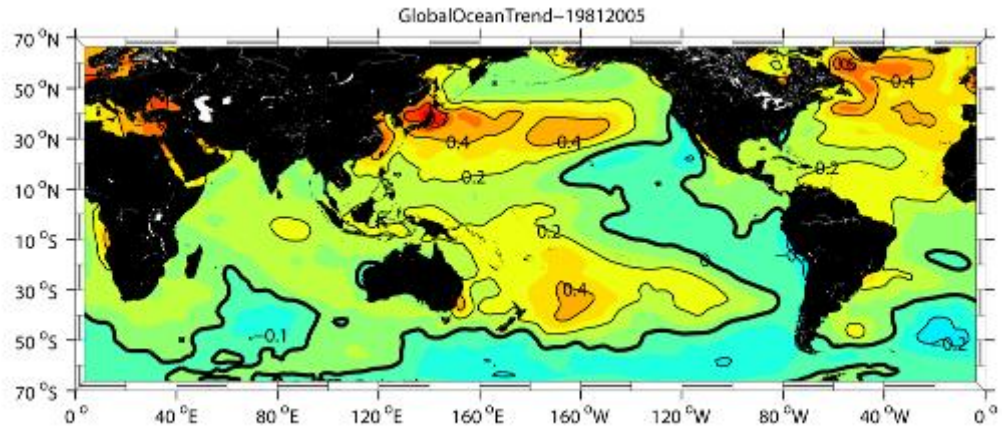

Fig. 1. Global map of sea surface temperature trends (in °C per decade) for the period 1981-2005.

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Information & Communication Technology

Chair : Gakhee LEE (Siemens, Austria)

- Information & Communication Technology (30.July, 13:20 ~ 15:00)

1. **ETRI** *(keynote speech)*
   Myoung-Joon KIM

2. **Reducing Monetary Costs of Amazon EC2's Spot Instances with Checkpointing**
   Sangho YI

3. **Culture or social interaction? A study oF influential factors on weblog design**
   Habin LEE, and Maimunah ALI

4. **Evaluation of persuasion in Human-Computer Interface: a validation of a criteria-based approach**
   Alexandra NEMERY, Eric BRANGIER and Steve KOPP

5. **Social Embeddedness and Opportunistic Behaviour in Buyer-Supplier Chains: A Game Theoretic Network Analysis**
   Jaeyoun OH, Habin LEE

6. **Cost Effective High-Voltage IC Technology Implemented in a Standard CMOS Process**
   Jong Mun PARK, Rainer MINIXHOFER, and Martin SCHREMS

Keynote Speech

Vitalization of Software R&D – viewpoint of government-driven R&D

Myung-Joon KIM

Vice President,
Creative and Challenging Research Division
Electronics and Telecommunications Research Institute (ETRI)

Nowadays ICT has been driven by the software technology. An example is the smart phone, such as iPhone, Google phone etc. Software decides the value of products and services. Korea has had some success stories in ICT domain except software. The government has invested in the promotion of software industry during last 10 years but we realized that there is still a large gap between the goal and the actuality.

Last year, a software industry promotion plan had been reestablished by Ministry of Knowledge Economy. ETRI experts had contributed to the planning, especially R&D strategy part. We summarized the plan and present on the conference. During the session ICT, we will distribute a recent, published on June 2010, Korean Inter-ministry Software R&D Strategic Plan (Korean version only) based on the above one.

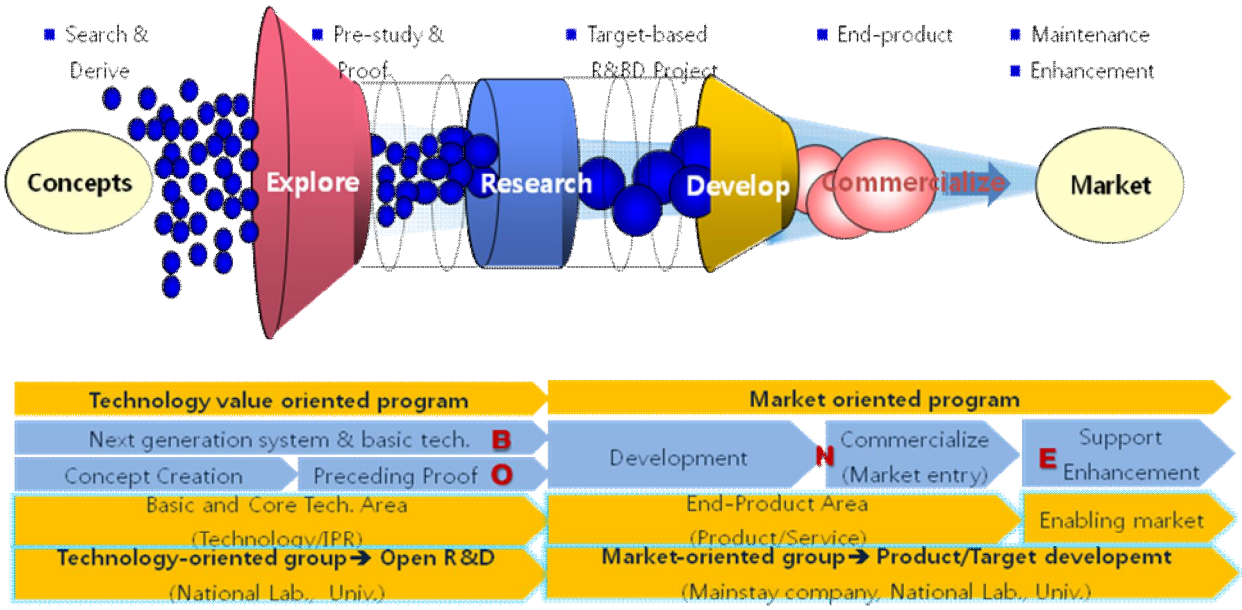

Fig. New R&D Plan: B.O.N.E

Reducing Monetary Costs of Amazon EC2's Spot Instances with Checkpointing

Sangho YI

INRIA, France

Recently introduced spot instances in the Amazon Elastic Compute Cloud (EC2) offer lower resource costs in exchange for reduced reliability; these instances can be revoked abruptly due to price and demand fluctuations. Mechanisms and tools that deal with the cost-reliability trade-offs under this schema are of great value for users seeking to lessen their costs while maintaining high reliability. We study how one such a mechanism, namely checkpointing, can be used to minimize the cost and volatility of resource provisioning. Based on the real price history of EC2 spot instances, we compare several adaptive checkpointing schemes in terms of monetary costs and improvement of job completion times. Trace-based simulations show that our approach can reduce significantly both price and the task completion times.

The main theme of this work:

The vision of computing as a utility has reached new heights with the recent advent of Cloud Computing. Compute and storage resources can be allocated and deallocated almost instantaneously and transparently on an as-need basis.

Pricing of these resources also resembles a utility, and resources prices can differ in at least two ways. First prices can differ by vendor. The growing number of Cloud Computing vendors has created a diverse market with different pricing models for cost-cutting, resource-hungry users.

Second, prices can differ dynamically (as frequently as an hourly basis) based on current demand and supply. In December 2009, Amazon released spot instances, which sell the spare capacity of their data centers. Their dynamic pricing model is based on bids by users. If the users' bid price is above the current spot instance price, their resource request is allocated. If at any time the current price is above the bid price, the request is terminated. Clearly, there is a trade-off between the cost of the instance and its reliability.

The current middleware run on top of these infrastructures cannot cope or leverage changes in pricing or reliability. Ideally, the middleware would have mechanisms to seek by itself the cheapest source of computing power given the demands of the application and current pricing.

In this paper, we investigate one mechanism, namely checkpointing, that can be used to achieve the goal of minimizing monetary costs while maximizing reliability. Using real price traces of Amazon's spot instances, we study various dynamic checkpointing strategies that can adapt to the current instance price and show their benefit compared to static, cost-ignorant strategies. Our simulation results show that using an appropriate checkpointing scheme can reduce significantly both the price and task completion time.

Our future work will include identifying correlation between past and current prices, between instance types, and between rising edges. We are also interested in developing robust prediction methods to minimize monetary costs and completion times under this schema. We will also investigate how to gather "hidden information" such as the amount of bids, the number of available resources, and the number of bidders in order to improve predictions.

Availability:

All data used in this study, the full source code of the simulator and additional results are available under the following URL:

http://spotckpt.sourceforge.net

Culture or social interaction? A study of influential factors on weblog design

Habin LEE, and Maimunah ALI

Brunel Business School, Brunel University, UK

The cultural influence on the web design has been one of the most popular research topics in information systems area for the last decade (Ning Shen and Khalifa, 2007). However, most of the existent studies are targeting static web pages where the users are information consumers and the interactions between web users are in the minimum level. The advent of the Web 2.0 has dramatically turned the mass information customer into information producer through participatory applications. The active user participation in Web2.0 led to more increased user interactions on the web and the way such social interactions influence user behaviour is gaining bigger importance in web-based information systems research (Hookway, 2008). How social interactions among web site users influence the customisation of web pages is the major research question of the paper.

The online social network groups have become prominent, due to the increase number of online communities and the rapid growth of social networking sites (Backstrom et al., 2006). How the online communities behave and are developed over time become interesting research issues in the social sciences domain. Researchers find that online memberships are playing bigger and wider roles in various aspects of membersôlife from friendship, learning, giving advice and opinion, purchasing and consuming products and obtaining services (Bagozzi and Dholakia, 2002). Indeed, Bagozzi *et al*. (2002) suggests groups that are formed through identification are very influential in shaping and changing membersôopinion, preferences and actions. Dholakia et al. (2004) found that decision-making in online membership is a direct function of social influence and indirect function (through social influence) of value perceptions. Given that personal weblogs are social groups, social interactions may induce changes in design based on users experience and usage and as frequent interactions among the same individuals result in greater knowledge and interpersonal relationships, ideas and knowledge are exchange frequently among regular groups of friends. The online social interactions give rise to issues: Is there any commonality in design preferences of blogs in a linked network?

To seek an answer to the research question, this paper adopts content analysis method on sampled weblogs in Malaysia. The initial process involved finding whether blogs in online affiliation share similar design preferences. This covers network of blogs with commonality in members based on demographic data. The network of blogs are analysed based on design elements based on five categorisation, namely the authorôs profile, blog profile, information design, navigation design and visual design. Findings on analysis of blogs design patterns concluded that blogs in a network share similar design elements and there is significant different of design patterns among different networks of blogs.

Evaluation of persuasion in Human-Computer Interface: a validation of a criteria-based approach

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Today the user experience covers areas such as usability, satisfaction and accessibility which are known as critical factors for success. However, studies about persuasion, relying on credibility of the product for instance, are less recognized. Our goal is to promote the introduction of persuasive methods in software elaboration

through psychosocial theories, especially in the Business Intelligence area. Currently, we are proposing a grid measuring persuasive criteria in interface.

1. Theoretical point of view

Fogg (2003) has established the science of captology, based on the acronym "Computer As Persuasive Technologyò. In a first step, we will define the persuasive technology and then present the framework for the persuasive elements analysis. According to us, persuasive technology can therefore be seen as a vehicle to influence and persuade people through ICT. The impact of persuasion technology affects the field of social work, psychology and ethics. Indeed, the technology becomes persuasive when people attribute qualities and properties to the technology that may increase the legitimacy, reliability and perceived credibility. Persuasive technology is characterized by the fact that the intention of changing the attitude and behavior is subtle, hidden and sometimes pernicious.

2. Proposed Criteria

Our proposal is based on a bibliographic analysis and draws up a grid that distinguishes forms and processes of social influence, respectively the static and dynamic aspects of the interface (Table 1).

Static aspects of the interface (criteria based on the content of technological influence)	1. Credibility of the interaction (Fogg, 2003), 2. Guaranty of the privacy (Berdichevsky & Neuenschwaner, 1999), 3. Personalisation (Peppers & Rogers, 1998), 4. Displaying format that may reinforce behaviours (Redström, 2006).
Dynamic aspects of the interface (criteria for the implementation of the influence process)	8. Priming, Initiation of the users. (Joule & Beauvois, 1987) 9. Commitment (Kiesler, 1971) 10. Freely accepted compliance (Joule & Beauvois, 1998) 11. Ascendency and possibility of addiction, (Suler, 2005)

Table 1: General articulation of criteria.

This distinction between static / dynamic introduces a gap between the surface property and the chronological organization of the interaction that progressively leads the user to do what is expected.

3. Discussion

We would like to discuss some points related to persuasive technology issues in contemporary ergonomics. Persuasion technology, like any persuasive method, is not unethical by itself; it depends on the way it is used). To address these problems, Berdichevsky and Neuenschwaner (1999) have proposed ethical principles of persuasive design. The most important principals explain that designers of persuasive technology should never seek to persuade one or several persons to do something they would not consent themselves to be persuaded to do.

4. Conclusion

This communication allows us to explain 8 criteria divided into 2 dimensions - static and dynamic aspects of the interface -seeking to improve the performance evaluation of persuasive elements in interfaces. These criteria can also serve as guidelines or rules guiding the choice of design. Moreover, classically inspect ergonomics software is judging one's ability to be effective, efficient, error tolerant, easy to learn and satisfying for its users; persuasion is generally outside the scope of the inspection. However, the intrusive aspects, ethical handling of certain domestic or professional interactions cannot remain outside the ergonomic analysis, particularly as these

factors affect the attitudes of users to technology. Our approach presupposes the existence of a relatively generic model of the human. However, the diversity of users and situations of use belies this narrow conception of human. For this reason, the performance of inspection techniques may be minimal. In any event, they should be supplemented by other evaluation methods. Therefore, the validation phase of this grid is to be achieved.

Social Embeddedness and Opportunistic Behaviour in Buyer-Supplier Chains: A Game Theoretic Network Analysis

JAEYOUN OH[1], HABIN LEE[2]

1. *Brunel Business School, Brunel University, Middlesex, U.K.*
2. *Brunel Business School, Brunel University, Middlesex, U.K.*

Opportunistic behaviour can increase transaction cost and decrease a firmôs performance. It is not unusual and can take place under any circumstances. Among the studies that aim to reveal how the opportunistic behaviour can be controlled, socio-economists focus on the role of social embeddedness to reduce the risks of opportunistic behaviour. However, in spite of many empirical reports on the positive role of social embeddedness on opportunistic behaviour, it is still not clear how the former depress the later in the context of a supply chain network. This paper aims to answer to the question. Network theory and game theory are reviewed to identify major theoretical constructs to develop hypotheses to explain the relationship between social embeddedness and opportunistic behaviour. An agent-based simulation is performed to test the hypotheses. The theoretical and practical implications of the findings are discussed.

Cost Effective High-Voltage IC Technology Implemented in a Standard CMOS Process

Jong Mun PARK, Rainer MINIXHOFER, and Martin SCHREMS

austriamicrosystems AG, Schross Premstaetten, Austria

For competitive high-voltage (HV) integrated circuit (IC) products an excellent trade-off between specific on-resistance $R_{on,sp}$ and breakdown voltage BV of a HV lateral DMOS (LDMOS) transistor, while keeping low fabrication cost, is mandatory. This paper presents a review of the HVIC technology trend with special emphasis on cost effective 0.35 µm and 0.18 µm HV-CMOS technologies. Through optimized process setup and device engineering a very competitive $R_{on,sp}$-BV trade-off of a HV LDMOS transistor without degrading the low-voltage (LV) CMOS performance has been achieved. A 0.35µm HV-CMOS technology with LDMOS transistor operating voltages from 20V to 120V is reported. Only two mask level adders on top of standard CMOS are required to provide the full set of 3.3V, 5V and 20V-120V HV devices. This is the result of taking advantage of predictive TCAD which enables early optimization of device layouts and dopant concentrations. In addition, HV and LV process integration issues of a 0.18 µm HV-CMOS technology, which play a key role to efficiently implement a HV module into a deep submicron CMOS process, are described. Key issues of p-channel LDMOS transistors are reviewed. The hot-carrier (HC) behaviour of a 50 V p-channel LDMOS transistor is presented, too.

Science & Technology in Culture

Chair : Seonghee KIM (Nottingham Trent University)

- Science & Technology in Culture (31.July, 09:30 ~ 11:00)

1. **Music, Burnout and Depression** *(keynote speech)*
   Roland HAAS

2. **Art, Science and the public; focusing on science as a resource for creative art** *(keynote speech)*
   Seonghee KIM

3. **Adaptive Strategy Decision Mechanism for StarCraft AI**
   Sangho YI

4. **The Excellence of the Historical Cultural Heritage of Korea - plus its scientific & technical applications.**
   Eonuh RHEE

Did you know...?

- Austria has 4 Novel prize winners in Peace, Economics and Literature
  - Bertha von Suttner (Peace, 1905), Alfred Hermann Fried (Piece, 1911), Elfriede Jelinek (Literature, 2004), Friedrich Hayek (Economy, 1974)
- A mummified body from the Stone Age was found in the ice of the Otztal Alps, between Austria and Italy, in 1991. (ñÖtzi the Icemanñ)
- About one fourth of the population of Austria lives in Vienna. (1,660,534/8,356,707)
- Austria is the only continental EU country that is not a member of NATO.
- Austrian flag is one of the oldest national flags in the world. (A.D. 1230)
- Ferdinand Porsche, the founder of 'Porsche' company, was an Austrian.
- In the 16th century, the Austrian Empire included Austria, Belgium, Czecho-slovakia, Hungary, the Netherlands, Spain, Spanish American colonies, parts of Italy and the former Yugoslavia.
- And they lost their seashore after World War I. That is why the Captain von Trapp is staying at home in ñSound of Musicò, which is based on true story ñ*Die Trapp-Familie in Amerika*ò.
- Many world famous composers, Mozart, Haydn, Schubert, Liszt, J. Strauss, Mahler and Bruckner, were Austrian.
- Marie-Antoinette, the wife of France's King Louis XVI, was the daughter of Marie Theresa, the Habsburg ruler of Austria.
- Salt (salz) was mined at Salzburg and Hallstatt in the early Iron Age also.
- Schönbrunn Palace, the summer palace of the Habsburgs, has over 1440 rooms.
- The Krimml Falls, with a height of 380 meters, are amongst the highest waterfalls of Europe.
- Vienna once served as the musical center of Europe.
- Vienna's Central Cemetery has over 2.5 million tombs (more than the city's present population), including those of Beethoven, Brahms, Gluck, Schubert, Schoenberg and Strauss.
- Wolfgang Amadeus Mozart was not born in 1756 as an Austrian but a Salzburger. In his times, Salzburg was not belonged to Austrian Empire. It was the seat of the Archbishopric of Salzburg, a prince-bishopric of the Holy Roman Empire. In 1803, the archbishop was secularized by Emperor Napoleon. In 1805 Salzburg was annexed to the Austrian Empire.
- The University of Vienna was founded in 1365 and is the oldest university in the German-speaking world and one of the largest in Central Europe.
- The first chocolate cake was invented by 16-year-old boy Franz Sacher in Vienna, 1832. His eldest son, Eduard Sacher completed the recipe in Demel Bakery. It was called Sacher Torte, which is still produced in many bakeries. You can taste the óOriginal SacherôTorte in Hotel Sacher in Vienna

Keynote Speech

Music, Burnout and Depression

Dr. Roland HAAS

CEO,
Sanoson Company

MusicMedicine – new intervention strategies based on specifically composed music programs as integrative therapies in psychosomatics

MusicMedicine is the term used to describe music interventions based on physiological and psychological parameters that, contrary to active forms of Music therapy, do not require a musician who is trained as a music therapist. For today reliable evidence exists to confirm that music produces reproducible effects and has valuable therapeutic properties. Therefore we recommend the use of the term MusicMedicine to designate the therapeutic use of music in medicine". (Spintge and Droh (eds.) 1987)

MusicMedicine implements music as a therapeutic medium in medical treatment. Tue patient listens to music that has been selected for him or her by the therapist, whereby the music takes on the role of a prescribed intervention. Where this is performed on the basis of exact knowledge of the various aspects and levels of effect, it would be legitimate to refer to MusicMedicine as music pharmacology.

By far, the greatest research efforts in the recent years have been directed towards basic neuroscientic research on the effects of music. This has involved investigation into the different ways in which musiciansô and non-musiciansô brains process music, as well as the effects of instrumental instruction and neurodevelopment. The few clinical practice studies that are available mostly lack data on untreated control groups or those subjected to placebo interventions. To date, only a couple of studies have been performed to investigate possible differences in the ways people suffering from disorders and healthy people process musical stimuli. Only very recently, imaging techniques have been implemented with a view to demonstrating therapeutic effects of music in patients.

Statistical reproducibility is a prerequisite for any form of intervention to be accepted into the canon of standard medical treatment. Despite the large number of studies that have been conducted to investigate the effects of music, few would satisfy the criteria of evidence-based medicine. In our MusicMedicine research program at the Paracelsus Medical University Austria, we have conducted RCTs in Salzburg and Vienna. In our two most recent studies we evaluated the effect of our specially composed music programs on depression and burnout.

Approximately 75% of men and women described as suffering from a depressive disorder according to standard clinical criteria never receive medical or psycho-therapeutic treatment (WHO). Further, mild-to-moderate depressive states are frequently chronic and therefore usually difficult to treat (Schmitz 1999, 2004). Mild-to-moderate depression and dysthymia may cause greater impairment than for those with major depression (Klein et al. 1997a), presumably because of the longer duration of depression in dysthymic disorder, which is also a prime risk factor for suicide. Research has consistently shown a strong link between suicide and depression, with 90% of the people who die by suicide having an existing mental illness or substance abuse problem at the time of their death.

Burnout syndrome is increasingly common and grows, in many cases, into an existential threat to those who are affected by it. Further, burnout may also lead to seriously disruptive consequences for society, organizations and companies. Burnout syndrome is a set of physical and psychological symptoms, including fatigue, anxiety, depression, irritability, cognitive weariness, sleep disturbances, headaches, gastric spasms, non-specific pain and poor health behaviour. Burnout develops gradually; symptoms can appear over several years. Prior studies link burnout with ill-health, including: metabolic syndrome, dysregulation of the hypothalamic-pituitary-adrenal axis and sympathetic nervous system activation, systemic inflammation, and impaired immunity, blood coagulation and fibrinolysis (Melamed et al.2006).

From a mental health perspective, burnout is characterized by low personal accomplishment, high levels of mental exhaustion and depersonalization, depleted emotional resources, and the loss of stress resilience. Progressive burnout results in decreased productivity. Without effective measures and adequate treatment, affected patients risk mental breakdown, after which complete recovery is difficult and relapse is common.

Research Results:

In comparison to the waiting list group and the placebo group, both the P1 and the P2 music therapies were observed to have a significant, positive effect in reducing depressive symptoms. The correlations between the measurement instruments for depression were only moderate, which suggests the different instruments included in the test battery (i.e. HRSD, BDI and HADS-D) tap into different constructs or sub-constructs of depression. Furthermore, the extent of the positive changes assessed by each single scale depended on whether P1 or P2 was applied. This suggests that the two programs effect improvements in different aspects of depression (Brandes et al. 2008). In the analyses of the qualitative data, study participants in the two verum arms of the study reported sustained subjective improvement in their condition.

Both the P1 and the P2 intervention also had a significant, positive effect in reducing burnout symptoms compared to the waiting list control group. The effect observed with the P1 program was slightly larger than the effect observed with the P2 program. The placebo music program was not observed to have a significant effect. These relationships persisted through various iterations and approaches to model building (Brandes et al. 2008). Within the study sample, the developed music programs were effective in reducing the symptoms of burnout after a relatively short five-week period of intervention. Considering the amount of time and money involved with other forms of treatment for burnout, these specially developed music programs display clear advantages. Furthermore, this newly developed form of receptive music therapy appears to be superior concerning its long-term effects. Qualitative, in-depth interviews have been completed every three months since study end. To date, all the participants have reported a sustained degree of stabilization.

Art, Science and the public; focusing on science as a resource for creative art

Dr. Seonghee KIM

Professor,
The Nottingham Trent University

Artôs search for new subjects and methods and scienceôs need for effective communication have led to the creation of what is known as Sci-Art. It is the central argument of this paper that collaboration between creative and scientific disciplines can play a useful role in society, but that this potential is held back by misunderstanding of the roles of art and science. The main purpose of this study is to determine the relationship between artists and scientists, focusing on the visualisation of DNA. This study identifies their shared approaches to its representation, and explores the history of DNA as an iconic form. An additional purpose of this study is to analyse the importance of the role of collaboration between scientists and artists including its application to education. My method is to review Sci-Art work and analyze the benefit of collaboration between science and art. Part of this research will focus on the benefits of Sci-Art collaboration for education. Collaborative artworks and exhibitions are the final outcome of this project; they explore the ways in which Sci-Art can be developed as a useful form of interdisciplinary practice. These creative methods provide a route to a deeper understanding of the relationship between art and science. This study demonstrates through a combination of theoretical argument and creative practice that Sci-Art has the potential to: Act as an aid to understanding difficult scientific concepts; add to debate about the ethical issues surrounding science; and increase the effectiveness of education.

Adaptive Strategy Decision Mechanism for StarCraft AI

Sangho YI

NRIA Grenoble Rhone-Alpes,France

Recent advancement of computer systems and their global networks have enabled us to enjoy many kinds of on-line games. StarCraft has been the one of the well-known on-line strategy simulation games, since it was made in 12 years ago. The game users have been extremely improved their playing level, but the AI (artificial intelligence) system of the game was rarely updated. At the consequence, current AI level is much poorer than that of the human players. In this paper, we present a noble AI mechanism for StarCraft based on the adaptive strategy decision mechanism. We implemented the proposed mechanism on the real StarCraft: BroodWar binary code. We compared the performance of the modified AI code, and the results show that the new AI code outperforms the existing artificial intelligence of the game.

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The Excellence of the Historical Cultural Heritage of Korea - plus its scientific & technical applications.

(우리가 알아야 할 자랑스러운 한국의 역사문화유산**)**

Eonuh RHEE

Senior Partner, Indarti Associates, UK

Throughout Korean history, dating from the B.C 3 & 4century of Old Chosun period, through Koguryo, Baekche, Silla, Koryo, Chosun. Korea has experienced a series of constant contact & exchanges with various Chinese, Mongol, Manchurian tribes.

These experiences have provided for many different layers of impact & influences on Korean society, its culture, philosophy, religion and science & technology.

This presentation will sample a few items from Korean Cultural Heritage to show itsôunique quality.

Among the architectural heritage, two examples will be focused here especially on the structural engineering with mathematical application of Sokkuram Grotto and the environmental engineering quality of the Depository Building in Haeinsa Temple.

Such heritages also show in some of artefactsô extraordinary & remarkable metallurgical technology of the Gilt-Bronze Incense Burner during 6th Century AD Baekche Kingdom. And also the Sarira Reliquary of Kamunsa Temple, 7th Century and the Sacred Bell of King Songdok, AD771 of Silla Kingdom.

The Buddhist paintings produced during Koryo dynasty (AD 918 ï AD 1392) have been cited as the most exceptional quality of any Buddhist paintings across Asia.

The historical documentary records are highly valued in terms of the significant historical contents and also as the high quality artefacts. Among them the Early Korean Cartography (Old Map) and the unique pictorial record of the Royal Protocols of the Chosun Dynasty (Uigwe, 1392-1910) are exampled.

However, the essence of the highly developed Korean Cultural Heritage is not introduced properly. They are less appreciated & studied, sometimes neglected, misguided and under valued in comparison with Chinese and Japanese artefacts.

Mechatronics & Mechanical Engineering

Chair : Hyun Woo SO (RWTH Aachen, Germany)

- Mechatronics & Mechanical Engineering (31.July, 09:30 ~ 11:00)

1. **Towards Greener Aircraft - Comparative Review of Current and Future Aircraft**
   Sung Ho YOON

2. **Use of higher tiered exposure assessment for worker in risk assessment under REACH**
   Jongmun CHA, Jongwoon KIM, Sanghun KIM, Eun Kyung CHOE

3. **Experimental Framework for Controller Design of a Rotorcraft UAV Using Multi-Camera System**
   Hyundong OH

4. **Dubins Path Planning of Multiple UAVs for Communication Relay**
   Seungkeun KIM

Towards Greener Aircraft - Comparative Review of Current and Future Aircraft

Sung Ho YOON[1] and EunKyong BAEK[2]

1. *Aerodynamic Engineer, Alstom Power, Rugby, UK*
2. *Faculty of Art and Design, De Montfort University, UK*

Air travel has become essential in modern society. However, the emission and noise from the aircraft raises environmental concerns. Therefore, it is important to understand where we are and where we are heading for towards greener aircraft. It is the aim of this paper to review the latest technology in aircraft design, including aero-engines, and review some promising technologies for the future aircraft.

Great efforts have been made to design aircrafts more efficient and environmentally more sustainable over the past decades. In particular, the latest aircraft designs from Boeing and Airbus, which are Boeing 787 and A380 respectively, show the state of the art. The important technical achievements of these aircrafts are reviewed and compared in this study. It is also relevant to understand that Boeing and Airbus has two different strategies in developing their aircrafts. In particular, Boeing 787 and A380 are designed based on the ópoint to pointô and the ôhub to spokeô model, respectively. The concept of the two different models is discussed in this paper. Further to this, both Boeing and Airbus have faced many problems and delays in delivering their aircraft. The history of designing their aircraft and the causes of their problems are also discussed.

Finally, three promising important technologies, which are likely to be employed in the future aircraft, are examined. These include the geared turbofan, open rotor and silent aircraft. However, each technology involves some challenges to overcome and these aspects are discussed.

Use of higher tiered exposure assessment for worker in risk assessment under REACH

Jongmun CHA[1], Jongwoon KIM[1], Sanghun KIM[1], Eun Kyung CHOE[2]

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2. *Korea Institute of Industrial Technology, 1271-18, Sa-3-dong, Sangrok-gu, Ansan Gyeonggi-do, 426-791, South Korea*

REACH (Registration, Evaluation, Authorisation and Restriction of Chemical substances; European Union, 2007) is the new European Community regulation on chemicals and aims to ensure control of risks for all substances. As the exposure assessment is required as a part of chemical safety assessment under REACH, computer exposure models are often used to estimate various exposure scenarios due to a lack of reliable measured data. The main objective of this study is the better understanding of the modelôs performance, strength, limitation and application for worker in risk assessment.

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Experimental Framework for Controller Design of a Rotorcraft UAV Using Multi-Camera System

Hyundong OH

Department of Informatics and Sensors, Cranfield University, Defence Academy of the UK, Swindon , UK

In recent years, there has been a growing interest in a small-sized unmanned aerial vehicle (UAV) in both civilian and military applications. In particular, new concepts of rotorcraft UAVs such as ring-wing and multi-rotor type have been studied by many researchers due to their capabilities of vertical takeoff and landing which can be used in small-area monitoring, building exploration, surveillance and rescue mission. Since the rotorcraft UAV is dynamically unstable, suitable control strategies are required for stabilization, and various methods have been developed. In developing the control system of the rotorcraft UAV, since it is difficult to accurately describe the aerodynamics, the verification of its performance by flight test plays an important role. Normally, most autonomous flight test was performed outdoor so that the reliable navigation system like GPS can be used. Several outdoor experimental test-beds have been developed for the rotorcraft UAVs. However, outdoor test-bed requires not only wide area, suitable transportation and qualified personnel but also tends to be vulnerable to the adverse weather condition. Accordingly, an indoor flight test-bed using a vision system is recently emerging as a possible solution to overcome these limitations and to perform more efficient and easier flight experiments. The indoor flight test-bed enables flight test which ensures protection from the environmental condition and there is no need of any other on-board sensors like GPS or INS since the pose information can be directly obtained by the image processing. Recent work on the indoor test-bed using the vision system has been carried out by the MIT aerospace control lab (ACL) in developing the RAVEN system. The RAVEN system estimates the information of the UAV by measuring the position of the reflective maker installed in the UAV via beacon sensor used in motion capture. Also, a visual control system for a micro helicopter has been developed. Two stationary and upward-looking cameras placed on the ground to track four black balls attached to the helicopter. The errors between the positions of the tracked balls and pre-specified references are used to compute the visual feedback control input.

In this paper, we propose the experimental framework considering the characteristics of the rotorcraft UAV for the design and the validation of the control system by applying the indoor test-bed concept using the vision system. The development of the rotorcraft UAV control system begins with nonlinear modelling of the vehicle followed by controller design using numerical simulation and concludes with the flight test. Our experimental framework performs the development procedure systematically by using manufactured quad-rotor UAV, 3-DOF flying mill as a setup for the attitude control and multi-camera system. The proposed framework can be applied to various types of the rotorcraft UAV with minimum personnel and low cost in a short period of time. Besides, since the position or the velocity control is performed after ensuring enough performance of the attitude control, which is inner-loop of the control system, experiment of the designed controller can be done effectively and safely. The experimental results show that the proposed approach can be viewed as a successful tool in developing the controller of new rotorcraft UAVs with its reduced cost and time.

Dubins Path Planning of Multiple UAVs for Communication Relay

Seungkeun KIM

Department of Informatics and Sensors, Cranfield University, Defence Academy of the UK, Swindon , UK

This paper investigates the path planning strategy of a swarm of UAVs with the aim of guaranteeing the communication relay between a ground control station and a friendly fleet. A decision making algorithm mainly relies on waypoint generations and path planning based on Dubins theory and deals with dynamic and strategic constraints such as maximum speed, minimum curvature radius, and no fly zones arising from the mission operative scenario. The example simulations concerning a baseline scenario with a swarm of three UAVs are done to verify the feasibility of the proposed path planning algorithm.

INTRODUCTION

Nowadays using a swarm of robots such as UAV (Unmanned Airborne Vehicle)s to aid the main mobile platforms has received attention because the overall system can perform the given missions with synergy using relatively inexpensive subsystems. To get use of this benefit for extending the mission area of a main FF (Friendly Fleet) such as aircraft and ground convoys, this study also focuses on path planning of multiple UAVs for communication relay between the FF and a GCS (Ground Control Station).

The focus of this paper is on the development of a trajectory planning frame of multiple auxiliary UAVs making use of the merit of the Dubins path theory for communication relay between a FF performing a main mission and a GCS centrally administrating the whole mission. The Dubins path is a composite path formed either by two circular arcs connected by a common tangent or three consecutive tangential circular arcs, or a subset of either of these two. A straight line provides the shortest distance for the rectilinear motion and the circular arc provides the shortest distance for an angular motion. Also, the arc provides a constant turning radius which also satisfies the maximum curvature constraint, i.e. the minimum turning radius which is a function of speed and maximum lateral acceleration. This is the basic idea of Dubins path. Using this Dubins path, the shortest path between two vectors in a plane can be designed with meeting the minimum bound on turning radius. Another benefit of the Dubins path planning is computational efficiency since it calculates the path between the successive waypoints using a simple geometrical relationship using the information of positions, orientations, and turning radii at the starting/final waypoints. In fact, the computational load of the Dubins approach is much lighter than that of the receding horizon method or the mixed-integer linear programming requiring optimisation because the Dubins theory does not need any iteration until converging to the candidate path. In this study, decision-making schemes are also developed to incorporate a waypoint generation algorithm for the Dubins path planning with handling of dynamic and strategic constraints such as UAV speed limit and non-flying zones, respectively. The numerical simulations on a baseline scenario are done to verify the feasibility and performance of the proposed approach.

Women in Scienceand Technology in Europe Forum (WiSTiE)

Chair : Myung-Joo KANG (GrAT, Center for Appropriate Technology, Austria)

- Encore Speech (31.July, 09:00 ~ 09:30)

1. **Korean Women in the 21st Century**
   Sung Ja CHANG

- WiSETiE Forum (31.July, 09:30 ~ 11:00)

1. **Education and Training Policies for Women Leadership in Science Technology & Engineering in Korea**
   Soonja CHOE

2. **Introduction of Women in Science and Technology in Europe**
   Sung-Eun BAE

This Forum is supported by the Korea Federation of Women's Science & Technology Associations (www.kofwst.org)

Encore Speech

Korean Women in the 21st Century

Dr. Sung Ja CHANG

Professor,
Namseoul University

Recently Korean women are performing the role as companions in various kinds of social fields having a competitive edge with men as they have higher educational level.
However, since mid-17th century Korean Confucianism (Seong Ri Hak, neo-Confucianism) had important influences on Korean social (community) and family norms and resulted in sexual division in the labor market and they became barriers for women to enter the fields which were regarded as exclusive fields to men (sciences, engineering and technologies).
Even though the new social / economic systems demand Korean women to participate in economic activities, problems of harmonious coexistence between family and work have effect on women.
Cultivating talent and their application to practical fields are the most urgent problems for Korea to firm up its position as a developed country.
Here in, we discuss about the current state and the supporting policies for Korean women to display their ability in the field of science, engineering and technology.

Contents:

- International Status of Korean Women
- Women and Family Life
- Traditional Family System
- Families in Modern Society
- Women and Social Life
- Women Moving into the Mainstream
- Women in Science, Engineering and Technology

Keynote Speech

Education and Training Policies for Women Leadership in Science Technology & Engineering in Korea

Dr. Soonja CHOE

Professor,
Department of Chemical Engineering, Inha University

In the presentation, the statistics of female ST&E, policies for female ST&E, education programs for female students in engineering school in Korea and the representative training program for the graduate students in the school of engineering, so called WATCH21, which is the Womenôs Academy for the Technology Changer in the 21st Century, will be reported. In addition, the suggested policies to empower women leadership in ST&E will be discussed

Introduction of Women in Science, Engineering and Technology in Europe

Sung-Eun BAE

University of Surrey, 16 Priors Barn, 53 Beaumont Drive, Worcester Park Surrey, UK

The mission of the WiSETiE (Women in Science, Engineering and Technology in Europe) Forum in EKC2010 is to establish and strengthen the network of Korean women in SET-related fields in Europe, and to facilitate communication and cooperation between our members to promote their career development and success.
An overview of female scientists and engineers in UK, Germany, France, Austria, and neighbouring countries ï number of female members and their research activities ï is going to be provided based on the statistic investigation.

Gangwon Techno Park: Technology Partnering

Chair : Myung-Joo KANG (GrAT, Center for Appropriate Technology, Austria)

- Gangwon Techno Park: Technology Partnering I (30.July, 13:20 ~ 15:00)

1. **Bio-medical convergence projects of leading industry development for Gangwon economic region** *(keynote speech)*
   (강원광역경제권선도산업 의료융합프로젝트)
   Dae Yong SHIN

2. **The Kangwon Fine Ceramics R&D strategy**
   (신소재클러스터사업단 R&D 전략)
   Sang-Yeup PARK

- Gangwon Techno Park: Technology Partnering II (30.July, 15:20 ~ 16:20)

1. **Gangwon plasma industry development strategy**
   (플라즈마국제교류협력센터 사업운영전략)
   Hyo-Soo JEONG

2. **Development for the anticoagulant as a peptide**
   (펩타이드성 황혈전제 제품화개발)
   Seok In KIM

- Gangwon Techno Park: Technology Partnering III (30.July, 17:00 ~ 18:30)

1. **Development of prostate cancer disease diagnostic system using time-resolved autofluorescence**
   (시간분해 자기형광기법을 이용한 전립선 암질환 진단시스템개발)
   Sang Dae LEE

2. **Development of Multivariate Index Assay based in vitro diagnostic Medical Decision Support System for ovarian cancer**
   (혈청 단백질 다표지 바이오마커 검출을 통한 난소암 체외진단 시스템상용화)
   Myung Sun LEE

3. **Non-contact Vital Sign Realtime Monitoring System**
   (비접촉형 생체징후 실시간 감시 시스템 개발)
   Weon Young LEE

Keynote Speech

Bio-medical convergence projects of leading industry development for Gangwon economic region

Dae Yong SHIN

Gangwon Leading Industry Office

Gangwon economic region has grown up to become the top bio-medical cluster in korea. The total size of Gangwon knowledge economy based on bio-technology, medical devices and fine ceramics has surpassed 1 million USD for the first time in 2007. In addition to the current 5-year 50 million USD Gangwon knowledge industry project □(2008~2012), Gangwon launched into another 3-year 42 million USD ambitious program called " Bio-Medical Convergence Project" for the 2nd great leap of Gangwon economic region.

Leading a synergy effect by cross-linking bio-medical industries, such as medical service, medicine manufacturing and medical device or converging with other industries, such as IT, BT, NT.

Consists of IT-intergrated medical device, imaging medical care device, early diagonostic system, natural substance medicine, medical care material, etc

The Gangwon Fine Ceramics R&D strategy

Sang-Yeup PARK

Gangwon Fine Ceramics Center, Gangneung, Gangwondo 210-702, Rep. of Korea

The Kangwon Fine Ceramics Center is dedicated to enhancing Gangwonôs research & development outcomes in fine ceramics technology and industry by promoting effective collaborations encouraging forum for field engineer and career researchers, increasing fine ceramics technology infrastructure, enhancing awareness of existing infrastructure, and promoting international links. Our aim is set to lead the industrialization of the Gangwon region by providing core technology as well as creating a local science and technology infrastructure that will transform the region into the R&BD hub of pan-pacific rim region. For further development of Gangwon province, we are going to create collaborative relationships with industry, university, and institutes at home and abroad. At the center of these global cooperative networks, KFCC is exposed to play an important role in establishing the global R&BD infrastructure to achieve the initiatives in fine ceramics technology and industry.

Gangwon plasma industry development strategy

Hyo-Soo JEONG

International Plasma Research Center, Cheorwon-gun, Gangwon-do, 269-802, Rep. of Korea

International Plasma Research Center (IPRC) is a division of Gangwon Technopark. It is located at Cheorwon Plasma Research Institute, Cheorwon County, Gangwon Province. It was founded in 2006 by Gangwon Provincial Government to activate the plasma technology based industry in Gangwon Province, in particular, the Cheorwon Plasma Industry.

Cheorwon County is proud of its cleaner environment than any other region in the nation. In general, the industry relevant to plasma technology applications minimizes the emission of pollution materials including waste water and CO2. Thus, Cheorwon County has chosen the plasma technology based industry for its growth engine for the region. Cheorwon Plasma Research Institute (CPRI) was founded by Cheorwon County for the development of the Cheorwon Plasma Industry. It seeks a role model for a research institute of local government. IPRC is working closely with CPRI.

IPRC has a variety of functions to support the Cheorwon Plasma Industry via collaborations and networks with foreign partners that have unique and competitive technology for the business. International collaborations between IPRC and foreign partners such as performing joint research activities, establishing joint research institute at Cheorwon, and attracting businesses are among the most important activities of IPRC. The plasma forum that is a technological symposium organized by both IPRC and CPRI contributes to good networks with many experts, both local and abroad, in the fields. The forum is being held twice a year.

IPRC seeks business oriented collaborations with foreign partners for the maximum of mutual benefits. Foreign partners collaborating with IPRC in the fields of plasma technology applications will have unique opportunities for the business in Korea.

Development for the anticoagulant as a peptide

Seok In KIM

C-TRI., NamyangJu, Gyunggi, Rep. of Korea

C-TRI (Chem. Tech Research Incorporation) is the first pharmaceutical venture in KOREA which set a goal to make complete peptide bio-pharmaceutical product from drug substance. We are preparing generic peptides Bilvalirudin as anti-coagulant, Leuprolide, Goserelin which are prostate cancer drugs to reach a goal of approval of cGMP facilities until April 2011. Also we are research and production of ionic liquids which is environment-friendly and has high possibility of applications in various fields. C-TRI is leading bio-pharmaceutical company for 21C which can perform basic research, production of raw materials as generic peptide and drug product.

Development of prostate cancer disease diagnostic system using time-resolved autofluorescence

Sang Dae LEE

IM, Wonju, Gangwon, Rep. of Korea

Recently domestic medical instrument companies have focused on optical microscope, sample gathering and diagnosis markers based on traditional medical instrument technology. Furthermore there are no companies which can approach fractal analysis utilizing laser and IT technique. The development of bench-top POCT cancer diagnosis system is expected by exploiting related technique, energy distinction technique according to autofluorescence analysis by laser and statistical database of disease factor, detailed technique field, can be applied to cancer disease test of various fields. Now quantitative cancer diagnosis instrument is in early part, if Optical Cancer Diagnosis (OCD) instrument with Single Photon Counting method launches at market, it is possible to be a next generation volunteer at cancer diagnosis IVD market of America and Europe by pioneering Blue Ocean of cancer diagnosis market.

Development of Multivariate Index Assay based in vitro diagnostic Medical Decision Support System for ovarian cancer

Myung Sun LEE

Ahgook Pharm., Gurogu, Seoul, Rep. of Korea

Ovarian cancer is a common malignant tumor in 50-70 yr ages of women which best feature is causes non-specific symptoms. Since more than 70% of ovarian cancer patients are diagnosed at stage III, already progressed far, there is an urgent need to diagnose in early stage. This study is objected to examine the alteration pattern of plasma protein in ovarian cancer and to develop the diagnostic products in early stage with Mutivariate Index Assay based on the study of statistical relations in each altered plasma proteins.

Non-contact Vital Sign Realtime Monitoring System

Weon Young LEE

MTM., Chuncheon, Gangwon, Rep. of Korea

The hospital's intensive care unit, burns, dental floss wife, who has a nursery and uncomfortable Country behavior, disaster sites, such as patient transportation, without regard to the situation in each pulse, temperature, respiratory and medical conditions based on non-contact sensor technology Optical fusion through the monitoring and U-healthcare system, produced by the device to a remote health care services to develop products that are carried out.

Korean Scientists' Assembly in EU

- **Korean Scientists' Assembly in EU I (30.July, 13:20 ~ 15:00)**

- **Korean Scientists' Assembly in EU II (30.July, 17:00 ~ 18:30)**

This session has no presentation but free discussions among the research institutes. Institutes and their representative technology will be introduced.

Korea Research Council for Industrial Science & Technology (IstK)

IstK was established in 1999 to develop knowledge-based industries and strengthen creation of new industries.

IstK, under the ñAct on the Establishment, Management and Promotion of Government-funded Research Institutes(GRIs),ò manages 14 GRIs systematically by carrying out the following activities; 1) evaluation of member institutesô strategy to promote research capabilities and to increase its competitiveness, 2) development and implementation of joint research projects for convergence technology, 3) development of cooperative initiatives based on the MOU such as joint research projects at international level, organization of joint workshop, and exchange of information/researchers.

With its 10-year experience and expertise, IstK strives to become a bridge between national science & technology and industries to advance GRIsôcapabilities.

IstKôs member institutes are as follows:

Korea Institute of Industrial Technology (KITECH)
Korea Institute of Construction Technology (KICT)
Korea Food Research Institute (KFRI)
Korea Institute of Machinery & Materials (KIMM)
Korea Institute of Energy Research (KIER)
Korea Research Institute of Chemical Technology (KRICT)
Korea Institute of Toxicology (KIT)
Electronics and Telecommunication Research Institute (ETRI)
National Security Research Institute (NSRI)
Korea Railroad Research Institute (KRRI)
Korea Institute of Geoscienc and Mineral Resources (KIGAM)
Korea Institute of Materials Science (KIMS)
Korea Electrotechnology Research Institute (KERI)
World Research Institute of Kimchi (W-Kimchi)

ULTRA Program (Universal Linkage for Top Research Advice)

- I. **Environment & Energy (30.July, 15:00 ~ 18:30)**

Climate Model : Infrastructure for Climate Change Research
Wonsun PARK

- II. **Bio Science (31. July, 09:30 ~ 12:30)**

The Journey to understanding "Brain and Memory Loss"
K. CHO

Conference Venue

- The Imperial Riding School Renaissance Vienna Hotel

- Ungargasse 60, Vienna, A-1030 Austria
- Phone: +43-(0)1-71175-0
- Fax: +43-(0)1-71175-8143

How to reach the Conference Venue

- From Vienna International Airport
  - Using Train (Duration: appr. 30 Minutes)
    - Please take the "**Schnellbahn (S-bahn)**" No. 7 in Direction to **Floridsdorf**
      The train starts every 30 minutes
      (for example, 9:18, 9:48, 10:18, 10:48, 11:18, ...)
      First train: 4:54am, last train: 0:18 am
      Price: 3.6 EUR (**You should buy a ticket for two zones**)
    - Get off in the station "**Rennweg**"
    - Walk about 150 meter
  - Using Taxi
    - If you take a taxi, it'll cost approximately 35 EUR.

From Conference Venue to City Center

- On Foot
  - Distance to Opera:~ 1.4 km
  - Time: ~22 minutes
- By public transportation
  - To Vienna pera House
    - Take the Tram "71" to Schwarzenbergplatz and change Tram "2" (one stop)
  - To Stephansplatz
    - Take the bus **4A** to Karlsplatz and change Subway Line **U1** (Red Line) to Stephansplatz (one stop) or
    - Take the Tram "**O**" to Landstrasse and change Subway Line **U3** (Orange Line) to **Stephansplatz** (two stops)

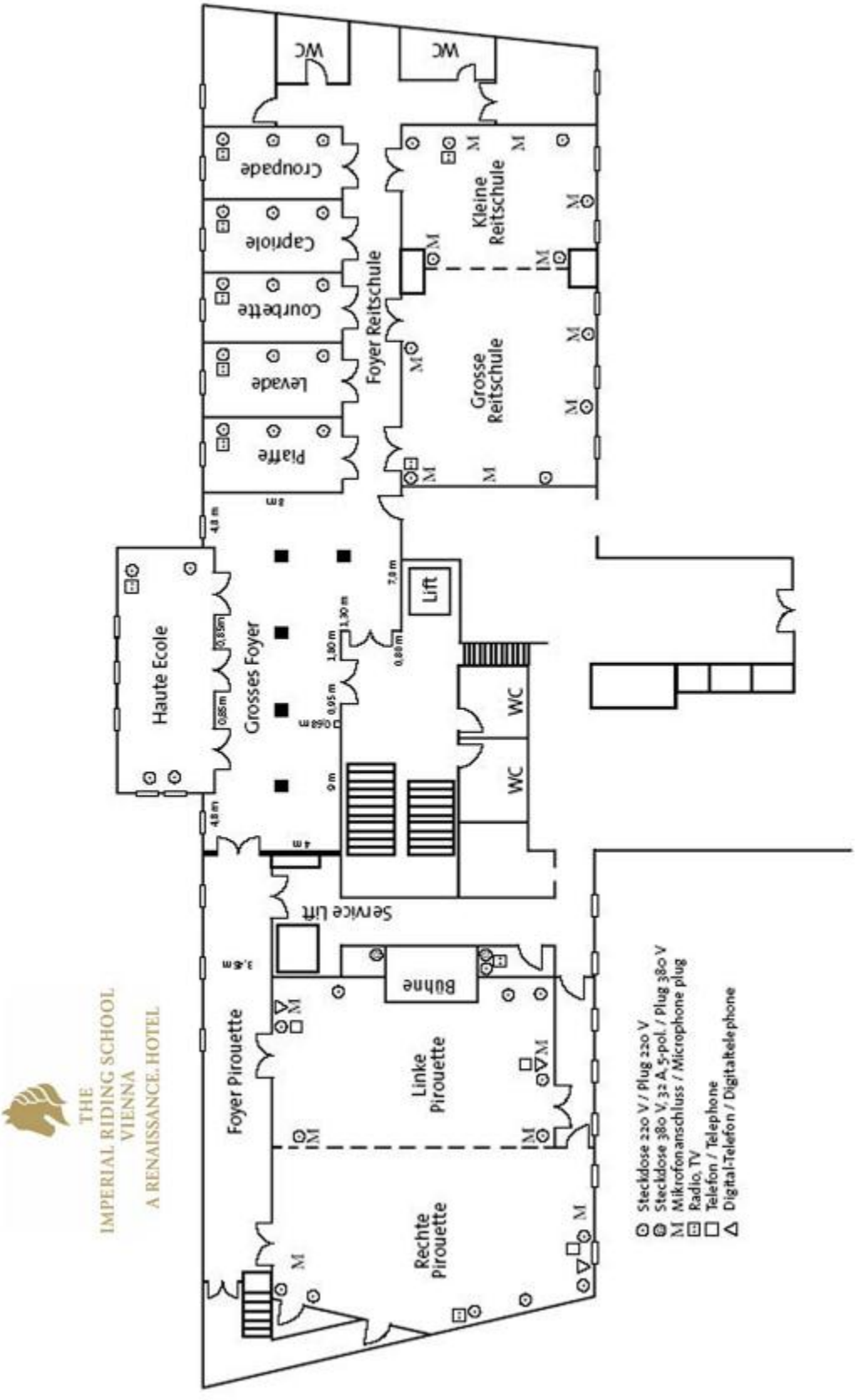
Places of interest near the hotel (please take a look at the Vienna city map before)

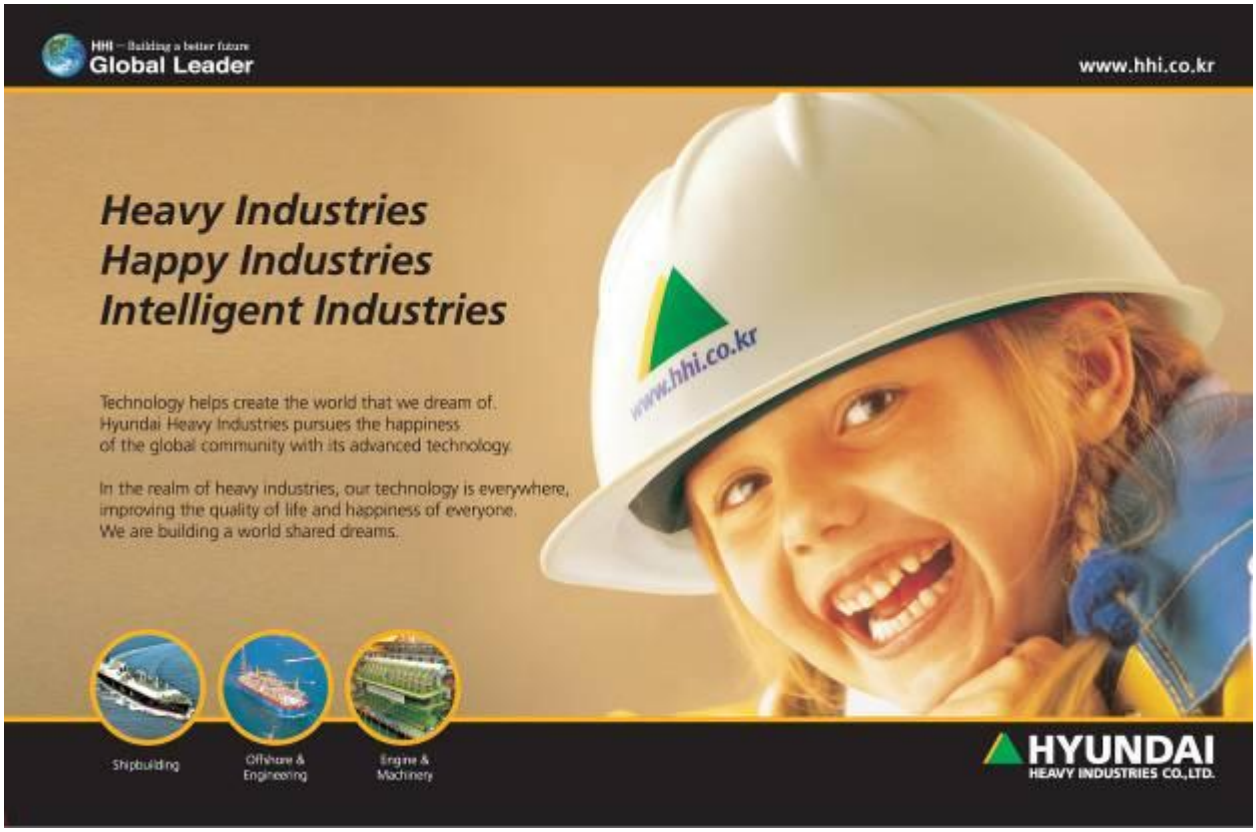
SCHLOSS BELVEDERE ï summer residence of Prince EUGEN in the Habsburger dynasty. There is a museum for GUSTAV KLIMT Pictures like ñKissò or ñJudithò For more detail or just type ñSchloss Belvedereòin google maps for the location. It takes about ten minutes from the Hotel on foot.

STADTPARK ï Statue for famous musicians like F. SCHUBERT, J. STRAUß etc. Kursalon for evening open-air concert (please inform yourself of the concert plan). It is located near Hotel INTERCONTINENTAL from where Mr. Shin Sangok and Mrs Choi Eunhee escaped to the U.S. Embassy in 1986. It takes about twenty minutes from your Hotel to the STADTPARK. Please type ñStadtpark Wienòin Google maps for its location.

DOWNTOWN ï you can go to the downtown on foot or by street car line 71 or by subway U3. Staatsoper (national opera), Burggarten (statue of W.A. Mozart), Heldenplatz (plaza of hero) which is famous for Hitlerôs address for Austriaôs Annexation to Germany in 1938. New Palace, Museums, Parliament, Rathaus (city hall), University of Vienna (the oldest one in the german-speaking countries), Stephansdom (cathedral), Graben (shopping), Kärntnerstraße (shopping), etc.

Conference Venue (1st Floor)

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EKC2010 has been co-organised by
VeKNI, KSEAUK, ASCoF, and KOSEAA

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