



Daegu Gyeongbuk
Institute of Science & Technology

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The World-leading Convergence University

DGIST Spring 2018 Application Guide for the Prospective Students of DGIST Graduate School

DGIST



DGIST

Spring 2018 Application Guide

for the Prospective Students of DGIST Graduate School

The World-leading Convergence University

Visualize your dream of being a creative global leader.

Right here at DGIST, The center for convergence science and technology of 21C.

Visualize your dream of
being a creative global leader!
Right here at **DGIST**,
The center for Convergence Science
and Technology of 21C

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DGIST History

DGIST,
the center of innovative
discovery and invention,
will be a world-leading institute!

2017

- Mar. 2017
Dr. Sang Hyuk Son
was inaugurated as
the third president of
DGIST

2016

- Feb. 2016
Fourth commencement
of the graduate school
was held
(Conferred its first Ph.D.)

2015

- Mar. 2015
Dr. Sung-Chul Shin was
re-inaugurated as the
second president of
DGIST

2013
2014

- Feb. 2013
First commencement of
the graduate school was
held
- Mar. 2014
First matriculation
ceremony of the
undergraduate school
was held

2003
2004

- Dec. 2003
Enacted DGIST Act
(Act No. 6996)
- Sep. 2004
DGIST was established as
a research institute

2008

- Jun. 2008
Amended DGIST Act
(Act No. 9108)
Extended its role to both
research and education
as a research-oriented
university

2011

- Mar. 2011
– First matriculation
ceremony of the
graduate school was held
– Dr. Sung-Chul Shin was
inaugurated as founding
president of the university.
- Oct. 2011
Established the Korea Brain
Research Institute affiliated
with DGIST

2012

- May. 2012
Proclaimed Vision 2020
and campus ground
breaking ceremony
- Dec. 2012
Opened the IBS-
Center for Plant Aging
Research



Our excellent **MIREBrain** program will lead us to the **World-leading Convergence University**



The Uniqueness of DGIST :
 the only university which has R&D division as well as Academic division

College of Transdisciplinary Studies

School of Undergraduate Studies

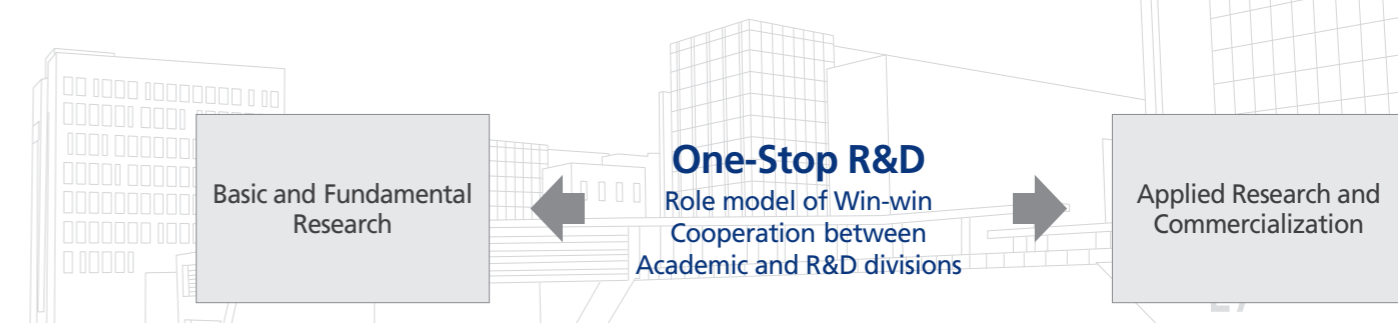
Graduate School

- Emerging Materials Science
- Information and Communication Engineering
- Robotics Engineering
- Energy Systems Engineering
- Brain & Cognitive Sciences
- New Biology



Convergence Research Institute

- Convergence Research Center for Solar Energy
- Convergence Research Center for Wellness
- DGIST-LBNL Research Center for Emerging Materials
- Research Center for Resilient Cyber Physical Systems
- Convergence Research Center for Microlaser Technology
- Convergence Research Center for Future Automotive Technology
- DGIST-ETH Microrobot Research Center
- Core Protein Resources Center
- Well Aging Research Center
- Convergence Research Center for Collaborative Robots
- Global Center for Bio-Convergence Spin System
- Companion Diagnostics and Medical Technology Research Group
- Smart Textile Convergence Research Group
- Magnet-Controlled Materials Research Group
- Intelligent Devices and Systems Research Group



The best research infrastructure, and global excellence in research!

A brighter future starts with the DGIST Convergence Research Institute



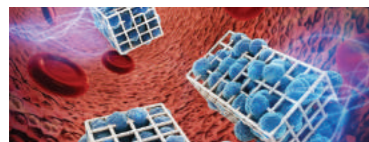
Convergence Research Center for Solar Energy

- Development of high-efficiency thin film solar cells from low-cost metallic elements
- Development of new organic dyes for high-efficiency dye-sensitized solar cells
- Development of high-performance organic-inorganic hybrid solar cells



Research Center for Resilient Cyber Physical Systems

- Researches on the resilient cyber physical system software technologies
- Collaboration with nationally leading CPS experts from both academia and industry



DGIST-ETH Microrobot Research Center

- Micro-Nano-robot
- MEMS based PZT
- Micro-Nano- Manipulation and control
- Bio-material for bio-application
- Magnetic Steering System
- Medical Image and surgical navigation



Convergence Research Center for Collaborative Robots

- Active Rehabilitation and Smart Health Robot
- Active Safety Control for Drone (Focus on Anti-Drone)
- Development of bottleneck technology of regional strategic industry



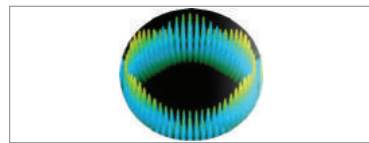
Smart Textile Convergence Research Group

- Wearable sensor
- Flexible Storage material
- Mechano Luminescence(ML) technology
- New material fiber
- Fusion technology



Convergence Research Center for Wellness

- Developing health improvement solution technology that monitors physical/mental bio-signal
- Fundamental Technology Development of Human body Compatible Wearable Wellness Device
- Providing actual practical business model based on convergence research technology



Convergence Research Center for Microlaser Technology

- World best 2-dimensional ultrahigh-Q microlaser
- Development of bio and chemical sensors by using ultrahigh-Q microlaser
- Development of 2-dimensional tiniest microlaser
- Development of optical sources for opto-electronic circuit



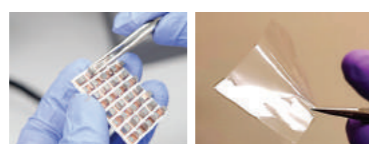
Core Protein Resources Center

- Protein common technology
- Expression of recombinant protein
- Protein analysis and advanced technology
- Core protein resources
- In-silico prediction of protein structural stability based on supercomputing
- Information data bank for core protein resources
- Support services for industrial company



Global Center for Bio-Convergence Spin System

- Bio-spintronics
- Neuromorphic spintronics
- Spin-metrology
- Computational spintronics



Magnet-Controlled Materials Research Group

- Materials for energy industry such as thermoelectric materials and devices, electrode materials, heat transfer materials, etc.
- Smart materials such as functional membranes, bioplastics, etc.



DGIST-LBNL Research Center for Emerging Materials (Lawrence-Berkeley National Laboratory)

- A joint research center with the Lawrence Berkeley National Laboratory, which is one of the top 3 laboratories in the field of basic science research
- Firm establishment of research facility for the development of functional new materials and characterizations
- Investigation of multifunctional materials through the control of the material structures in atomic and molecular level scale



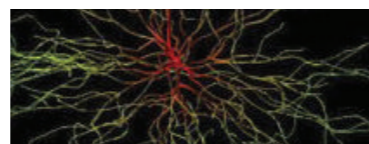
Convergence Research Center for Future Automotive Technology

- Convergence technology development for smart car
- Technology commercialization development(customer need based)
- Industry-University-Research cooperation and large scale project planning



Well Aging Research Center

- 'Sustainable mobility and cognition' for the human longevity
- Innovative and creative R&D on monitoring and controlling of human aging
- Researches on systemic convergence of muscle, nerve, vessel and immune system for human longevity
- Research on centenarians and superlongevity



Companion Diagnostics and Medical Technology Research Group

- Molecular and non-molecular biomarkers for companion diagnostics
- Standardization of novel companion biomarkers
- Artificial intelligence system to predict diagnosis and prognosis of incurable diseases considering drug resistance



Intelligent Devices and Systems Research Group

- Core research for materials and devices
- Development of the situational awareness algorithm technology superlongevity

The best research infrastructure that raises the global competitiveness of Korean science and technology



Korea Brain Research Institute

- DGIST-affiliated and Korea's first government-funded national research institute for brain research
- Founded to concentrate national brain research abilities and serve as hub of national brain research



Center for Core Research Facilities

- Established to provide world-class research support within and outside of DGIST
- 3 key elements : Professional staff, Customer-oriented operation, and State-of-the-art research facilities
- Facilities : Material characterization, Device processing, Bio imaging, measurements and simulation, Machine shop



Laboratory Animal Resource center

- The Laboratory Animal Resource Center(LARC) is the most important public infrastructure facility supporting animal-research which steadily provides laboratory animals required for biotechnological-related research and the convergence technology development.
- Stabilization of Animal Laboratory Facilities
- Accelerating bio-convergence research
- Leading High-tech Industries



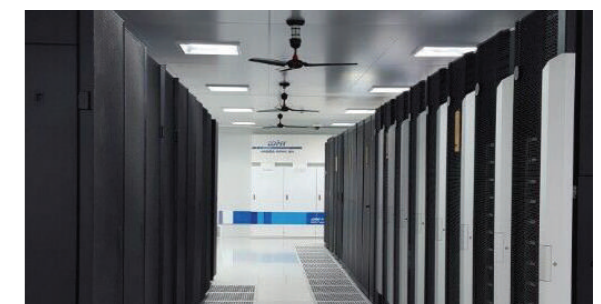
IBS-Center for Plant Aging Research

- A national research group that receives research funding from the Korean government annually
- Systems understanding on the complex processes of plant senescence and life span



Office of University-Industry Cooperation

- Various technology business incubation infrastructures and development rooms to support corporations occupied in the Office of University-Industry Cooperation
- Technology/business consultation services with internal and external experts, such as '1 to 1 mentoring program' and 'guardian system'



DGIST Supercomputing & Bigdata Center

- Self-sustained operation & development of leading-edge supercomputer
- Education on Linux computing, bigdata analysis, and visualization
- Promote excellency in computational research
- Facilitate industrial application
- Enrich supercomputing ICT culture
- World-competitive convergence research by scientific supercomputing

Transdisciplinary Subjects for Graduate School

- Graduate school offers various subjects on transdisciplinary curriculum, which is co-developed by the graduate departments, in order to eliminate boundaries between disciplines and foster creative convergence talents.
- Transdisciplinary subjects include 'Convergence in Anatomy' and 'Convergence in Physiology' to understand human organism in terms of engineering, 'Neuroinformatics', which analyzes thousands of nerve-related data, and 'Dialogue between Science and Art' to discern the creative concepts in art pieces and to apply the concept in science.
- Spread of Convergence education through co-operation with 6 majors, school of Undergraduate studies and Research institute etc.



Various Programs

to Nurture Talented Professionals with Convergence of Knowledge



Distinguished Lecture Series

Inviting world's greatest scholars including Nobel laureates with globally notable research achievements, DGIST seeks to improve an excellence in convergence researches, to provide the students great opportunities to grow as creative global talents in science, and eventually to become as a 'World-leading convergence university.'



DGIST Leadership Program

To help students with establishing their own role models and growing up as competitive scientists and social leaders, DGIST invites experts and opinion leaders in every field to deliver lectures in the Leadership Program.



DGIF(DGIST Global Innovation Festival)

DGIF is a comprehensive international academic conference, where various leading experts, representatives, and intellectuals from academia to industry, from home and abroad, participate to share trends of latest science technologies and to develop solutions to improve the world.



Education Center for Technology Ventures

As the entrepreneurship center in DGIST, Education Center for Technology Ventures facilitates entrepreneurship education. Sponsored by Ministry of Science, ICT, and Future Planning, it offers several entrepreneurial activities as follows

- 'Yong-Ja(meaning fearless) Program', the venture initiation program, which teaches essential skills and effective strategies for starting a startup to DGIST students
- 'Young Entrepreneurs Seminar Series' sharing experiences and knowledge of startup companies
- Proving 'Startup Sauna', a place to inspire entrepreneurial potential, which offers collaborative team space, a 3D printer resources and information on startups



Monday Lunch Seminar

Every Monday, various research contents are shared in this seminar to improve research and education capability in terms of promoting cooperation between education and research divisions.



Biseul Cultural Event

By attending the cultural events, DGIST students experience the diverse offerings and understandings of culture and artistic expressions - musics, movies, literatures, and arts performances with interpretations - at firsthand, which help them to be cultured, develop potential abilities, and derive creative ideas.

DGIST Global Networking

DGIST forges key partnerships with world-renowned universities, enterprise, research institutes, industry and organizations as a means for advancing global competitiveness and discovering innovative ideas.

| JAPAN

- Osaka University
- Kyushu University
- Waseda University
- University of Yamanashi
- University of Tokyo
- Kyoto University

| UNITED STATES

- Greenpoint Asset Management, LLC
- University of Virginia
- Johns Hopkins University
- Agilant Technologies
- University of Louisville
- Purdue University
- University of Michigan-Dearborn
- Lawrence Berkeley National Laboratory
- Massachusetts Institute of Technology
- University of Washington
- Texas A&M University
- University of California-Riverside (UCR)
- California Institute of Technology (Caltech)

| SWITZERLAND

- Swiss Federal Institute of Technology Zürich

| SINGAPORE

- Infineon Technologies AP

| SPAIN

- Universitat Autònoma de Barcelona

| INDIA

- Indian Institute of Science

| MONGOLIA

- Mongolian University of Science and Technology (MUST)

| FRANCE

- Institut National Des Sciences Appliquées Centre Val De Loire

| PHILIPPINES

- University of Santo Tomas

| GERMANY

- University of Goettingen
- Deutsches Forschungszentrum fur Kunstliche Intelligenz GmbH (DFKI)

| NETHERLANDS

- Maastricht University

| CHINA

- Tsinghua University

| HONG KONG

- Hong Kong Polytechnic University

Best Faculty with World-Class Scholars

DGIST invites world's top scholars as our visiting professors, renowned with their research on innovative convergence technologies, to lead global leader education and development of the convergence technologies.



Sang Hyuk Son (DGIST Fellow)

Third President of DGIST / Professor of Information & Communication Engineering
World's leading luminary in the field of Cyber Physical System(CPS) / IEEE Fellow(2013) / President, Korean Computer Scientists and Engineers Association in America / Chair, IEEE Computer Society Technical Committee on Real-Time Systems / Professor, Department of Computer Science at the University of Virginia, USA(1999-2012) / WCU Chair Professor, Sogang University

Hong Gil Nam (DGIST Fellow)

Professor of New Biology
Director, Center for Plant Aging Research, Institute for Basic Science (IBS) / POSCO TJ Park Prize in the field of Science(2009) / The National Scholar of Korea, Ministry of Education & National Research Foundation(2010) / The 24th Ho-Aim Prize in Science(2014) / Hong Deok Distinguished Professor, POSTECH

Dae Won Moon (DGIST Fellow)

Professor of New Biology
The 1st KRIBS Fellow(2007) / Role-model Scientist appointed by Ministry of Education and KOFAC(2004) / Doyak Medal of Order of Science and Technological Merit / Professor, University of Science and Technology(2003-2012) / Best Research Award, Ministry of Knowledge Economy, Korea(2011)

Wook-Hyun Kwon

Visiting Chair Professor of Information & Communication Engineering
Korea Highest Scientist Award(2007) / Vice-President, The National Academy of Engineering of Korea / President, IFAC / Professor emeritus, Seoul National University

Kyungjin Kim

President of KBRI / Visiting Chair Professor of Brain & Cognitive Sciences
National Academy of Sciences Award(2010) / Mogam Award, Korean Society for Molecular Biology(1997) / Chair, Department of Brain & Cognitive Sciences, Seoul National University(1985-2015) / Director, the 21st Century Frontier Program in Neuroscience / CEO, Neurogenex Co., Ltd.(2000-2003) / Alexander von Humboldt fellow, University of Gottingen, Germany



Kurt Wüthrich

Distinguished Chair Professor of Brain & Cognitive Sciences
2002 Nobel Laureate in Chemistry / Professor, Swiss Federal Institute of Technology, Zurich(ETH) / Professor, SCRIPPS Institute, USA

John Byrne

Distinguished Professor of Energy Systems Engineering
2007 Nobel Laureate in Peace with the other senior members of IPCC / Director, Center for Energy & Environmental Policy, University of Delaware / Distinguished Professor, Energy & Climate Policy, University of Delaware / Professor, University of Delaware

Erwin Neher

Distinguished Chair Professor of Brain & Cognitive Sciences
1991 Nobel Laureate in Physiology or Medicine / Emeritus Director, Max Planck Institute for Biophysical Chemistry / Director, Max Planck Institute for Biophysical Chemistry(1983-) / Honorary Professor, University of Gottingen, Germany

John A. Stankovic

Visiting Chair Professor of Information & Communication Engineering / Distinguished Chair Professor of University of Virginia
Director, Applied Computing Institute of Massachusetts / ACM, IEEE Fellow

Nam-Duh Kim

Chair Professor of School of Undergraduate Studies / Honorary Professor of Seoul National University
Korean representative philosopher of ancient western philosophy / Professor, Seoul National University(1985-2013) / Director, Korean Society of Greco Roman Studies / Korean Philosophical Association(2000-2002)



Jeon, Jongwoo

Distinguished Chair Professor of School of Undergraduate Studies / Honorary Professor of Seoul National University
Professor, Seoul National University(1981-2013) / Member, OECD World Forum organizing committee / President, Korean Statistical Society

Kim, Hasuck

Visiting Chair Professor of Energy System Engineering / Chairman, Korean National Research Resource Center
Professor, Seoul National University(1977-2010) / President, International Society of Electrochemistry(2013) / Director, The Korean Academy of Science and Technology(KAST) / Kyu Won Choi Academic Excellence Prize Award(Korean Chemical Society)

Sang Chul Park

Distinguished Chair Professor of New Biology / Director of Well-Aging Research Center, DGIST
Head, SNU Institute on Aging / Member, The Korean Academy of Science and Technology(KAST) / Moran Order of Merit Award(2002)

Insup Lee

Visiting Chair Professor of Information & Communication Engineering / Distinguished Chair Professor of University of Pennsylvania
Director, The PRECISE center of University of Pennsylvania / CEAS 2011 Best paper Award

Kyu-Young Whang

Visiting Chair Professor of Information & Communication Engineering / Distinguished Chair Professor of School of Undergraduate Studies / Professor of KAIST
ACM, IEEE Fellow / Trustee, The VLB Endowment / Member, The Korean Academy of Science and Technology(KAST) / Korea President Award(2012)



Daniel Strickland

Visiting Chair Professor of School of Undergraduate Studies
Kaiser Permanente southern California, Director of Research / Univ. of Nebraska College of Medicine, Departmental Director

Kim, Hak-Soo

Visiting Chair Professor of School of Undergraduate Studies / Honorary Professor of Sogang University
First Korean ICA(International Communication Association) Fellow member(2015) / President, The Korean Society for Journalism & Communications Studies(KSJCS) / Fellow, The Korean Academy of Science and Technology(KAST) / Woongbi Order of Science and Technology Merit Award(2001)

Choe Hui-Woog

Visiting Chair Professor of Brain & Cognitive Sciences / Distinguished Chair Professor of Chonbuk National University
The world's first investigation of the crystal structure of metarhodopsin II / Prime Minister's commendation(2014)

Spring 2018 Application Guide

for the Prospective Students of DGIST Graduate School

Application Schedule

Classification	Spring I 2018	Spring II 2018	Spring III 2018
Application	June 29(Thu) ~ July 13(Thu)	Oct 12(Thu) ~ Oct 26(Thu)	Dec 14(Thu) ~ Dec 28(Thu)
Documentary Elimination	July 27(Thu)	Nov 9(Thu)	Jan 11(Thu), 2018
Interview	Aug 7(Mon) ~ Aug 14(Mon)	Nov 13(Mon) ~ Nov 21(Tue)	Jan 15(Mon) ~ Jan 22(Mon), 2018
Announcement of Final Results	Aug 28(Mon)	Dec 4(Mon)	Feb 9(Fri), 2018

Application Checklist and Information

- Not allowed to apply for more than one major at the same time
- Results will be posted on the DGIST Admission website.
- Detailed information for interviews will be announced with the Documentary Elimination, and Interview schedules can be different depending on the departments.

Majors and Programs

Majors	Programs
Emerging Materials Science	
Information & Communication Engineering	M.S. / Integrated M.S.&Ph.D. / Ph.D. ※ Note that you could get an admission for M.S. program according to the evaluation results, even if you applied for the Integrated M.S.&Ph.D. Program.
Energy Systems Engineering	
Brain & Cognitive Sciences	
Robotics Engineering	M.S. / Ph.D. ※ M.S. program students in 2 nd semester of study can transfer to Integrated M.S.&Ph.D. program through a certain process.
New Biology	Integrated M.S.&Ph.D. / Ph.D.

Eligibility

Degree Program	Eligibility
Spring 2018	M.S. / Integrated M.S.&Ph.D. Student who hold bachelor's degree or is expected to receive his/her bachelor's degree by February, 2018
	Ph.D. Student who hold master's degree or is expected to receive his/her master's degree by February, 2018

※ No prior knowledge of Korean is necessary for admission, but all international students are required to take Korean courses to earn a degree.

Benefits

Classification	Details
Tuition	<ul style="list-style-type: none"> Full scholarship for all graduate students
Stipend for Education and Research	<ul style="list-style-type: none"> Ph.D : 13,680,000RW + α / year M.S. : 7,440,000KRW + α / year
DPF (DGIST Presidential Fellowship)	<ul style="list-style-type: none"> Special scholarship : 3,000,000KRW / semester Research scholarship : Maximum 10,000,000KRW Study abroad scholarship : Maximum 16,584,000KRW ※ Amount is subject to change
International Exchanges	<ul style="list-style-type: none"> Opportunity of training in the world's leading class university Opportunity to participate various international conferences
Government Research Project	<ul style="list-style-type: none"> DGIST Convergence Research centers & groups (Convergence Research Center for Solar Energy, Convergence Research Center for Wellness, DGIST-LBNL Research Center for Emerging Materials, Research Center for Resilient Cyber Physical Systems, Convergence Research Center for Microlaser Technology, Convergence Research Center for Future Automotive Technology, DGIST-ETH Microbot Research Center, Core Protein Resources Center, Well Aging Research Center, Convergence Research Center for Collaborative Robots, Global Center for Bio-Convergence Spin System, Companion Diagnostics and Medical Technology Research Group, Smart Textile Convergence Research Group, Magnet-Controlled Materials Research Group, Intelligent Devices and Systems Research Group) Korea Brain Research Institute IBS-Center for Plant Aging Research
Dormitory	<ul style="list-style-type: none"> Convenient dormitory facilities ※ Dormitory and utility fees will be charged separately

※ Please visit a website of each department for more detailed information about scholarships.

Application Documents

Documents to Submit	Application Process
A Application Form	<ul style="list-style-type: none"> Online application(prescribed form)
B Personal Statement and Study Plan	<ul style="list-style-type: none"> Online application(prescribed form) You can choose to write in English, Korean or both.
C Degree Certificate (either completed or to be completed)	<ul style="list-style-type: none"> Online attachment(PDF) <ul style="list-style-type: none"> M.S. / Integrated M.S. & Ph.D. Applicants : Undergraduate Degree Certificate Ph.D. Applicants : Undergraduate & graduate Degree Certificate ※ Please submit Certificate of Enrollment if you can't hand in Certificate of Expected Graduation.
D Official Transcripts	<ul style="list-style-type: none"> Online attachment(PDF) <ul style="list-style-type: none"> M.S. / Integrated M.S. & Ph.D. Applicants : Undergraduate Official Transcript Ph.D. Applicants : Undergraduate & Graduate Official Transcript ※ Applicants for the Department of New Biology must include a class rank with the transcript
E English proficiency certificate	<ul style="list-style-type: none"> Online attachment(PDF) <ul style="list-style-type: none"> TOEIC, TOEFL IBT, TOEFL CBT, TOEFL PBT, IELTS, or TEPS
F Other certificates	<ul style="list-style-type: none"> Online attachment(PDF) <ul style="list-style-type: none"> Other certificates that show the applicants' capability and possibility
G Letter of Recommendation	<ul style="list-style-type: none"> Direct submission from the evaluator through e-mail (prescribed form) : admission@dgist.ac.kr Form of recommendation letter is downloadable at DGIST website No limitation on the number of recommendation letter
Application Fee	<ul style="list-style-type: none"> 80,000 KRW / 80 USD

- ※ Application form & Personal Statement and Study Plan must be filled in online.
- ※ 'Online application system' link will be posted on DGIST website (admission.dgist.ac.kr) - Notice
- ※ Degree Certificate, Official Transcripts and other required documents must be written in English
- ※ Please make a single PDF file contain all the documents in the alphabetical order(C - F) and make sure that it does not exceed 10MB.

A. Evaluation based on application documents

Applicants' academic ability will be evaluated through official transcripts from former institutions, personal statement and study plan, etc.

B. Interview(only for the students who passed the documents evaluation)

- Evaluation of fundamental knowledge of the field of study, enthusiasm for research, potential ability to be a

Admissions Procedure

scholar, communication ability, etc, through individual and/or group interviews. More details are determined by each department.

- Online interview can be arranged for students residing outside Korea, by early request.

1) Emerging Materials Science

- On-site Interview to evaluate the basic background knowledge(mathematics, physics, chemistry, biology, etc.) required for the materials science research, potential for future growth, personal integrity, motivation, responsible decision-making, ethical standards, and interpersonal skills.
- Presentation : 10 minutes(English) presentation on [M.S., M.S./Ph.D.] Undergraduate research experience(recommended) or one's own understanding of major concepts learned in the undergraduate studies [Ph.D.] Achievement during M.S. course and future research interests.

2) Information and Communication Engineering

- Oral examination about foundations and applications of information & communication, computer, electronics, mathematics, physics, chemistry, attitude, personality, and vision as an engineer
- English Presentation of up to 5 minutes (5 slides) about an important concept that you learned through your undergraduate core courses for M.S. degree applicants, and that is related to your future Ph.D. research for Ph.D. degree applicants.
- A part of the interview will be conducted in English

3) Robotics Engineering

- Questions on fundamental knowledge of the robotics related subjects or courses, enthusiasm for research, potential ability to be a scholar, communication ability, etc. in both English and Korean.
- A short presentation in English on the research experience, achievements, research plan, etc for about 5 minutes and 10 minutes for M.S. and Ph.D. respectively.

4) Energy Systems Engineering

- Personal interview in English with the concerned professors
- Self-introduction(5 Minutes presentation)
- Questions on fundamentals and specialized knowledge about application of Energy Systems Engineering such as Physics, Chemistry, Mathematics, Biology, Thermodynamics and Transfer phenomenon according to the applicant's specialty background, and on culture, personality and vision as engineering students.

5) Brain & Cognitive Sciences

- The interview is planned as a Two-days/One-night program.
- Presentation in English (Ph.D. course applicants should present their M.S. thesis work. M.S. course applicants and M.S.-Ph.D. combined course applicants can choose one option between two options below.)
 - Option 1 : You can present one paper published in J.Neurosci., Nature Neuroscience, Neuron, J.Neurochem., Neuroscience by using PowerPoint within 10 minutes (5-10 slides) followed by additional 10 minutes for Q&A
 - Option 2 : You can present one paper chosen from the provided list of recommended papers (please check papers in our website at <https://brain.dgist.ac.kr>) by using PowerPoint within 10 minutes (5-10 slides) followed by additional 10 minutes for Q&A
- Personal Essay : Presentation of motivation and interests on a suggested topic

6) New Biology

- Interview (10 minutes) : Qualification evaluation of personality, leadership and communication skills including English, creativity, and knowledge required for study of convergence biology.
- Oral Presentation : Each applicant will be asked to give a 20 minutes presentation, which includes a 5 minutes Q&A. Presentation topic will be announced a week before the presentation.

A. Registration period and procedure will be notified with the final results announcement

- B. Documents to submit :**
- | | |
|--|-------------------------|
| 1) Admission confirmation(Prescribed form) | 3) Official transcripts |
| 2) Degree certificate | 4) Medical certificate |

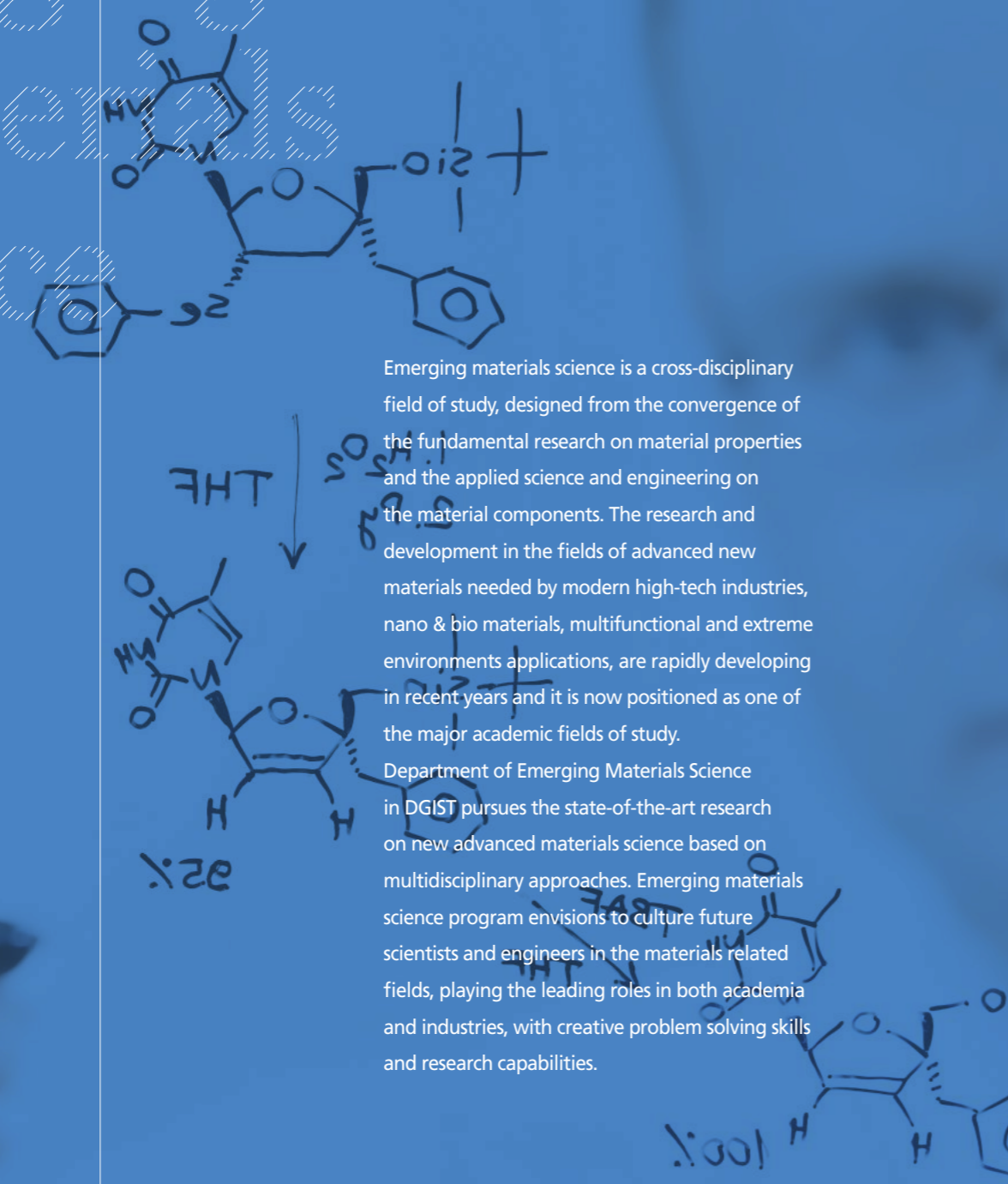
C. Notes

- 1) Admitted students must submit the required documents to complete registration. Otherwise, admission will be cancelled.
- 2) Submitted documents will not be returned. If any of the documents contain false information, admission will be cancelled.
- 3) Applicants have to agree with the terms and conditions for collection of Personal Information. The collected personal information is to be used for admissions purpose only.
- 4) Applicants are fully responsible for any disadvantage they may occur due to errors and/or omissions in the information provided.

Registration of Admitted Students

Admissions contact details

Tel : +82-53-785-5147 E-Mail : admission@dgist.ac.kr Website : admission.dgist.ac.kr
 Postal Address : DGIST Admissions Team, 333, Techno jungang-daero, Hyeonpung-myeon, Dalseong-gun, Daegu, 42988, Rep. of Korea



Emerging materials science is a cross-disciplinary field of study, designed from the convergence of the fundamental research on material properties and the applied science and engineering on the material components. The research and development in the fields of advanced new materials needed by modern high-tech industries, nano & bio materials, multifunctional and extreme environments applications, are rapidly developing in recent years and it is now positioned as one of the major academic fields of study.

Department of Emerging Materials Science in DGIST pursues the state-of-the-art research on new advanced materials science based on multidisciplinary approaches. Emerging materials science program envisions to culture future scientists and engineers in the materials related fields, playing the leading roles in both academia and industries, with creative problem solving skills and research capabilities.

Emerging Materials Science

Pursuing the state-of-the-art science on new materials via interdisciplinary research

◆ What topics are studied in the department of Emerging Materials Science?

Applications of microcavity lasers

An ultrahigh-Q microcavity laser can be applicable to chemical and bio sensors. A tiny microcavity laser is a promising optical source for opto-electronic circuits.
(Micro Laser Laboratory : Prof. Chil-Min Kim)

Superconducting materials / thermoelectric materials

As civilization progresses, resource depletion, pollution and problems of the aging population is increasingly emerging. For the improvement of quality of life and sustainable development, eco-friendly future technologies with the most efficient energy are required. For this purpose our research is focused on the development of new superconducting materials with near room superconducting temperature and thermoelectric materials with high performance
(Quantum Functional Materials Laboratory : Prof. Yong Seung Kwon)

Bio-implementation of high-performance spintronic technology

In our laboratory, we are researching on new concepts of novel magnetic materials for implementing high-performance spintronic technology, including the materials analysis and their applications. We are developing the next generation of spintronic devices using the NEMS(Nanoelectromechanical) and MEMS (Microelectromechanical) techniques for functional magnetoelectronic devices in the mobile, IoT and wearable devices. In addition, we are applying the new concept of spintronics-bio fusion devices aiming for disease diagnosis, therapy and live functionality.
(NanoBiomaterials & SpinTronics Laboratory : Prof. CheolGi Kim)

What happens in the ultrafast world?

Scientists opened the gate to new material world named 'nano' by making the space smaller and smaller. Now what happens in the 'ultrafast' world created by making the time shorter and shorter? We open the gate to future science to explore new material world during the ultrafast time span.
(Light and Matter Theory Laboratory : Prof. JaeDong Lee)

Spin Phenomena for Information Nano-devices

Spin based nano-devices have many advantages such as non-volatile, ultra fast operation, ultra high density, extreme low power consumptions, logic operation, and non-Boolean logic applications. We studied various spin phenomena which are related with next generation spin devices for information and neuromorphic applications. We equipped various cutting edge measurement systems to reveal not only spin dynamics, but also basic material properties of nano-devices and materials.
(Spin Phenomena for Information Nano-devices Laboratory : Prof. Chun-Yeol You)

Nano electric and magnetic materials

We aim to achieve the emerging electric and magnetic properties of the modern materials through the artificial manipulation of the materials structures in nanometer scale. Interactions and behaviors of the spins and electrons within the nanostructures are studied to achieve the understanding as well as the control of the exotic properties of the various functional material systems. Various nanomaterials including nanoparticles, nanowires, and thin films are synthesized and characterized to develop electromagnetic materials suitable for advanced modern technologies.
(Quantum Electric & Magnetic Materials Laboratory : Prof. Jung-Il Hong)

Biomimetic Chemistry

Biomimetics is to get a huge number of information and inspiration from Nature for human life. Problem solving in environment, disease, and energy, as well as sustainable economic growth has been accompanied by the biomimetic technology. Biomimetic synthesis plays an essential role in the production and functionalization of an enormous range of chemicals, biomolecules, and materials. Studies are being conducted to focus for drug development and environmental issue through the development of biomimetics.
(Biomimetic Materials Laboratory : Prof. Jaeheung Cho)

The material where all the atoms are exposed to its surface.

"Making smaller" has opened new nanoworld! Cutting a cube produces smaller cubes and its heavy repetition engenders "nanocube", where surface atoms can be more abundant than internal atoms. Nevertheless, the quantity of the internal atoms in nanocube are still substantial. Is it possible to make a material that are composed of only surface atoms? The inverse architecture of nanocube assembly, 'nano jungle gym'! It would be a trigger for opening new field of nanochemistry and nanoscience. (NC Lab. for Supramolecular Nanochemistry : Prof. Nak Cheon Jeong)

New Science Emerging in Light-Matter Interaction

- Nanophotonic Materials
 - Study on emergent optical properties based on light-matter interactions.
 - Development of new functional optoelectronic devices.
- 2D Semiconductors
 - Study on optoelectronic properties of atomically-thin 2D semiconductors.
 - Large-scale and heterostructure growth of 2D semiconductors.

(Nanoscale Optoelectronic Materials Laboratory : Prof. Chang-Hee Cho)

Nanoscience in Atomic Scale

Scanning tunneling microscopy (STM) provides a powerful technique to visualize quantum states of materials in atomic scale. We use a home made STM to investigate emerging quantum phenomena of matters like magnetism, superconductivity, topological properties of matters and so on. (Nanospm Lab : Prof. Jungpil Seo)

Computational Materials Design

The ultimate goal of materials science is to understand, predict, and control matter, energy and information at fundamental length and time scales. To achieve this and to design new functional materials, we use atomistic simulations of real materials at the nanoscale. The primary tools are density-functional theory (DFT) and high-performance supercomputers. Research areas of interest include (i) design of materials for energy conversion, storage and transport and (ii) inverse design of new materials with predetermined, desired material properties.

(Computational Materials Theory group : Prof. Joongoo Kang)

Bio-harmonized device

Issue on healthcare is growing rapidly due to increase of lifetime and development of technology. Our lab. is focusing on extremely light, flexible and bio compatible sensors that can monitor bio information without our recognition utilizing ultra-flexible device. Moreover, we are developing world first bio liquid (sweat, blood and so on) permeable device for wearable and implantable devices in order to minimize side effects.

(Bio-Harmonized Device Laboratory : Prof. Sungwon Lee)

Multifunctional films and nanostructures

Films and nanostructures have attracted great attentions of industries as well as academics due to intriguing physical/chemical phenomena. Our lab. is unveiling mechanisms and developing multifunctional films and nanostructures for future device and energy applications.

(Multifunctional films and nanostructures Laboratory : Prof. Shinbuhm Lee)

Stimuli-Responsive Organic-Inorganic Hybrid Materials

Organic-inorganic hybrid materials have been featured as an alternative material that can be used to achieve high performance with unexpected properties from either of the building blocks. We have tried to diversify smart-hybrid materials based on the inspiration of geometric entities such as Platonic/Archimedean solids and biological building units. The smart-hybrid materials will provide a new direction in the ever emerging field of material science for future energy and environment.

(Organic-Inorganic Hybrids Laboratory : Prof. Jinhee Park)

Biomolecular Science

To regulate and elucidate membrane protein dynamics using nanoparticles for cellular function engineering, *i.e.* neuronal morphogenesis and Epithelial-Mesenchymal transition (EMT), we are developing 1) nanoprobe to gauge conformational change of molecules at single molecule level, 2) microscopic and computational tools to understand proteins mobility in live cell, 3) a membrane protein activation method for spatial control of thermal, chemical, and mechanic stimuli to individual living cells, and 4) a cell function control system for real medical applications.

(Biomolecular Science Laboratory : Prof. Daeha Seo)

Biomaterials and Biointerface Engineering

We seek to address the challenge in developing novel adhesive biomaterials by bio-inspired approaches. In particular, we have interested in designing a variety of polymeric biomaterials by mimicking the unique chemical structures of natural organic materials such as mussel foot proteins and plant-flavonoids that show remarkable molecular-level adhesion to tissues in aqueous environment. Those adhesive functional moieties are able to co-join with biopolymers to construct adhesive hydrogels and also act as a molecular glue to prepare bio-active surfaces for bioassays.

(Biomaterials and Biointerface Engineering Laboratory : Prof. Seonki Hong)

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Research interests Nonlinear dynamics | Quantum chaos | Quantum optics | Microcavity laser
Career&Major achievements Creative Research Initiative Center for

Controlling Optical Chaos : Director | Center for Quantum Chaos and its Application : Director | Center for microcavity laser sensor : Director



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Degree Ph.D., Tohoku University

Research interests Investigation of High Tc superconductivity and magnetic materials

Career&Major achievements Professor at Sungkyunkwan University | Nagoya University Invited Professor | Institute for

Molecular Science (IMS in Japan) Invited Professor



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Degree Ph.D. KAIST

Research interests Novel magnetic materials | NEMS/MEMS devices | NanobioEngineering

Career&Major achievements Professor at Chungnam National

University | Invited professor at Tohoku University & McMaster University | Director, Center for NanoBioEngineering & Spintronics



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Degree Ph.D., KAIST

Research interests Spin Nano-Devices | Condensed Matter Physics | Magnetic Materials & Thin Films

Career&Major achievements Professor, Dept. of Physics, Inha University, Korea | Post-Doc, Argonne National Lab., USA



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Degree Ph.D., POSTECH

Research interests Theory of solid state physics | Ultrafast dynamics | Nonequilibrium phenomena | First-principles calculation

Career&Major achievements JAIST Assoc. Professor | NIMS-ICYS Fellow | CALTECH Researcher | Researcher at Tokyo Univ. | MPI-FKF Researcher



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Degree Ph.D., Northwestern University

Research interests Electric and magnetic properties of nanomaterial systems

Career&Major achievements Georgia Tech Research Faculty | CMRR (in Univ. of Cal.-San Diego) Researcher | RPI ABB Postdoctoral fellow



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Degree Ph.D., Kanazawa University

Research interests Biomimetic Chemistry | Metalloenzymes | Superoxide Reductase | Insulinomimetic Anti-Diabetic Drug Development | Neurotransmitter

Career&Major achievements Ewha Womans Univ. Professor for special appointment, Full-time lecturer | Postdoctoral Fellow at Univ. of Delaware



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Degree Ph.D., Sogang University

Research interests Development of supramolecular nanoporous materials

Career&Major achievements Postdoctoral Fellow at Northwestern University



Chang-Hee Cho Associate Professor

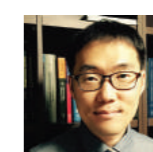
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Degree Ph.D., GIST

Research interests Photonic semiconductors | Nanophotonics materials/devices

Career&Major achievements Postdoctoral Researcher at University of Pennsylvania



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Degree Ph.D., Seoul National University

Research interests Superconducting Materials, Topological Phase Transition, Low-dimensional Materials

Career&Major achievements Postdoctoral Researcher in Princeton University



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Degree Ph.D., KAIST

Research interests Computational materials design and theory

Career&Major achievements Senior Scientist, National Renewable Energy Laboratory (NREL)



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Degree Ph. D. Yonsei University

Research interests Ultra-thin and Bio Compatible Device Fabrication and Bio Sensor development

Career&Major achievements Postdoctoral Researcher in the University of Tokyo, Japan



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Degree Ph. D. Seoul National University

Research interests Multifunctional films and nanostructures

Career&Major achievements Postdoctoral Researcher in University of Cambridge (UK) and Oak

Ridge National Laboratory (US).



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Degree Ph.D., Texas A&M University

Research interests Stimuli-responsive organic-inorganic hybrid materials for energy and environmental applications

Career&Major achievements Senior Researcher, Korea Electrotechnology Research Institute (KERI)



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<http://small.dgist.ac.kr>

Degree Ph. D. Korea Advanced Institute of Science and Technology (KAIST)

Research interests Synthetic Nanochemistry | Biophysics | Cell Biology

Career&Major achievements Postdoctoral Researcher in U.C. San Francisco | U.C. Berkeley | LBNL



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Degree Ph. D. Korea Advanced Institute of Science and Technology (KAIST)

Research interests Nature-inspired biomaterials | Tissue-adhesive hydrogels | Bio-active surface fabrication | Molecular diagnostics

Career&Major achievements Postdoctoral researcher in Massachusetts General Hospital | Harvard Medical School



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Degree Ph.D., KAIST

Research interests Magnetism | Spintronics
Career&Major achievements CXRO/LBNL Project scientist | Postdoctoral Researcher at KAIST

Overview

Cultural and scientific revolutions in human history have always been with the new discovery or development of new 'synthetic' materials, People never stopped innovating and overcoming the natural resources to achieve the technological breakthroughs and advancements, which has been the main driving force for the growth of modern societies. Materials science has been at the core of these modern technological developments.

Department of Emerging Materials Science(EMS) at DGIST aims to stay at the core of these technological trends and lead the progresses of modern materials science, as well as to foster global leaders, to define the future technologies.

Vision

- Frontier research in the field of materials science with the aim to make contributions to humanity.
- Produce creative researchers with convergence scientific minds based on broad disciplines of science.
- Development and education of globalized research capacity in Korea and setting the collaboration networks with global academic leaders.

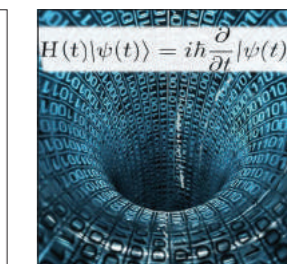
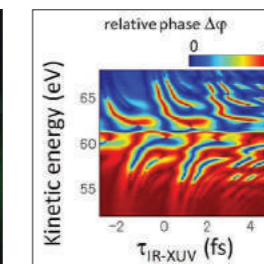
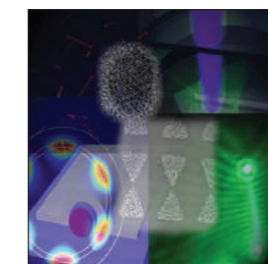
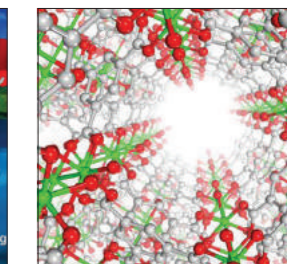
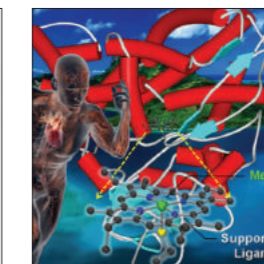
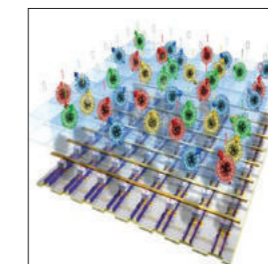
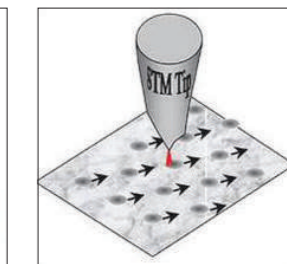
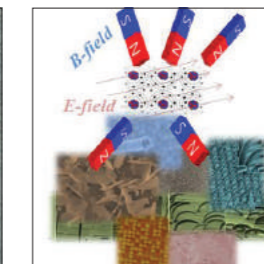
Research and Education

- Make progress in our understanding on diverse material systems through the modern experimental and theoretical studies and stay at the forefront of the material research.
- Provide the frame for the multidisciplinary education of the next generation with the contemporary convergence research.
- Research program at world-leading groups to promote international and multidisciplinary collaboration in materials science
- Annual student-led workshop for stimulating discussion and collaboration among students in different fields



Specialized Research Fields

- Research and development of new materials and phenomena based on understanding of quantum mechanical correlations between atoms.
- Understanding and applications of nano- and bio-materials with the focus on emerging new properties due to the nanoscale size.
- Exploration of new functional properties via the theoretical studies of electronic and dynamic structure of materials.



Interview Contents

- On-site Interview to evaluate the basic background knowledge(mathematics, physics, chemistry, biology, etc.) required for the materials science research, potential for future growth, personal integrity, motivation, responsible decision-making, ethical standards, and interpersonal skills.
- Presentation : 10 minutes(English) presentation on [MS/MS-Ph. D] Undergraduate research experience(recommended) or one's own understanding of major concepts learned in the undergraduate studies [Ph. D] Achievement during MS course and future research interests.
- Online interview can be arranged for students residing outside Korea, by early request.

Industries that are dependent upon information and communication technology are one of the fastest growing ones in the world. For the future knowledge-based society, information and communication technology takes the key role in converging Bio Technology(BT), Culture Technology(CT), Energy Technology(ET), Nano Technology(NT), Robot Technology(RT), and many more. We are seeking for ambitious, passionate, and enthusiastic students who have a vision for creative engineering research and development. The goal of Information and Communication Engineering department is to foster these students to have :

- 1) creativity for seeking new research and directions
- 2) practicality for solving real world problems
- 3) global networking to embrace international perspectives
- 4) social entrepreneurship for generating new value in existing and novel applications to advance the future industry

Information & Communication Engineering

Embracing the next generation through convergence of information and communication



◆ What do we study in Information and Communication Engineering Department?

Information and Communication Engineering department has a goal of fostering internationally competitive researchers and leaders. In order to pursue such a goal, we educate students with existing core technologies, such as information and communication, electronics, data processing, and electrical engineering to have fundamental skills sets. Furthermore, we aim to apply convergence technology in order to generate new ideas for technological transformation. To achieve these goals, we are researching various future convergence technologies through mutual cooperation with domestic and international institutions and researchers. Ultimately, Information and Communication Engineering department embraces various research areas that will impact the development of convergence technology.

◆ What are the prerequisites for applying to Information and Communication Engineering Department?

Information and Communication Engineering department emphasizes on converging various disciplines by fostering research that requires diverse technologies. Therefore, we encourage students not only from IT related fields, but also from other natural science and engineering fields to apply. Please do not hesitate applying to our department although you may not taken many IT related courses. However, you must have suitable knowledge and skill sets for your specific research interest.

◆ What career opportunities are there after graduating?

Based on the fact that Korea leads the IT industry in the world, graduated students will have various career opportunities. You may consider Samsung, LG, and other prestigious companies, as well as international and domestic research institutes, and universities. Moreover, various job opportunities overseas may be provided through our international networks.

◆ Please introduce the current laboratories in the department.

Prof. Suha Kwak

Computer Vision / Machine Learning

- Computer Vision
 - Object detection, segmentation, and tracking
 - Action and behavior analysis
 - High-level interpretation of visual data
- Machine Learning
 - Deep learning
- Learning with limited supervision
 - Structured prediction
 - Applications: Autonomous driving, Intelligent video surveillance, Visual question answering, Biomedical image processing

Prof. Kyoung-Dae Kim

Autonomy/Reliability/Cooperation of Cyber-Physical System

- Cyber-Physical Transportation System
 - Control theories and computational methods for autonomous driving and navigation.
 - Reinforcement learning for reliable and cooperative autonomous driving decision.
 - Collision-free and higher throughput intelligent intersection management.
 - Planning and control of autonomous vehicle for high speed racing
- Robotics and Autonomous Multi-Agents Systems
 - Theories for cooperative decision making of multi-agents system.
 - Motion planning and control for cooperative collision avoidance of multi-agents system.
 - Modeling, analysis, and control for acrobatic and high speed maneuvers of UAV.
 - Software framework for distributed realtime control system

Prof. Daehoon Kim

Computer Architecture/Operating Systems/Virtualization/Cloud Computing

- Architectural support for virtualized systems
- Scalable multi-core architecture
- On-chip resource virtualization
- Hypervisor/OS scheduler for high performance and energy efficiency
- Resource provisioning for large-scale cloud data centers
- DRAM architecture for virtualized systems

Prof. Min-Soo Kim

Database/Data Mining/ Machine Learning/Distributed-Parallel Computing/Genomics/Proteomics

- Distributed/parallel graph processing systems for trillion-scale graphs
- Hadoop-based distributed query processing systems for business big data
- Distributed in-situ analysis systems for large-scale scientific tensor data
- GPU-based big data mining algorithms
- Distributed/parallel processing systems for human connectome
- Large-scale optimization system of deep neural network models
- Distributed/parallel AI engine based on deep learning and reinforcement learning
- Hadoop-based short sequence design algorithms for DNA and RNA
- Large-scale protein mass spectrum data analysis
- Fast and accurate alignment and de novo assembly using NGS data

Prof. Kyung-Joon Park

Cyber-Physical Systems and Networks

- We carry out fundamental research on networking as a key element in cyber-physical systems (CPS).
- Resilient networking for CPS
 - Network/control co-design for CPS
 - Net-Drone : Improvising network infrastructure with drone fleet

Prof. Yongsoon Eun

Cyber-Physical Systems and Feedback Control

We carry out research on modeling of dynamic systems, advancing control theory and the applications to cyber-physical systems(CPS).

- Resilient CPS design methods
- Controls for systems with nonlinear actuators and sensors
- Geometric Control of UAVs
- Networked Control Systems
- City metro precision stop control

Prof. Sungjin Lee

Operating System/System Software/Storage Systems

Operating system support for high-performance storage systems

- Cross-layer optimization for non-volatile memory systems
- High-performance all flash-array systems
- KV-based distributed storage systems
- Secure storage systems

Prof. Junghyup Lee

Integrated Circuits and Microsystems

- Low-power biomedical microsystems
 - Neural stimulation and recording systems
 - Wearable biomedical devices
- Analog & mixed-signal circuits and systems
 - On-chip reference frequency generation systems
 - Smart sensor interface ICs
 - Low-power, high-precision current and voltage references
- Low-power, high-efficiency wireless communication microsystems
 - Wireless communication systems using a human body channel
 - Wireless power transfer through a human body channel

Prof. Jemin Lee

Information Security and Communication

Research on fundamentals and techniques for efficient, reliable, and secure wireless networks

- Advanced Communication Techniques for Future Wireless Networks
 - Ultra-dense heterogeneous network for 5G
 - Unmanned aerial vehicle (UAV) communication
 - Vehicle-to-Everything (V2X) communication
 - Ultra-low latency transmission for tactile Internet
- Security Techniques for Emerging Networks
 - Smart jamming and anti-jamming techniques
 - Physical-layer secret key generation
 - Integrated-layer security design for IoT
 - Social trust-degree based techniques

Prof. Jae Eun Jang

Advanced Electronic Devices

To make a breakthrough in various advanced electronic devices as well as traditional memory, display and mobile device, we study the concept and the design of nano-device using nanotechnology

- The development of nano optical devices : Research on antenna type solar energy harvesting system employing nano antenna structure, next generation opto-transistor, structural color filter, and new optical shutter.
- Nano devices for biology related applications : Bio-mimic artificial sensors such as psychological tactile sensor or e-nose and basic core structures for electrical brain.
- Wearable & Flexible device : Study and development of new process technologies for soft electronic device, such like wearable computer and flexible display.

Prof. Sunghyun Cho

Computational Photography / Computer Graphics / Computer Vision / Machine Learning

We study computational algorithms for developing next-generation cameras and imaging technologies, and for helping create new image/video contents.

- Image restoration technologies to overcome limitations of traditional cameras
- New camera applications that can bring new user experiences
- New image editing algorithms
- New types of cameras such as dual cameras and 360-degree cameras, and computational algorithms for them
- Machine learning and deep learning for understanding images and users

Prof. Ji-Woong Choi

Communication System and Signal Processing

Research on 1) communication theory and core signal processing technologies for advanced communication systems and 2) bio-medical signal processing and wireless body area communications/networking

- Wireless physical layer security and anti-jamming for resilient CPS
- Advanced technologies for IoT/M2M/D2D and 5G applications including full duplex, stochastic geometry and massive multi-input multi-output(MIMO)
- Inner-vehicle and vehicle-to-X (V2X) communications and security enhancement
- In-body/on-body wireless body area network(WBAN) for medical and wearable applications
- Bio-medical signal processing for invasive/non-invasive brain machine/computer interface(BMI/BCI)
- Magnetic wireless communication, power transfer and stimulation for medical and IoT applications

Prof. Jihwan Choi

Wireless and Satellite Communication Networks

Cross-layer system design for satellite and wireless networks

- Wireless networks
 - Cross-layer optimized resource scheduling
 - Co-existence of heterogeneous radio protocols
- Space communications
 - Resource allocation for space-terrestrial heterogeneous networks
 - Onboard processing architecture for next generation satellites

Prof. Jae Youn Hwang

Multimodal Biomedical Imaging and System

Multimodal biomedical imaging and Mobile health-care systems

- Mobile health-care systems and image/bio-signal processing
 - Smart-phone based spectral imaging system for detection of skin diseases
 - Wearable sensor systems and signal processing for mobile healthcare
- Multimodal endoscope/microscope for detection of various diseases
- High-frequency ultrasound microbeam technologies for determination invasion potentials of cancer cells
- Acoustic radiation force impulse imaging via photoacoustic detection



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Degree Ph.D, University of Maryland, College Park, MD, USA
Research interests Real-time systems | Wireless sensor networks | Cyber physical systems | Data and event services | Information security
Career&Major achievements IEEE Fellow | The President of Korean Computer Scientists and Engineers Association | Chair of the IEEE Computer Society Technical Award, IEEE RTCSA | WCU Chair Professor, Sogang University | Outstanding Contribution Award, IEEE RTCSA | Outstanding Contribution Award, ACM/IEEE Cyber Physical Systems Week | Professor, Department of Computer Science at the University of Virginia, USA(1986-2012)



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Degree Ph.D, Brown Univky, USA
Research interests Predictive control | Time-delayed system | Industrial applications of digital control
Career&Major achievements Korea Highest Scientist Award(2007) | Vice-President of Korean Academy of Science and Technology | President of IFAC | Vice-President of National Academy of Engineering of Korea | President of the Korean Institute of Electrical Engineers | Fellow of IEEE, TWAS, IFAC



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Degree Ph.D, Stanford University, USA
Research interests Intelligent-Information Service | Database | Search Engines
Career&Major achievements Senior Engineer, Agency for Defense Development (ADD), Korea | IBM TJ. Watson Research Center, Research Staff Member | Chairman, Computer Science Department, KAIST | Director, Academic Information Management, Computing, and Science Library, KAIST | Director, Advanced Information Technology Research Center(AITrc) – an Engineering Research Center(ERC) of Excellence supported by Korea Science and Engineering Foundation(KOSEF) | Professor, Computer Science Department, KAIST | KAIST Distinguished Professor



Suha Kwak Assistant Professor

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Degree Ph.D, POSTECH, Rep. of Korea
Research interests Computer vision | Machine Learning
Career&Major achievements Postdoctoral researcher, Inria-Paris | Bronze Prize, Samsung Techwin Research Centers (2013)



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Research interests Computer Architecture | Operating Systems | Virtualization | Cloud Computing
Career&Major achievements Postdoctoral Research Associate, University of Illinois, Urbana-Champaign | Postdoctoral Research Associate, University of Wisconsin, Madison | Best Paper Award, IEEE Computer Architecture Letters (2014)



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Research interests Computer Architecture | Operating Systems | Virtualization | Cloud Computing
Career&Major achievements Postdoctoral Research Associate, University of Illinois, Urbana-Champaign | Postdoctoral Research Associate, University of Wisconsin, Madison | Best Paper Award, IEEE Computer Architecture Letters (2014)



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Degree Ph.D, KAIST, Rep. of Korea
Research interests Database | Data mining | Bioinformatics
Career&Major achievements Postdoctoral researcher, IBM Almaden Research Center | Developed the query engine of IBM Smart Analytics Optimizer for DB2 for z/OS | Postdoctoral Research Associate, UIUC | Best Demonstration Award, IEEE ICDE 2005



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Degree Ph.D, Seoul National University, Rep. of Korea
Research interests Cyber-physical systems and networks
Career&Major achievements Senior Engineer, Samsung Electronics | Postdoctoral Research Associate, UIUC | Associate Editor, Wiley Transactions on Emerging Telecommunications Technologies | Gold Prize, Samsung Inside Edge Paper Competition(2008)



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Degree Ph.D Kyungpook National University, CE
Research interests Computer Networks | Wireless Sensor Networks | Cyber-Physical Systems
Career&Major achievements PIRL, POSTECH, Research Scientist



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Degree Ph.D, University of Michigan, Ann Arbor, USA
Research interests Control theory for cyber-physical systems | Resilient cyber-physical systems | Control systems with nonlinear sensors and actuators | Cyclic control | Performance improvability of control systems | Variable structure control
Career&Major achievements Senior Research Scientist, Xerox Research Center Webster, Xerox Corporation | Co-author of the book <Quasilinear control>(2011) | Xerox Innovation Group Excellence in Research and Technology Award(2011) | 2nd Asian Control Conference Young Author Award(1997)



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Research interests Operating System | System Software | Storage Systems
Career&Major achievements Assistant Professor, Inha University, Incheon, Korea (2016.03-2017.06) | Postdoctoral Associate, MIT CSAIL, USA (2013.09-2016.02) | Microsoft Research Asia Fellowship, Microsoft (2010)



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Research interests Integrated circuits and microsystems
Career&Major achievements Scientist, Institute of Microelectronics, A*STAR, Singapore | Best Design Award, KCS(2009) | Outstanding Paper Award, IDEC(2011, 2009) | Best Design Award, Samsung Electronics(2000)



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Career&Major achievements Research Fellow, iTrust Centre, Singapore University of Technology and Design | Postdoctoral Researcher, MIT, USA | IEEE ComSoc Asia-Pacific Outstanding Young Researcher Award(2014) | Temasek Research Fellowship(2013)



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Research interests Nanotechnology applications for advanced electrical devices
Career&Major achievements Principle Senior Researcher, Samsung Advanced Institute of Technology | Outstanding Paper Award, IJIMD(2010) | Innovative Invention Award, Samsung Electronics(2009) | Samsung Best Paper Award(2008)



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Research interests Computational Photography | Computer Graphics | Computer Vision | Machine Learning
Career&Major achievements Senior Engineer, Samsung Electronics, Suwon, Korea | Research Scientist, Adobe Research, Seattle, WA, USA | Microsoft Graduate Research Fellowship Award (2008)



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Research interests Communication theory and signal processing techniques for wired and wireless communication systems | Bio-medical signal processing for brain machine/computer interface(BMI/BCI)
Career&Major achievements Staff Engineer, Marvell Semiconductor, CA, USA | Postdoctoral Researcher, Stanford University | IEEE Senior Member | Silver Award, Samsung Human-Tech Paper Competition(2005)



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Research interests Wireless and satellite communications | Cross-layer network design
Career&Major achievements ICT R&D planner, Institute for Information and Communications Promotion(IITP), Korea | Principal Systems Engineer, Marvell Semiconductor Inc., Santa Clara, CA, USA



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Research interests Multimodal biomedical imaging | High-frequency ultrasound | Biomedical optics | Mobile healthcare system | Image and bio-signal processing
Career&Major achievements Research Associate, NIH Resource Center for Medical Ultrasonic Transducer Technology | Postdoctoral Researcher, Cedars-Sinai Medical Center | Researcher, Medical Research Center at Seoul National University, Korea Science Foundation Graduate Fellowship, 2004-2005



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Research interests Revenue Management | Data Analytics | Smart Transportation
Career&Major achievements PARC, Xerox Company, Senior Research Scientist



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Career&Major achievements BP America Professor, University of Virginia



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Research interests Computer Science
Career&Major achievements Cecilia Fittler Moore Professor, University of Pennsylvania



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Research interests Convex optimization applications in control, signal processing, and circuit design
Career&Major achievements Samsung Professor of Engineering at Stanford University | AACC Donald P. Eckman Award(1992) | IEEE Fellow



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Research interests Nanoelectronics | High power IC design
Career&Major achievements Fellow of the Royal Academy of Engineering | Chartered Engineer and Fellow of the Institution of Electrical Engineers | Royal Academy of Engineering Silver Medal(2007)



ICE Summer Student Workshop



ICE Happy Hour

Overview

Information & Communication, which is considered as a core of the future knowledge society, takes a key role in the convergence with Bio Technology (BT), Culture Technology (CT), Energy Technology (ET), Nano Technology (NT), Robot Technology (RT), etc. The department fosters information and communication professionals equipped with 1) creativity for seeking new research and development directions in the advancement of our future industry, 2) practicality for solving real world problems, 3) globalization for embracing international perspectives, and 4) social entrepreneurship for generating added value in existing or novel applications

Vision

- Becoming the department of excellence with international academic recognition
- Advancing core technologies needed for the development of future industries
- Educating professionals equipped with both the ability of global research & development and the sense of technology management
- Opening up new fields through information and communication convergence with other fields of study

Research and Education Focus

- Select specialized major research areas and support them intensively
- Cluster the related specialized major research areas as centers
- Conduct convergence research between each field of information and communication and other fields of study

Specialized Research Fields

Cyber Physical Systems

- Real-time and embedded systems
- Smart homes and intelligent transportation systems
- AI-based context awareness and decision support
- Control and modeling
- Big data systems and big data mining
- Physical-layer security

Connected Smart Systems

- Internet of Everything (IoE)
- Nano communication devices
- Resilient networks for cyber-physical systems
- Satellite communications networks
- Cross-layer communication and signal processing
- Vehicular communications

Biomedical Systems

- Biosignal sensing system and biomimic devices
- Smart healthcare
- Bioinformatics and neuroinformatics
- Biomedical communications and signal processing
- Brain-machine interface/ Brain-computer interface(BMI/BCI)
- Biomedical Imaging and Mobile healthcare systems

CPS Global Center

- The CPS Global Center at DGIST, established in 2012, performs both fundamental research to develop new principles, models, and theories for CPS and inter-disciplinary research to apply CPS to a number of areas including automobiles and transportations.
- It is one of the biggest center in Korea dedicated to CPS research. The CPS Global Center has built a strong global research network with world-class researchers in CPS, actively collaborating with four participating institutes in USA : University of Virginia, University of Michigan, University of Pennsylvania, and Carnegie Mellon University.

Resilient Cyber-Physical Systems Research Center

- DGIST research proposal on CPS resiliency won Korean government funding
- Resilient Cyber-Physical Systems Research Center has begun 8 year journey of R&D for safe, convenient and energy-efficient future society
- The center focuses on Real time Resilient Cyber-Physical Systems Software Technology that enables continuous operation despite external attacks or internal faults, reduced

Department Cooperated Research Center

Academic Events

Students Events

Convergence with Other Majors

Alumni Career Pathways

Interview Contents

- capacity operation if the severity of faults and attacks is too high to maintain full operation and graceful degradation if failure is inevitable
- The outcome will contribute to the economic growth of local and national economy as well as technology based, safe, convenient and energy efficient society

International Workshop on Cyber-Physical Systems(IWCPS)

- For developing collaboration research with the highest levels of national and international research institutions, CPS Global Center hosts annual workshop with the theme of the Cyber-Physical Systems.

ICE Student Conference

- Gives opportunity to students to convey information about their thesis and research plans with sharing background knowledges. The workshop also cultivates paper writing and presentation skills.

WookHyun Kwon Outstanding Research Award

- Based on exemplary academic skills and excellent research achievements of the students, give WookHyun Kwon Outstanding Research Award and prize.

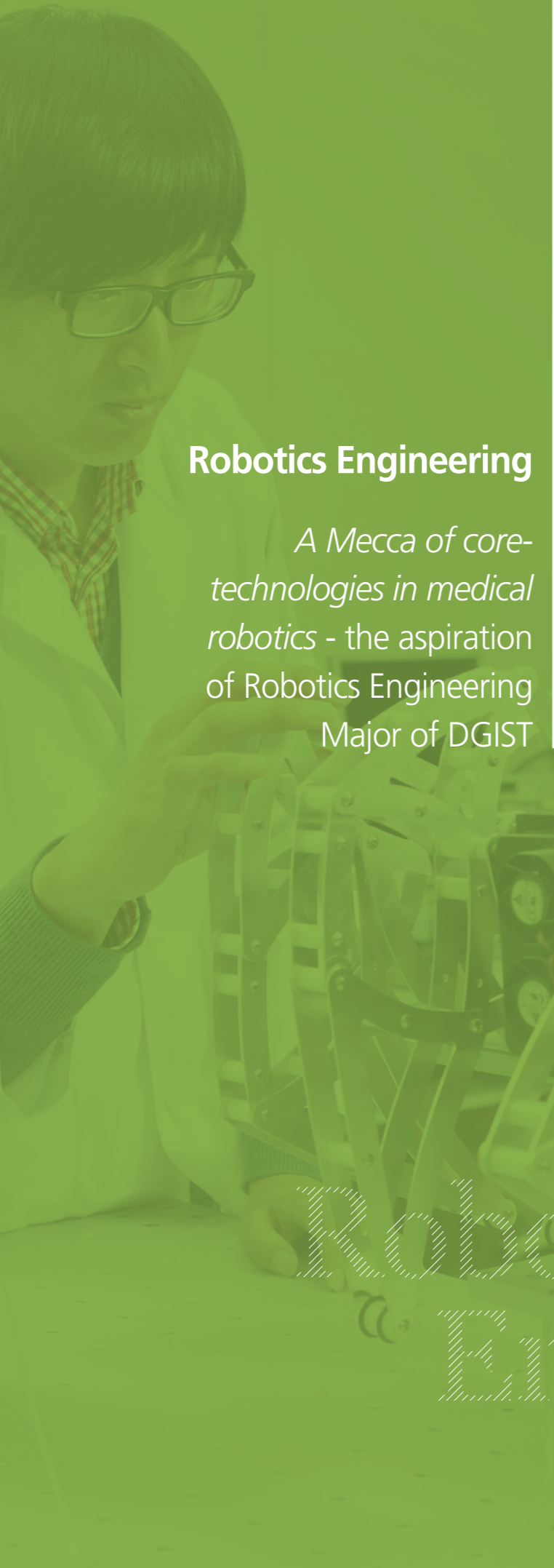
ICE Happy Hour

- Along with pursuing healthy activities with all the department members, the event cultivates humanity through culture programs and promotes unity between the members.

- Convergence with Emerging Materials Science : Research on electronic devices based on new materials
- Convergence with Robotics Engineering : CPS and brain mapping based rehabilitation robot technologies, Machine-learning based brain machine interface, Sensor and actuator wireless interface
- Convergence with Energy Systems Engineering : Energy IT convergence technologies including smart grid and renewable energy
- Convergence with Brain & Cognitive Sciences : Medical imaging, Biomedical signal processing, Nano devices with possible application to human body, Database and data mining for medical applications, Biomedical wireless communications and network
- Convergence with New Biology : Next Generation Sequencing(NGS) genome data analysis, Large-scale protein mass spectrum data analysis

- Government research institutes including Agency for Defense Development(ADD), Defense Agency for Technology Quality(DTaQ), Korea Testing Laboratory(KTL), Korea Airports Corporation
- Research centers of conglomerates companies including Samsung Electronics, LG Electronics, Samsung Display, Hyundai Motor Company, and Hyundai Mobis
- Prospective foreign and mid-sized industries including UL Korea, SL and Innoreless
- Ph.D Course

- Oral examination about foundations and applications of information & communication, computer, electronics, mathematics, physics, chemistry, attitude, personality, and vision as an engineer
- English Presentation of up to 5 minutes (5 slides) about an important concept that you learned through your undergraduate core courses for MS degree applicants, and that is related to your future PhD research for PhD degree applicants
- A part of the interview will be conducted in English
- Online interview can be arranged for students residing outside Korea, by early request.



Robotics Engineering

A Mecca of core-technologies in medical robotics - the aspiration of Robotics Engineering Major of DGIST

Medical robotics is a future research area possessing an immense potential to greatly contributes to improving health and quality of life. For this reason this area deserves the dedication of people with brightest minds and challenging spirits.

◆ **What kinds of majors of undergraduate are suitable to apply master or doctoral degree for Robotics Engineering, and which courses should be taken in advance for the Robotics Engineering?**

Based on interdisciplinary research, Robotics Engineering targets to medical robotic researches and its applications to lead convergence research. Therefore, as well as mechanical engineering, electric or electronics engineering, and computer science, any research background from university, research institute, and company is possible to apply DGIST Robotics Engineering, i.e. biotechnology(BT), information technology(IT), micro/nano technology(MT/NT). Moreover, many majors related to natural scientific research such as mathematics, physics, and chemistry could contribute medical robotics engineering research since these majors might be helpful to figure out underlying physics for developing any special medical applications. Any specific courses related to robotics are not mandatory to qualify master/doctoral degree. Applicants who do not have necessary background knowledge can take specially offered basic courses of the department.

◆ **Is there any differences if one starts his/her Ph. D. program at the Department of Robotics Engineering after MS from other schools compared to continuing Ph. D. after completion of MS at the same department?**

If one studies at DGIST for their Ph.D. after MS from other schools, parts of credits earned in other universities may be transferred and applied toward a student's graduate degree program. Those transferred credits can be counted for the Ph.D. credit hours. If one studies from MS to Ph.D. at DGIST, all credits earned for MS degree are transferred for Ph.D. He also may be able to finalize the Ph. D course earlier by applying MS-PhD combining course.

◆ **What kinds of researches are performed in the Robotics Engineering Department?**

Single port surgery robot
Single incision laparoscopic surgery(SILS) or single port surgery(SPS) is a next generation surgical method that can substitute the conventional laparoscopic surgery. It provides less incision, less scar, and the shorter hospitalization period for the patient. However, SILS demands many surgical experiences and skills of surgeons due to the highly limited vision and operation space during the surgery. In the robotics engineering department, we develop a compact, precise and dexterous master slave type SILS robot to enable more safe and efficient surgery

Image-guided surgical robot
This research is performed to realize accurate and safe surgery with a robot based on medical images, such as CT, MRI, ultrasound which provide the positional information of the tumors, vessels, and other interested area. The positions obtained from medical images are delivered to the robot controller to access the target lesion with digitized numerical coordinates. Particularly the robot is developed to compensate the real-time movement and deformation of target organs affected by respiration, heartbeat, and other involuntary motions during the procedures. MRI-compatible robot and ultrasound guided needle insertion robot are the research topics of this field.

Surgical navigation
This study is to use medical images, such as MRI, CT, ultrasound as a map for guide during the surgery, which are originally taken for diagnosis. The tumors, vessels, and major nerves that are located in or under the organs are visualized and presented to the surgeons through the virtual and augmented reality environments. Ambiguous boundaries between tumors and normal tissues are identified, and invisible vessels and nerves can be detected by using this techniques. The accurate, fast and non-invasive registration of patient to image, or image to image is important technical issues of this topic.

Development of a Cyber-Knife system using a dual-arm control
A dexterous Cyber-Knife is to be developed by using the control technique of dual-arm robot systems, where the one hand holding radioactive gun is coordinated according to the other hand serving as the bed.

Smart micro-surgical robot
Microsurgery requires precise and safe tool tip manipulation in a small volume like a human eye. However, micro-surgeons have a physiological tremor at about 10Hz with 100 μ m order. Here, we study smart micro-manipulation aided robotic-surgery tool(SMART) using optical coherence tomography sensor and precise motors. It can be expanded into the development of various micro-surgical tools. Also, the biomedical optics based systems can be applied into novel micro-surgical techniques

Robot-aided rehabilitation based on brain mapping
Motor recovery after stroke is essential for most activities of daily life(ADL). The recovery is, however, the most challenging goal in rehabilitation field. As a promising solution of the problem, we are going to make a novel hand rehabilitation protocol based on brain mapping techniques, such as electroencephalography(EEG) and functional near-infrared spectroscopy(fNIRS).

Robotic telerehabilitation of upper extremity
Physical impairments due to stroke make patients hard to visit clinic/hospital for getting rehabilitation services. Telerehabilitation, the remote delivery of rehabilitation services, has been considered as the promising solution to this problem. In this topic, a telerobotic system has been proposed for kinesthetic sensation based remote assessment of stroke patient's impaired elbow. In addition, a robot-aided in-home therapy is going to be developed by reducing cost and complexity of therapy, and by improving effectiveness of therapy.

Sensor-based improved assessment for rehabilitation/healthcare
Recent development of sensor technology can provide better rehabilitation/healthcare services, such as assessment as well as monitoring. In this research, we have attempted to improve accuracy, reliability and usability of conventional clinical instruments by using sensors.

Treadmill-based gait rehabilitation
Since Treadmill provides a safe, convenient, and fairly compact environment to patients and clinicians, treadmill-based gait training has become an accepted rehabilitation method for improving the patients' lower extremity coordinative skills. Based on this idea, we have developed a novel treadmill system, interactive treadmill. On the treadmill, users can naturally change their walking speed while the treadmill follows their intention of speed change. With the treadmill, patient's better gait recovery is promising because the treadmill requires the user's more conscious engagement that would result in large brain activation. We have also attempted to show the brain activation by using brain mapping techniques.

Stochastic estimation of impedances of human arm, shoulder, and finger.

Stochastic estimation method of impedance using robots has been popular for its accuracy and convenience. This method, however, is based on the assumption that the system to be estimated be linear, and becomes inaccurate as discontinuous nonlinearity increases such as Coulomb friction or stiction. Instead of using a specially designed robot having negligible friction, we propose an active control to reduce such frictions so that the estimation may still yield accurate results with robots having relatively high friction.

Brain information guided robotic rehabilitations system for animal

Brain diseases including a stroke is a big issue in improving the life quality of the elderly. A correlation analysis between the brain disease and its rehabilitation training will be studied. The result could contribute to the human rehabilitation by suggesting the effective cue.

Neurosurgical micro-robot

The goal of this project is to investigate the application of established microrobotic systems for ophthalmic-retinal therapies to a new application in neurosurgery. We collaborate with Prof. Bradley Nelson at ETH Zürich, Switzerland to achieve this goal. Topics to be considered include real-time imaging of microrobotic devices in the brain, magnetic manipulation system design for the brain, and design & fabrication of future microrobots for targeted delivery within the brain.

Neural prostheses

Artificial cochlea is one of the most successful neural prostheses. Basilar membrane and hair cells are the key parts for passive hearing in the cochlea. Hair cells generate bioelectrical signal by the vibration of the basilar membrane and the generated bioelectrical signal is transferred to the auditory nerve system. In this research, piezoelectric artificial basilar membrane (ABM) will be studied to mimic the functionality of the basilar membrane and hair cells. We also study Brain-Machine Interface for neural interfaces between the brain and our ABM. The results will be the key technology for a next generation of artificial cochlea.

Neural interfaces

For brain-machine interfaces (BMI) or neuroprosthetic devices, neural interfaces at the boundary between a biological system and an artificial system are required. Neural interfaces convert ionic currents into electronic currents, and vice versa, thereby enabling to read out neural signals or inject commands to neurons. They need to be in micrometers scale in order to interact with neurons, and thus, are fabricated using MEMS (micro-electro-mechanical system) technologies. Recently, such neural interfaces are developed based on polymers or polymer/silicon hybrid structures for better biocompatibility and compliance with neural tissues. Also, we research novel implantable optical and magnetic neural stimulation methodologies in addition to traditional electrical stimulation, because light at specific wavelengths and magnetic fields can also elicit neuronal responses.

Implantable microdevices

Active implantable microdevices, different from passive implants such as dental or knee implants, are demanded for the purpose of health monitoring, diagnosis, treatment, or rehabilitation for patients with chronic diseases and for future preventive healthcare services. For active microdevices to be implanted in the body, they need to be small in size, require wireless power supply/data exchange, and robust packaging. We develop strategies to improve long-term performance of thin-film polymeric encapsulation in physiological environments and wireless powering technologies. Also, we carry out computer simulation studies based on finite element method (FEM) to systematically analyze the interaction between the implanted devices and the body.

Stretchable/wearable sensors

Flexible and stretchable electrodes are of great interest these days to realize novel applications such as wearable sensors, electronics, computers or robots. We develop fabrication techniques to pattern thin-film metals or silver nanowires based on flexible and/or stretchable polymeric substrates. It is expected that these fabrication techniques based on flexible/stretchable materials can be further developed to realize next-generation flexible printed circuit boards (FPCB), and wearable/patchable bio-signal monitoring sensors towards future smart health-care systems.

Soft Actuator

Soft actuator, recently, draws attention from robotic engineers as a driving system that can provide strong and smooth force/torque. Series Elastic Actuator (SEA) which consists of a motor, reduction gears and a spring is the most widely accepted soft actuator, and our research is on the analysis of its dynamics and design based on the dynamic model. Since soft actuators are the integration of the mechanical design and control design, our research focuses on the mechanical design in terms of control engineering and the control design taking into consideration the mechanical properties of soft actuators.

Muscle-inspired Walking Assistive/Rehabilitation Robot

Many of recent walking assistive/rehabilitation robots are designed and controlled based on the joint torques, which is different from human's musculo-skeletal system. The main target of this research is development of walking assistive/rehabilitation robot based on human's musculo-skeletal model. At first, we analyze the characteristics of human's musculo-skeletal system in terms of dynamics and robotics. Then the results are reflected in the development of mechanism and control algorithms so that they can realize human motions in a more natural way and provide better assistance and rehabilitation ability.

Biorobotics and Mechatronics

Bio mimetic (or Nature inspired) technology aims to investigate end analyze the structure and the motion of animals or plants on the earth, which evolved for a long period, and tries to extract the valuable information from the procedure to design the engineering system. The main objective of this research is to conduct research and development of the creative robot and mechatronics system. To do this, soft robot technology using soft/smart materials as well as conventional robot technology based on machining is used to build multi-functional and diverse robot. Elementary and essential technologies such as sensors and actuators are also studied for robot/mechatronics application. Application of the developed technology to the medical and industrial robot/mechatronics field based on the above research is our research goal.

Imperceptible Robotics

Conventional robotic technologies hold many promises to advance disease diagnosis and therapeutic research by enabling precise sensing and actuation in small scale, leading to implantable, portable, or even wearable biomedical systems. Current medical devices interfaced with our body are still rigid, bulky, and remains permanently. However, biological organs and systems are soft and curvilinear, time-dynamic. To bridge this gap we are challenging to create soft robotics that provides intimate, minimally invasive, electrically stand-alone, and biocompatible interfaces with the human body so that people cannot feel the existence of the device.

Biomedical Micro/Nano Robotics

Recently, various type of biomedical micro/nano robotics have been widely developed and actively studied for real clinical applications. In this research, we focus on the following areas: biomedical micro robots using miniaturized mechanisms and magnetic actuations, therapeutic drug/cell delivery micro/nanorobot system using external actuating forces, cell based microrobots, and bio-instruments for biomedical researches.

Nano materials and Devices

Nanomaterials have shown great potential for future robots and electronics with their outstanding materials properties. We work on developing advanced manufacturing processes for emerging nanomaterials and functional materials for device, energy, and robot applications. Key thrust areas include: 1) Utilization of Nanoscale Thermal Energy for Manufacturing and Materials Characterization. 2) Batch Fabrication of Nanomaterials and Functional Materials Integrated Devices. 3) Development of Multi-physical Smart Sensor Devices for Robotic Systems.

Medical Image Processing

We are interested in enhancement of health care system by creating algorithms for automatically extracting and analyzing useful information latent in medical images and signals. Specifically, we are developing techniques for medical image enhancement & visualization, segmentation of interest organs or vessels, registration of multi-modal and multi-time series images, classification & pattern recognition of diseases, longitudinal studies & quantitative analysis

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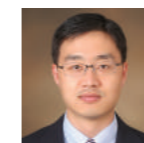
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Research interests Surgical Navigation | Surgical Robot | Medical Imaging
Career&Major achievements Best presentation paper awards at ICAM 2010, and ACCAS 2007 | Best engineering paper award of JSCAS 2007 | Japan government(JSPS) postdoc researcher | Associate Professor at Kyushu University | Special board member of the Korean Society of Medical Robot | 120 clinical applications in surgical navigation



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Career&Major achievements LG Electronics Production Research Center, Senior Researcher | KIST Microsystem Center, Senior Researcher | Chonnam National University, Mechanical Engineering, Professor



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Research interests Micro/nano robot | Neural prostheses | MEMS | BioMEMS | BMI
Career&Major achievements Outstanding Teaching Assistant Award & Teaching Assistant Excellence Award, Washington State University(2004) | Best Post Award, International Symposium on Nature-Inspired Technology, 2009 | Post Doctoral Researcher, University of California, Davis, Nov. 2007 - Feb. 2009 | Senior Researcher, Korea Institute of Machinery & Materials, Feb. 2009 - Sep. 2010



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Research interests Neural interface | Neural stimulation | Bio MEMS | Stretchable electronics | Numerical simulation of implant-body interactions
Career&Major achievements Researcher, Fraunhofer Institute for Biomedical Engineering, Germany(2001-2005) | Postdoctoral Researcher & Research Assistant Professor, University of Utah(2006-2009) | Assistant & Associate Professor, Gwangju Institute of Science and Technology(2009-2015) | Best Paper Award, National Research Foundation(2013) | Excellence in Neural Engineering Travel Award, IEEE-EMBC Neural Engineering Conference(2007)



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Career&Major achievements Postdoctoral fellowship award, National Institutes of Health(NIH) | Researcher, NIH Clinical research center



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Research interests SMART micro-surgical system | Biomedical optics/microsurgery | Neuro-rehabilitation system
Career&Major achievements KAIST Postdoctoral Researcher | Johns Hopkins University Postdoctoral Researcher



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Research interests Research on Human-friendly motion control | Development of human assistance/rehabilitation system | Design of robotic system based on human musculoskeletal system | Analysis of human walking dynamics and its application to robotics
Career&Major achievements Project Assistant Professor, The University of Tokyo | Visiting Scholar, The University of Texas at Austin | Senior Engineer, Samsung Heavy Industries | Research Professor, Sogang University



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Research interests Biomimetic Robot | Soft Robotics | Robot elementary technology : Sensors and actuators | Study on the medical application | Study on the industrial application
Career&Major achievements Researcher, Agency for Defence Development (ADD) | Senior researcher, Korea Institute of Machinery and Materials (KIMM) | Post-doc, UC Berkeley | KSME conference Paper Award(2007) | KSME conference Poster Award(2010) | KSPSE conference Paper Award(2015) | KIMM Achievement Award (2008, 2015) | KIMM Academic Award(2015)



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Research interests Skin-mountable and body-implantable health care system | Embedded system for wireless power transmission, communication, and bio-signal processing | Smart cloth with artificial intelligence
Career&Major achievements University of Illinois at Urbana-Champaign Postdoctoral Researcher (2011-2016) | Frontispiece for October issue of Advanced Functional Materials, 2016 | Cover for June issue of Advanced Functional Materials, 2015 | Feature image for the September issue of Nature Communications, 2014



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Career&Major achievements Carnegie Mellon University Postdoctoral Researcher (2015-2016)



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Research interests Medical image enhancement | Visualization | Segmentation | Registration | Classification & Disease pattern extraction | Longitudinal studies
Career&Major achievements SRI International at Menlo Park, Postdoctoral fellow (2016-2017), University of North Carolina at Chapel Hill, Postdoctoral fellow (2014-2016)



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Degree Ph.D., MIT, USA
Research interests Rehabilitation robot | Dual arm robot | Time-delay control
Career&Major achievements 2010 Best Research Award(ADD) | 2007 Best Lecturer Award(Department of ME, KAIST) | 2006 Best Paper Award(International Workshop of Human-Welfare Robotic Systems) | 1995 Best Lecturer Award(KAIST) | 50 papers in international refereed journals



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Career&Major achievements IEEE Transactions on Robotics & Automation and other famous Journal's editorial board | ETH University, Institute of Robotics and Intelligent Systems(IRIS) Founding Director(2002) | United States "Scientific American 50" Award | United States "McKnight Presidential Fellows" Award



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Research interests Medical Robotics | Medical Imaging & Modeling
Career&Major achievements Director, CISST ERC at Johns Hopkins University | John C. Malone Professorship(2011) | MICCAI Society Enduring Impact Award | Fellow, MICCAI Society(2009) | Fellow, Engineering School of the University of Tokyo(2009)



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Research interests Bio-Signal based Rehabilitation Robotics | Tele-operation Robotics | Embedded Control & Intelligence Control
Career&Major achievements President's Award [Semiconductor Design Contest 2005] | Head of LG Industrial Systems Research Center(2004-2006) | Dean of Robotics Engineering Department(2007-2010) | Chairman of KOROS(Korea Robot Standard) Medical Robot Committee(2010-present) | Korean Delegation of ISO Medical Robot Standardization(2009-present)

Overview

Vision

Strategies

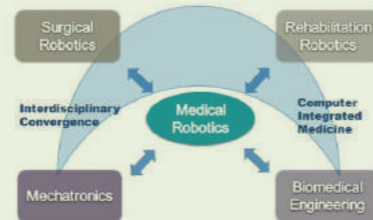
Specialized Research Fields

- In the medical field, robots have performed numerous missions instead of human being to improve the quality of life as well as human health and welfare.
- In order to become a leader of next decade, advanced countries have investigated and spurred on the robot technology as a new growth engine.
- Since the research areas of medical robots have rapidly grown with the infinite possibilities, people who have experienced skills and challenging spirit can dedicate their effort to research, and prepare for the upcoming new future.

- We aim to research core technologies of future robotics toward human-centered medical services in the 4th Industrial Revolution Era, and to educate interdisciplinary experts in robotics who understand the challenges in the fields and define the problems by one's own, and solve those problems actively and collaboratively.

- Research
 - Understand the challenges in medical fields and apply basic theories and technologies appropriately
 - Run the whole cycle of R&D in close collaboration with medical staffs
 - Extend the developed core technologies to other research and industrial fields
- Education
 - Intensive on-site education and training
 - Strengthen the fundamental courses and foster multidisciplinary convergence education
 - Self-motivated learning to promote logical thinking and creativity
 - Encourage care and communication, and strengthen research ethics

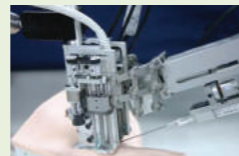
Robotics Engineering Department conducts robotics researches to develop creative fusion technologies by converging conventional engineering subjects (Mechanical, Electrical, Electronics Engineering, Mechatronics, etc) with advanced high technologies such as Biotechnology (BT), Information Technology (IT) and Micro & Nanotechnology (MT/NT). With this fusion technologies, the department will focus on the biomedical robotics fundamental researches on Robot Mechanism Analysis and Design, Precision Actuator and Sensor, Biometric sensing (bio-sensors), Control System, Biomodeling, Medical Simulation, Optical System Design, Biomedical Imaging, and Micro/Nano Systems Design & Fabrication.



- **Surgical Robot** : Advanced robotic technologies that provide advanced eyes and hands for surgeons to assist more accurate and safe surgery through the image-guided minimally invasive surgery. Surgical simulation based on virtual and augmented reality technologies helps surgeons to practice surgical skills preoperatively.



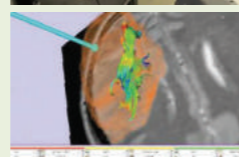
- **Rehabilitation Robot and Life Support Robot** : Rehabilitation robots that help recover or assist the motor/cognitive functions of the handicapped and impaired persons. Life support robots such as welfare assistant and home care robots that improve quality of life of the beneficiary.



- **Bio Micro-Nano Robots/BRI** : Exploration, diagnosis and drug delivery for targeted areas; treatment of the brain and human body through the use of micro/nano robots and artificial sensing systems/control of robots, artificial prosthesis and external devices using BRI.



- **Robot Design & Service Robot** : Robot design and optimization for medical and other advanced robotic applications based on advanced robot mechanism, sensors, actuators, control, machine vision, motion planning, navigation, etc., and innovative service robots to improve the quality of human life.



Research and Education Focus

- Medical robotics to combine robotics engineering with medical applications.
- Major research areas : Surgical Robot, Rehabilitation Robot, Life Support Robot, Robot Design & Service Robot, and Bio Micro-Nano Robots/BRI
- Converged robotics engineering through interdisciplinary education, system integration education, team based working process, and project-based practical learning process.

– Training opportunity in the world's leading class research team



– Summer school for medical robotics with top class lecturers



Convergence with Other Majors

- Although DGIST is still at its growing stage, the Robotics Engineering Department will conduct an international education-research program called "Global Alliance Program" that collaborates with world leading universities.
- The department will invite world renowned professors to give lectures, co-supervise student thesis, and conduct cooperative research.
- The department will promote exchange of visits at the level of professor / research staff, and students' internship programs in order to encourage their international experience.

Interview Contents

- Questions on fundamental knowledge of the robotics related subjects or courses, enthusiasm for research, potential ability to be a scholar, communication ability, etc. in both English and Korean
- A short presentation in English on the research experience, achievements, research plan, etc for about 5 minutes and 10 minutes for MS and PhD respectively
- Online interview can be arranged for students residing outside Korea, by early request.

Energy Systems Engineering

Energy Systems Engineering

Research and Development of environmentally friendly renewable energy sources and the devices

The limited supply and detrimental environmental effects of fossil fuels is seriously intimidating human survival. In order to solve such issues, ESE pursues the education and research for the next-generation sustainable energy sources and the devices storing or utilizing them.

◆ What are we going to study in the Department of ESE?

The Department's core courses are thermodynamics, electrochemistry and fundamentals of materials science & engineering. After completing the core courses, students are supposed to choose a major track among solar cell, fuel cell, battery, and molecular modeling, and battery, and take the in-depth courses within the track. In addition, you will extend your textbook knowledge through various R&D activities in the relevant research sectors in DGIST. You will be trained to be a creative and challenging personnel to lead the global future energy fields.

◆ Specific subject of each track?

The R&D fields of the major tracks are as follows :

- **Solar cell** : Core-materials and fabrication technology for the next generation photovoltaic and catalysts
- **Fuel cell** : Key materials and system design for the hydrogen/bio/ solid-oxide fuel cells.
- **Battery** : Mastering the present Li-ion battery technologies and exploring the innovative post-Li chemistry
- **Molecular modeling (computational chemistry)** : Virtual experiments using supercomputers (complementary to real-world synthesis, fabrication, and measurements) to get basic understanding of molecular-level mechanism and design principles underlying the above 3 tracks

◆ I'm worried about my English skills and hesitate to apply for DGIST since all the classes are delivered in English.

English communication skill is a prerequisite for the "World Top Class" university that DGIST aims at. Our Department is providing various English education programs to improve the students' English proficiency. With those courses you are encouraged to substantially mature your English communication capability.

◆ Possible career path after graduating the Department of ESE?

- Private R&D institutes (Samsung, LG, SK, Hyundai, POSCO, BASF, etc.)
- Universities and Government R&D institutes
- Renewable energy fields (solar & hydrogen fuel cells)
- Battery and energy conversion
- Energy and environment policy

◆ International network being built so far?

The world's greatest scholars are invited to offer the firm background and the world class education on the future energy issues to DGIST students. We have, at present, Professor J. Caton at the Mechanical Engineering in Texas A&M University, Nobel laureate Professor J. Byrne at the Energy & Environmental Policy in University of Delaware, world leading Professor M. Watanabe in Yamanashi University in the fuel cell. We are also collaborating with world-renowned research groups (e.g., Waseda university, Uppsala university). In addition, the department will continue to invite outstanding full-time Professors from all over the world, and take off to the "World Top Class" Department in the future energy field.

Faculty

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Research interests Materials chemistry | Nanomaterials | Electrochemistry | Carbon and porous materials | Fuel cell | Battery | Supercapacitor | Sensor and

Photochemical catalyst
Career&Major achievements Professor, Korea University | Research Associate, Northwestern University & Pennsylvania State University, USA



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Degree Ph.D.(Chemical Engineering), POSTECH
Research interests Green Solar cell | Image sensor | Surface chemistry
Career&Major achievements Assistant Professor, Chung-Ang University | Postdoctoral researcher, University of Chicago, USA



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Degree Ph.D.(Chemistry), Seoul National University
Research interests Next generation rechargeable batteries | Solid state chemistry | Crystallography
Career&Major achievements Project Leader of Innovative Battery R&D team, LG Chem Research Park | Research Associate, Iowa State University & Oregon State University, USA



In, Su-Il Associate Professor, Dean of External and International Affairs
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Degree Ph.D.(Chemistry), University of Cambridge, UK
Research interests CO₂ conversion to hydrocarbon fuels | Water splitting for hydrogen generation | Quantum dot devices | Dye sensitized solar cells | Environmental remediation | Synthesis of functional nanomaterials | Microbial fuel cell

Career&Major achievements Visiting scholar, University of California, Berkeley, USA | Postdoctoral associate, Technical University of Denmark & Pennsylvania State University, USA



Jang, Yun Hee Professor
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Degree Ph.D.(Chemistry), Seoul National University
Research interests Multiscale molecular modeling | Quantum mechanics, Molecular dynamics & Monte Carlo | Material design at the molecular level

Career&Major achievements Associate professor, GIST | Visiting professor, ENSCM & University of Tours, France | Postdoctoral scholar, Caltech, USA



Lee, Hochun Associate Professor
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Degree Ph.D.(Chemistry), KAIST, Korea
Research interests Advanced Li-ion battery | Next generation rechargeable batteries | Electrochemical energy conversion

Career&Major achievements LG Chem Battery R&D | Kumoh National Institute of Technology | Postdoctoral scholar, Brookhaven Nat'l Lab, USA



Lee, Jong-Soo Associate Professor
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Degree Ph.D.(Metallurgical Engineering), Chonbuk National University
Research interests Synthesis of Hybrid Nanomaterials | Quantum Dot and Organic-Inorganic Hybrid Quantum Dot

Solar Cells | Thermoelectric and Optoelectronic Devices | Photo and Image Sensors | Nanodevices based on 2D Nanomaterials.
Career&Major achievements Research Specialist, University of Chicago, USA | Postdoctoral Researcher, Lawrence Berkeley National Lab. & University of California, Davis, USA | Research Assistant Professor, Korea University



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Degree Ph.D., University of Florida, USA
Research interests Advanced energy conversion and storage systems | Solid-state Electrochemical Energy Devices | All solid-state batteries | Low-temperature solid oxide fuel cells(SOFCs)

Career&Major achievements Research Scientist, University of Maryland & University of Florida, USA | Research Engineer, LG Electronics Institute of Technology



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Research interests Professor, Hanbat National University | Researcher, SK Innovation
Career&Major achievements Professor, Dept. of Chemical and Biological Engineering, Hanbat National University | Researcher, SK Innovation



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Research interests Organic Solar cell | OLED | Printed Electronics
Career&Major achievements Senior Engineer, Samsung Electronics | King Sejong Patent Award(2004) | Research Scientist, LG Chem Research Park(OLED R&D)



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Degree Ph.D.(Chemistry), Indian Institute of Technology Madras, India
Research interests Fuel Cells | Metal-Air batteries | Biosensors | Multifunctional Magnetic materials

Career&Major achievements Assistant professor, Waseda Univ. Japan | Guest Scientist, RWTH Aachen Univ. Germany | Postdoctoral Fellow, Bar-Ilan Univ. Israel | Best Ph. D thesis Award(2005), Chemistry, IIT Madras, India

Advisory & Adjunct Faculty



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Research interests Electrochemistry | Fuel cell | Electrochemiluminescence

Career&Major achievements Vice-president, Seoul National University | President, International Society of Electrochemistry | Chairman, Korean National Research Resource Center | Fellow, International Society of Electrochemistry



Byrne, John Distinguished Professor
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Research interests Energy & Environmental Policy
Career&Major achievements Distinguished professor, Univ. Delaware, USA | Director of CEEP | Nobel Laureate('07)

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Degree Ph.D.(Physics), University of Nice, France

Overview

Securing sustainable and environmentally friendly energy resources is an important task to accomplish human survival in future. Frontier science and technology are extensively searching for such power sources as well as systems utilizing the renewable energies. With this wide range of social movement, it is required to shift the conventional education paradigm innovatively to have students handle new forms of the energies. The Department of Energy Systems Engineering in DGIST aims at educating graduate students to contribute to the new generation of renewable energies with the creative mind.

Vision

- State of the art courses fostering competent scientists and engineers for the beyond conventional energy sources
- Creation of core academic areas and policies for future green energy society
- Education of graduate students for future-oriented and creative R&D capability
- Cultivation of international leaders for the convergence energy devices through closely interconnected interdisciplinary system of DGIST.
- International exchange (including double-degree program) and team projects with global top Institutes
- Solution searching education and research experiences to technical challenges

Research and Education Focus

- Key materials and system design for the advanced hydrogen and bio-fuel cells
- Production and storage of hydrogen and practical applications of renewable energy systems
- Core-material and fabrication technology for the next generation photovoltaic cells
- Photocatalytic water splitting and recycle of the waste products such as CO₂ and waste water
- New materials for high energy density Li-ion batteries
- Post-Li batteries including multivalent(Mg, Zn, Ca) ion, metal-air batteries
- New materials for low-energy-consumption electronic devices
- Multi-scale molecular modeling of materials for clean energy

Specialized Research Fields

- Information and Communication Engineering : Electricity storage devices and sensor network system for smart grid to improve the efficiency of renewable energies
- Robotics Engineering : Small batteries for micro-robots for medical application, and large-batteries for human care/ industrial robots
- Brain/biology : Bio-energy systems for the treatment of brain signals and processing, and biocompatible power sources

Convergence with other Majors

- Personal interview in English with the concerned professors
- Self-introduction(5 Min. presentation)
- Questions on fundamentals and specialized knowledge about application of Energy Systems Engineering such as Physics, Chemistry, Mathematics, Biology, Thermodynamics and Transfer phenomenon according to the applicant's specialty background, and on culture, personality and vision as engineering students.
- Online interview can be arranged for students residing outside Korea, by early request.

Interview Contents

Brain & Cognitive Sciences

Leading the world in brain & cognitive sciences through convergent education and research

Brain & Cognitive Sciences



Brain & Cognitive Sciences is the study of the fundamental principles of brain structure and function, based on neurobiology and cognitive science.

DGIST Brain & Cognitive Sciences provides interdisciplinary convergence and global networking that is becoming so important not only in science and industry but also in anthropology and social science fields.



◆ **What curriculums does the Department of Brain & Cognitive Sciences provide to the students?**

- Intensive courses for the basics of physiological and pathological mechanisms of the brain
- Courses centered on the experimental methods for the study of the brain function and structure
- Internships and seminars for in-depth as well as broad knowledge and thinking
- Taking courses from other majors, such as IT, RT, and ET, as a prerequisite for brain convergence science.
- Study the theoretical and computational biophysics in order to understand the fundamental physico-chemical principle behind the brain-cognitive phenomena.

◆ **What are the goals of the Department curriculums?**

- To provide creative and systemic education, research-focused, interdisciplinary training, and global networking in education and research
- Individual meeting with faculty for deeper one on one conversations
- To produce global leaders who will lead application of our knowledge for mankind on the basis of professional knowledge and research ability of the brain convergence science

◆ **What is the educational philosophy of the Department?**

- **Integrity** : responsibility and honesty in performing and reporting research
- **Collegiality** : scientific interactions and communications
- **Collaboration** : sharing of knowledge and resources for mutual development
- **Collective wisdom** : sharing of knowledge for the pursuit of truth
- **Social responsibility** : the accountability of science to society
- **Translation** : conduct of research for clinical and practical application
- **Partnership** : partnership between faculty and students

◆ **What are extracurricular activities on-going in the Department?**

- **Student Symposium** : At this student-run annual symposium, the students invite speakers for seminar and present their research work.
- **Seminar** : The Department invites renowned speakers for seminar
- **Convergence seminar** : This seminar is co-hosted with other departments to facilitate convergent research and collaboration between the departments.
- **Happy hour** : The students and one faculty member have a happy hour every month for mutual understanding

Laboratory Introduction

Prof. Eun-Kyoung Kim

The goal of my research project is to elucidate the mechanisms by which brain regulates energy homeostasis to prevent or treat metabolic diseases such as obesity, diabetes and neurodegenerative diseases.

- **Appetite control for obesity and diabetes therapies** : Identification of compounds or hormones to modulate hypothalamic AMPK(AMP-activated protein kinase) regulating food intake helps on understanding their cellular and molecular mechanisms of action for development of therapeutic strategy.
- **Autophagy in diabetes and obesity** : Understanding of the role of AMPK in autophagy and investigating of the interplay between autophagy and apoptosis in the pancreatic beta-cells and neuronal cells using viral expression systems and in vivo experimental design hold promising potential to developing new compounds targeting autophagic pathways.
- **Insulin actions on obesity, diabetes and neurodegenerative diseases** : Characterization of central roles of brain insulin in neuroendocrine neurons of hippocampus and hypothalamus provides new insights on linking metabolism and neurodegeneration.

Prof. Kyungjin Kim

My laboratory aims to elucidate the integrative action of molecular clockwork and functional relevance in biological rhythms of the mammalian brain by using a variety of experimental tools including molecular, cellular, anatomical and behavioral approaches.

- Deciphering the fundamental principles and physiological significance of biological oscillations including circadian and ultradian rhythms.
- Identifying the process of molecular clockworks by real-time monitoring of a single neuron's activity.
- Elucidating the functional link between molecular clockwork and mood regulation in a variety of circadian rhythms-related disorders including Parkinson's disease.

Prof. Iksoo Chang

We aim to uncover the fundamental physico-chemical principle of the life scientific phenomena of bio-neuro-brain system based on statistical physics and computational physics.

For this purpose our laboratory is working on the following research topics :

- Supercomputing modelling of protein structure and function at the level of atoms.
- Protein thermodynamics, folding kinetics, and mutagenesis.
- Protein-protein, protein-DNA interaction.
- Effect of intra-cellular pH on protein structure and function
- Membrane protein, receptor protein and signal communication across cell membrane.
- Protein aggregation mechanism and neuro-degenerative proteins
- Supercomputing analysis of big-data and complex network phenomena of bio-neuro-brain system

Prof. Cheil Moon

My laboratory is studying the chemical senses of the brain, in particular studying the processes of the olfaction using molecular, cellular, morphological and behavioral approaches & translating these knowledges into the biomedical fields.

- **Structure and functions of olfactory systems** : My laboratory is trying to understand the signal processes of olfaction in the brain. This includes the detection processes at the level of odorant receptors and networking of olfaction-related neurons in the brain and the molecular mechanisms underlying the signal transduction pathways of chemical sensation.
- **Translational research using olfactory systems** : In this topic, we will determine the fundamental mechanisms of neuronal development by using the olfactory sensory neurons as a regeneration and neuroprotection model system and perform translational research to overcome numerous neural disorders including early detection kit development for neurodegenerative diseases, neuronal protection drugs against stroke and glaucoma etc.
- **Olfactory cognition** : In this topic, we are trying to understand how the brain processes various olfaction-related signals using various brain signal detection devices including the EEG device, fNIRS and fMRI.

Prof. Seong-Woon Yu

My research interests are focused on neuronal cell death mechanisms in neurodegenerative diseases.

A fundamental gap in our understanding of molecular mechanisms of non-apoptotic cell death and plasticity in switching between distinct cell death pathways hinders development of novel strategies for treatment of neurodegenerative diseases.

- **Autophagic cell death mechanisms** : The role of autophagy and its molecular mechanisms in neurodegeneration remain to be elucidated. Our study will bring to light the role of autophagy in neurodegenerative diseases, such as Alzheimer's disease, stress and psychiatric disorders.
- **Neuroinflammation and microglia activation in the brain** : This study will contribute to anti-inflammatory therapeutic design for neurodegenerative diseases. All these research programs will lead to a better understanding of the pathogenic mechanisms of neurodegenerative diseases, and thereby provide strategies for self-repairing of damaged human brain.

Prof. Byung-Chang Suh

My research goal is to understand the molecular mechanism and biophysical properties of ion channel modulation by membrane phospholipids in neuronal excitability and synaptic transmission, and then to examine the functional significance of membrane lipids and proteins in physiological and pathophysiological activities of neurons.

- **KCNQ K+ Channels and Epilepsy from Molecules to Medication** : To investigate the fundamental functions of membrane phosphoinositides (PIs) in the regulation of KCNQ channels and neuronal excitability in peripheral and central nervous systems. The results will provide new insight into the physiological significance of phospholipids in the regulation of cell excitability.
- **Ca2+-Permeable Channels and Pain Signaling in Nociceptive Neurons** : To understand the effects of receptor-mediated modification of membrane phospholipids on nociceptive channels, such as VGCCs, TRPV1, and ASICs. This knowledge will contribute significantly to understanding the biophysical properties of lipids in pain transmission.
- **Lipidomics : Modification and Functions of Phosphoinositides (PIs)** : To define the functional actions of PI turnover on signal transduction pathways in living cells, focusing mainly on voltage-gated ion channels. I will utilize several PI-specific modifying approaches including chemically-inducible dimerization, voltage-sensitive phosphatases, and optogenetics which permit observation of PI modulation of channel activity without activating any other signaling pathways.

Prof. Kyuhung Kim

The overall broad goal of my work is to investigate the circuits and molecules that integrate environmental cues with internal signals to drive specific developmental and behavioral outcomes

- Identification of the intra- and intercellular signaling pathways that transmit pheromone(an environmental cue) signals and the molecular mechanisms by which food signals are integrated with pheromone signals to regulate neuroendocrine signaling and development
- Investigation of the mechanisms and neuronal circuits underlying sexually dimorphic pheromone responses

My research focuses on identifying the neuronal and molecular mechanisms that underlie pheromone-mediated regulation of development and behavior using the *C. elegans* model system. These studies will allow us to better understand the mechanisms and neuronal circuits by which complex species-specific environmental cues and internal metabolic status are integrated to drive highly precise developmental and behavioral responses

Prof. Jaewon Ko

Neurons communicate with each other through synaptic transmission at specialized intercellular junctions called 'synapses'. Synapses form not only during development, but also throughout life. Synapses transmit, process, and store information in the brain. During synaptic transmission, a presynaptic neuron releases a chemical neurotransmitter that is recognized by the postsynaptic neuron. Neurotransmitter release is triggered when an action potential opens voltage-gated calcium channels and calcium flows into the presynaptic nerve terminal. Released neurotransmitters elicit a postsynaptic response by binding to specific postsynaptic receptors. My laboratory is interested in how synapses form and function during development and in adulthood. Our work focuses on (1) the role of synaptic cell-adhesion molecules in shaping synapse properties, (2) pre- and postsynaptic mechanisms of synaptic development, and (3) impairments in synapse formation and function in neuropsychiatric disorders. To address these questions, My laboratory employs multiple, interdisciplinary approaches ranging from biochemical and biophysical studies to physiological and behavioral analyses of mutant mice deficient in key synaptic adhesion molecules and their associated proteins. We are currently working on problems related to social cognitive processes at synaptic and circuit levels.

- Synapse formation and function by key synaptic cell-adhesion molecules
- Synapse formation and function by synaptic cell-adhesion-associated scaffolds
- Circuit mechanisms mediating complex social behaviors in mice

Prof. Ji Won Um

The goal of my research is to understand the pathophysiological mechanisms underlying neurological diseases (i.e. Alzheimer's disease, autism spectrum disorders, or schizophrenia) that may be caused by various forms of synaptic dysfunctions. To better understand how synaptic genes associated with those neurological disorders impact brain functions at synaptic, cellular and systems levels, we have aspired to alter the activity of specific neuronal circuits and to evaluate the consequences on pathology, network activity, and animal behaviors. To achieve our goals, we are using a combination of protein biochemistry, cell imaging, electrophysiology and mouse genetics. Three major research programs are currently ongoing in the laboratory. First, we are investigating how mutations of synaptic genes associated with autism spectrum disorders or schizophrenia alter synaptic functions. Second, we are studying molecular and cellular mechanisms through which synapses are formed and eliminated in health and disease conditions. Third, we are exploring the role of specific synaptic signaling proteins to elucidate mechanisms underlying the maintenance of excitation-to-inhibition balance at various synapses and circuits.

Prof. Sung Bae Lee

The primary goal of our research is to reveal the cellular and molecular basis of neurodegenerative diseases such as Huntington's disease and Parkinson's disease that are often associated with protein toxicity or defective intracellular organelles. Our three major questions are listed below.

- **What is the "cellular basis" of neurodegenerative diseases?** We aim to characterize specific neuronal abnormalities preceding cell death, such as mitochondrial defects or cytoskeletal alterations in these late-onset neurological disorders.
- **How can we ameliorate the toxicity of aggregated proteins associated with neurodegenerative diseases?** We are working on three possible strategies such as chaperone activation, autophagic clearance, and the use of structural inhibitors.
- **What's the relationship between neuronal cellular aging and late-onset neurodegenerative diseases?** It is of interest to see the changes in neuronal cellular vulnerability with aging against protein toxicity.

Prof. Yong-Seok Oh

My research is mainly focused on the molecular mechanism underlying major depression and its reversal by long-term antidepressant medication. We are pursuing the specific aims as follow.

- Identification of neuronal subtypes and molecules regulating mood/ anxiety and their roles in the context of the neuronal circuit and behaviors.
- Neuro-adaptive responses to the prolonged antidepressant treatment, with a focus on cell-type specific transcriptional change.
- Serotonin-dopamine interaction and its relevance to depression and antidepressant actions.
- Exploration about molecular mechanisms underlying the comorbidity of metabolic diseases and the mood disorders.

Prof. Hyosang Lee

The ultimate goal of our research is to understand the neurobiology of motivational and emotional behaviors such as anger, love, and pain. In particular, we are interested in studying the neuronal circuit mechanisms underlying pain and itch, aggression and sexual behavior, and obsessive-compulsive behavior with the following questions :

- **Where are those behaviors mediated in the brain?**
- **What is the relationship between neuronal circuits mediating similar or opponent behaviors(e.g., pain vs. itch, aggression vs. sexual behavior)?**
- **How are those neuronal circuits altered in response to internal and external environmental changes?**

Our approach to accomplish this goal combines molecular biology, biochemistry, histology and mouse genetics. In addition, we use in vivo functional manipulations such as optogenetics in combination with behavioral assays to measure the causal-relationship between neuronal activity and behavioral changes.

Prof. Han Kyoung Choe

The goal of my lab is to understand temporal organization of animal behaviors and its underlying principles.

Research Fields :

- Circadian pattern of social behaviors and underlying mechanisms
- Olfactory perception and its modulation by status of the brain such as sleep
- Genetic labeling of active neuronal ensemble selectively responding to intrinsic cues

To answer these questions, we take advantage of cutting-edge techniques in neuroscience, such as optogenetics, in vivo GCaMP recording, and genome editing. Furthermore, we shall devise behavioral paradigms and develop neurotools to accomplish our mission above.

Prof. WooKyung Yu

My research goal is to understand the biophysical properties of proteins using variety of computational simulation and biophysical experiment including site-resolved hydrogen exchange experiment, and then examine these properties are related with the function of brain and neuron. Our laboratory is studying the following research topics :

- Protein biophysics with amino acid resolution by experiment and computational simulation including protein folding, dynamics, conformational change, protein-protein interaction and protein structure.
- Building a method to compare experiment and computational simulation
- Computational neuroscience
- Understanding the phenomena in brain science by studying folding, dynamics, conformational change and interaction of proteins in neurobiology with amino acid resolution.
- From coevolution information of proteins to studying protein function and protein design.

Prof. Hyeon-Ae Jeon

My research agenda is to identify the neural correlates which support high-level cognition in humans. To this end, I use cognitive neuroscience methods including functional magnetic resonance imaging (fMRI), diffusion MRI, behavioral testing, and testing of patient populations. Specific research questions are as follows.

1. What are the underlying mechanism of cognitive control and hierarchical processing?
2. How does the cognitive control influence on hierarchical processing?
3. How can we process complex sequences in everyday life?
4. How are language structures processed in the brain?
5. How does the brain change with learning?



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Research interests Neuronal mechanisms of obesity, diabetes and metabolic disorders
Career&Major achievements Assistant Professor, Michigan State University | Post-doctoral fellow at JHU | Member, Society for Neuroscience | Young Scientist Research Promotion Award | Published several seminal papers on appetite control



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Degree Ph.D., University of Illinois at Urbana-Champaign, USA
Research interests Neural/neuroendocrine integration | Synaptic plasticity and circadian timing system
Career&Major achievements Professor, Department of Brain & Cognitive Sciences/ School of Biological Sciences, Seoul National University(1985-2015.02) | 21Century Frontier Program in Neuroscience(2003-2013) | Member, Society for Neuroscience, Regular member of the KAST | The National Academy of Science Award (2010) | Published many seminal papers in Cell, PNAS, and J. Neuroscience



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Research interests Theoretical and Computational Proteome Biophysics and Statistical Physics | Supercomputing Modelling and Simulation of Proteins, DNA | Big-data and Complex Network Analysis of Bio-Neuro-Brain system
Career&Major achievements Professor, Dept. of New Biology, DGIST | Professor, Dept. of Physics, Busan National University | Director, Creative Research Initiatives Center for Proteome Biophysics | Director, DGIST Supercomputing and Bigdata Center | Busan Science and Technology Award('08)



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Degree Ph.D., Imperial College London, UK
Research interests Chemical senses | Brain convergence engineering based on olfaction
Career&Major achievements JHU School of Med visiting professor | Member, Society for Neuroscience | Instructor at JHU | British Overseas Students Awards | Published several seminal papers on chemical senses including Ann Rev of Physiol, Neuron, PNAS etc.



Seong-Woon Yu Professor
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Degree Ph.D., Seoul National University, Rep. of Korea
Research interests Programmed cell death of neurons and neural stem cells during neurogenesis, neural development and neurodegeneration | Role of autophagy in brain function | Mechanisms of microglia activation and neuroinflammation | Pathogenic mechanisms of neurodegeneration
Career&Major achievements Assistant Professor, Michigan State University | Post-doctoral fellow at JHU | Member, Society for Neuroscience | Raymond B. Bauer Award and other several awards | Published several seminal papers cited over 100 times including Science(1,250 times), PNAS(315)



Byung-Chang Suh Associate Professor
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Degree Ph.D., POSTECH, Rep. of Korea
Research interests Lipidomics, ion channel regulation, and molecular mechanism of epilepsy and pain
Career&Major achievements Research Assistant Professor, University of Washington-Seattle | Member, Society for Neuroscience | Young Scientist Research Promotion Award (1997), DGIST Achievement Award (2016), Citation for Distinguished Service to the Journal of General Physiology (2017) | Published seminal papers cited over 300 including Science and Neuron



Kyuhyung Kim Associate Professor
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Degree Ph.D., Boston University, USA
Research interests Neural Circuits and behavior | Neurodevelopment | Neurogenetics
Career&Major achievements Research Specialist and Post-doctoral fellow at Brandeis University | POSCO T.J. Park Award | Published seminal papers including Science, Neuron, and Development | Member, Society for Neuroscience



Jaewon Ko Associate Professor
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Degree Ph.D., KAIST, Korea
Research interests Synapse Formation and Function | Neural Circuit Formation and Function | Social behaviours and Neural Circuits
Career&Major achievements Assistant & Associate Professor, Department of Biochemistry, Yonsei University(2011.09-2017.02) | Founding Member, Y-KAST(2017-present) | Presidential Young Scientist Award(2016) | Asan Medical Award(2014) | POSCO T.J. Park Award(2011)



Ji Won Um Associate Professor
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Degree Ph.D., Yonsei University, Rep. of Korea
Research interests Pathogenic mechanisms of synaptic disorders including Alzheimer's disease, autism spectrum disorder and epilepsy
Career&Major achievements Assistant Professor, Yonsei University College of Medicine | Postdoctoral fellow at Yale University School of Medicine | Presidential Postdoctoral Fellow (2013) | Member, Society for Neuroscience | Published seminal papers including Nature Neuroscience, Neuron, Nature Communications & PNAS



Sung Bae Lee Assistant Professor
 +82-53-785-6122 sblee@dgist.ac.kr <http://home.dgist.ac.kr/sblee>
Degree Ph.D., KAIST
Research interests Neurodegenerative Disease & Neuronal aging
Career&Major achievements Postdoctoral fellow at UCSF, HHMI | Agarwal award | Published seminal papers including Nature, PNAS, Nature Communications, and EMBO reports | Member, Society for Neuroscience



Yong-Seok Oh Assistant Professor, Director, Laboratory Animal Resource Center
 +82-53-785-6114 ysoh2040@dgist.ac.kr <http://neurogenomics.dgist.ac.kr>
Degree Ph.D., POSTECH
Research interests Monoaminergic regulation of the CNS and mood/anxiety disorder
Career&Major achievements Research Associate, the Rockefeller University, New York | Adjunct Faculty, the Rockefeller University, New York | Member, Society for Neuroscience | 2013 NARSAD Young Investigator award | Published several seminal papers including Cell, Nature Review Neuroscience, and Molecular and Cellular Biology



Hyosang Lee Assistant Professor
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Degree Ph.D., Johns Hopkins School of Medicine, USA
Research interests Neuronal circuits underlying emotional behaviors
Career&Major achievements Senior Research Fellow and postdoctoral fellow at California Institute of Technology, Pasadena, CA, USA | Postdoctoral fellow at Massachusetts Institute of Technology, Cambridge, MA, USA | Pathway to Independence Award(The National Institute of Health, USA) | Research Grant(The Christopher and Dana Reeve Foundation, USA) | Publications in Nature, PNAS, and other journals



Han Kyoung Choe Assistant Professor
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Degree Ph.D. in Biological Sciences, Seoul National University
Research interests Temporal organization of animal behavior, Principles of hierarchical biological rhythms
Career&Major achievements Postdoctoral fellow at McGovern Institute for Brain Research, Massachusetts Institute of Technology | Postdoctoral fellow at Department of Biological Sciences, Seoul National University



WooKyung Yu Assistant Professor
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Degree Ph.D., Pusan National University
Research interests Protein folding, protein dynamics and conformational change of protein, computational neuroscience
Career&Major achievements Postdoctoral fellow at University of Chicago | Research professor at DGIST | Postdoctoral fellow and Research professor at Pusan National University | Published seminal papers including 4 PNAS papers



Hyeon-Ae Jeon Assistant Professor
 +82-53-785-6151 jeonha@dgist.ac.kr <http://cogneuro.dgist.ac.kr>
Degree Ph.D. in Cognitive Science, Seoul National University
Research interests Neural correlates involved in high-level cognition, Functional brain imaging
Career&Major achievements Principal Investigator at the Partner Group of the Max Planck Institute for Human Cognitive and Brain Sciences | Research scientist at Max Planck Institute for Human Cognitive and Brain Sciences, Germany | Senior researcher at Neuroscience Research Institute, Korea | Research published in Nature Communications, Trends in Cognitive Sciences, etc.

DGIST Adjoint Professor

Wonbae Jeon Adjoint Professor wjjeon@dgist.ac.kr

Current Position Division of Nano and Energy Convergence Research Senior researcher

Research interests Cell and tissue aging and regeneration

Eunjoon Kim Adjoint Professor ejkim@dgist.ac.kr

Current Position Division of Nano and Energy Convergence Research Senior researcher

Research interests Nanotoxicity | Biological application of nanomaterials | Biosensor | High throughput screening

Daewon Moon DGIST Fellow, Adjoint Professor dwmooon@dgist.ac.kr

Current Position DGIST Fellow

Research interests NanoSurface Imaging with Ion Beams(SIMS, TOF-MEIS) | Non-linear optical imaging of cells & biointerfaces(CARS, SPRIE)

DGIST Adjunct Professor

Jerome Golebiowski Adjunct Professor jerome.golebiowski@unice.fr

Current Position Dept. of Chemistry, Univ. of Nice

Research interests Computational Neuroscience

KBRI Adjoint Professor

Jawook Koo Adjoint Professor jawook.koo@k bri.re.kr

Current Position KBRI Principal Researcher

Research interests Epigenetics: Histone modifications | DNA methylation | non-coding RNAs, etc

Kyung-Jun Kim Adjoint Professor kjwang1@k bri.re.kr

Current Position KBRI Senior Researcher

Research interests Human disease and Drosophila Genetics

Jong-Cheol Rah Adjoint Professor jcrah@dgist.ac.kr | jcrah@k bri.re.kr

Current Position KBRI Principal Researcher

Research interests Experience-dependent plasticity of cortical circuit

Hyungju Park Adjoint Professor phj2@k bri.re.kr

Current Position KBRI Senior Researcher

Research interests Studying molecular mechanisms regulating synaptic plasticity using electrophysiology(slice patch), fluorescence microscopy(2-photon microscope, FRET, FRAP, FCS), and molecular biology tools

Won-Jong Oh Adjoint Professor ohwj@k bri.re.kr

Current Position KBRI Principal Researcher

Research interests Neurovascular interaction and Axon guidance mechanism

Kea Joo Lee Adjoint Professor relaylee@k bri.re.kr

Current Position KBRI Principal Researcher

Research interests Molecular mechanisms underlying activity-dependent synapse remodeling

Hyun-Ho Lim Adjoint Professor hhlhm@k bri.re.kr

Current Position KBRI Principal Researcher

Research interests Elucidating molecular mechanisms, physiological significances, and three dimensional structures of membrane transporting proteins(i.e. ion channels and transporters) in the nervous system

Youngshik Choe Adjoint Professor dallarae@k bri.re.kr

Current Position KBRI Principal Researcher

Research interests Neural stem cells | Neurodegeneration | Neurodevelopment | Biomarker | Neurodevice

Jinseop Kim Adjoint Professor jinseop.s.kim@k bri.re.kr

Current Position KBRI Principal Researcher

Research interests Computational study on the neural mechanism of microcircuits

Sung-Jin Jeong Adjoint Professor sjeong@k bri.re.kr

Current Position KBRI Principal Researcher/Director of Brain Research Policy Center

Research interests Study on disorders related with cortical development and aging and nanomics with extracellular vesicles/exosome

Distinguished Chair Professor

Erwin Neher Distinguished Chair Professor(1991 Nobel Laureate in Physiology or Medicine)

Current Position Max Planck Institute for biophysical Chemistry, Dept. of Membrane Biophysics Goettingen, Germany, Emeritus Director

Research interests Electrophysiology | Ion channels

Kurt Wüthrich Distinguished Chair Professor(2002 Nobel Laureate in Chemistry)

kurt.wuethrich@mol.biol.ethz.ch

Current Position Professor of Biophysics, ETH Zurich, Switzerland / Professor of Structural Biology, The Scripps Research Institute, La Jolla, USA

Research interests Nuclear magnetic Resonance | Molecular Structural Biology | Protein Science and Structural Genomics

Hui-Woog Choe Distinguished Chair Professor

Current Position Chair Professor of Chonbuk National University

Research interests Structural biology

Overview

The brain is the last great frontier in the exciting field of research. Brain & Cognitive Sciences is the study of the fundamental principles of brain structure and function. The integration and convergence of Brain & Cognitive Sciences with others disciplines is rapidly expanding. With interdisciplinary approaches, Brain & Cognitive Sciences research will contribute to not only the field of science but also humanities, social science, and industrial fields.

Vision

We aim to create a world-class research and teaching environment to facilitate Brain & Cognitive Sciences discovery and education, and to achieve the improvement of brain health and human life based on this knowledge. This is accomplished through the training of global practice leaders, technology partnerships, and the establishment of a neuroscience knowledge community.

Research and Education Focus

Specialized education for Brain & Cognitive Sciences by performing cutting-edge research on the structure and function of the brain as a common theme without interdisciplinary barriers

Specialized Research Fields

- **Neurodegeneration and Metabolism**
 - Research area focused on the cellular and molecular mechanisms of neurodegeneration and programmed cell death of neurons and neural stem cells in neurological disorders.
 - Development of novel disease prediction and diagnosis technologies through the convergence research with BT and IT
 - Research on the basic principles of the central nervous system through the systems-level approaches to the study of the mechanisms governing neurodevelopment, differentiation, and neurodegeneration
 - Research aimed at understanding the metabolic mechanisms of neural systems about obesity, hypertension, diabetes and various other metabolic diseases for prevention and treatment.
 - Focus on the metabolic regulation of the etiology of neurometabolic diseases like neurodegenerative disorders on a single molecule/cell level to develop the technology for early diagnosis of diseases.
 - Observation of minute changes in metabolite levels using Metabolome analysis, stem cell/gene therapy and calcium channels for research applicable to therapeutic intervention for prevention and treatment of neurometabolic diseases.
- **Synapse Biology**
 - Understanding of organizing principles underlying synapse formation, function, plasticity at molecular, cellular and systems levels.
 - Investigation of synaptic transmission mechanisms involving membrane lipids, receptors, channels and adhesion molecules.
 - Developing new technical platforms for therapeutic interventions against neuropsychiatric, neurodevelopmental, neurodegenerative, and pain disorders.
- **Neural Circuits and Behaviors**
 - Affective and mood-related behaviors in mice
 - Social behaviors, agony-related behaviors (pain and itch) and addiction in mice
 - Proprioception and sensory imprinting in *C. elegans*
- **Computational Neuroscience, Biophysics and Quantum Biology**
 - Deciphering proteomic structures and functions at an atom level through statistical and computational physics and investigation of physicochemical fundamental of life science in Bio-Neuro-Brain system
 - Mechanisms of protein fibrillization and proteomic principle of neurodegenerative diseases
 - Supercomputing of dementia-predicting big-data and complex network analysis
 - Supercomputing-based modeling of protein structure in the brain and nervous system
 - Structure analysis of membrane proteins and receptor proteins in the view of signal transduction mechanisms through cell membrane
- **High-level Cognitive Neuroscience**
 - Neural correlates of high-level cognition such as language, memory, decision making and prediction, more specifically, the brain mechanism involved in the process of cognitive control, hierarchical structure and automaticity.
 - Functional and structural networks related to human high-level cognition through brain imaging technique using magnetic resonance imaging (MRI), with the hope of delineating the brain map related to processes of the high-level cognition.
 - Deficits in the processes of high-level cognition along with frontal lobe dysfunctions in the patients with neurological diseases or brain damages through neuropsychological methods.
- **Sensory Biology and Circadian Rhythm**
 - Research aimed at understanding the basic principles underlying the structure and functions of the sensory system, including chemical senses (olfaction, pheromone, & taste) and vision.
 - The basic research focused on the cellular and molecular mechanisms of chemical senses, pain, pheromone action.
 - Translational research such as the discovery of neuroprotective materials and development of novel disease prediction/diagnosis technologies, new biomimetic sensing technologies and sensory system based neuro-tools through convergence studies with other majors including new biology, robotics, and information technology.
 - Regulatory mechanisms of circadian bioclock in the brain through molecular, cellular, anatomical, and behavioral approaches
 - Principles and applications of diverse biological rhythms including circadian rhythms and ultradian rhythms
 - Functional link between molecular clockwork and mood disorder in diseases and disorders with circadian dysfunction
 - Real-time imaging of neuronal population at a single-cell level to understand circadian and ultradian biological rhythms

Interview Contents

- The interview is planned as a Two-days(optional)/One-night program.
- Presentation in English (Ph.D. course applicants should present their M.S. thesis work. M.S. course applicants and M.S.-Ph.D. combined course applicants can choose one option between two options below.)
 Option 1 : You can present one paper published in J.Neurosci., Nature Neuroscience, Neuron, J.Neurochem., Neuroscience by using PowerPoint within 10 minutes (5-10 slides) followed by additional 10 minutes for Q&A
 Option 2 : You can present one paper chosen from the provided list of recommended papers (please check papers in our website at <https://brain.dgist.ac.kr>) by using PowerPoint within 10 minutes (5-10 slides) followed by additional 10 minutes for Q&A
- Personal Essay : Presentation of motivation and interests on a suggested topic
- Online interview can be arranged for students residing outside Korea, by early request.

New Biology for Sustainable Humanity

Creates a next-generation paradigm of knowledge, technology, and science in the era of the new biology for sustainable humanity



The department of New Biology aims to generate the world-best creative knowledge, technology, science culture, and talents to pave the way for new civilizations through the realization of the New Biology based on holistic convergence education and research.

◆ Who can apply to New Biology?

Undergraduate students from any disciplines with an interest in convergence biological science are welcome to apply to DGIST's New Biology department. Students majoring in New Biology are **expected to enjoy confronting challenges and creative thinking**, which are characteristics required for student-led learning and research.

◆ Who are the right students for New Biology?

The New Biology department is looking for **creative and talented students who are capable of not only raising new issues instead of merely solving given problems but also creating knowledge and technologies**. Students shall **be outstanding scientists through a holistic curriculum** with various topics such as scientific creativity, logic, ethics, philosophy and communication, the history of scientific discoveries, and business administration.

◆ Does the New Biology department offer its own specialized curriculum?

4-year PhD Program
Students usually **finish his/her PhD degree within four years**. During the first year, which is consisted of 2 semesters: 4 semesters, students go through a basic training program with basic and specialized coursework and scientific experimental training such as experimental techniques, usage of various laboratory equipment and facilities, and data analysis etc. Then they decide their research topic according to their career pathway. From the second year on, students concentrate on their research topics. They are trained to be efficient by disciplined and concentrated research.

Education Track

1. Interdisciplinary New Biology (INB) Track : places graduate students at the forefront of fundamental convergence biological research and provides access

to New Biology's cutting-edge core science and technology and modern biology laboratories.

2. Translational New Biology (TNB) Track : places graduate students at the forefront of application of convergence biological research to biological, biotechnical and medical fields and provides access to New Biology's collaboration partners (e.g. hospitals, biotechs, etc.).

◆ Therefore, requirements for graduation may differ from track to track.

In addition to Research Advisors students are assigned an Academic Advisor. This **lifelong mentoring system is provided throughout the program** and continues even after graduation for development of career.

◆ How is the research environment in New Biology?

Instead of the typical laboratory-based environment, the New Biology department **integrates education and research in a matrix structure**, and **maximizes research and learning capacity for large-scale projects**. Students will be **offered many opportunities to participate in major research groups during their course of study and even produce world-class results**.

Center for Plant Aging Research (Hong Gil Nam, DGIST Fellow)

Basic research on the lifecycle of plants through multi-dimensional analysis, and acquisition of fundamental knowledge on food and biomass production based on plant aging control

- System biology research on plant senescence and death
- Computational biology and complex omics
- Plant senescence, life and environment reactions
- Comparative biological research on plant senescence and death
- Research on aging, reproduction, and plant productivity
- Establishment of the world's best automatic phenome equipment



◆ How is the research environment in New Biology?

Nanobio Imaging Research Group (Daewon Moon, DGIST Fellow)

Development of next-generation nanobio imaging technology (non-linear nano-optical 3D/2D cell imaging, atmospheric mass spectrometry molecular imaging, and TOF-MEIS nanoparticle composition analysis), and technological applications in cell aging, regeneration mechanism, medical diagnosis, new medicine screening, and nanomaterial growth mechanism

- Development of real-time nanobio imaging technology for cells and tissues
- Establishment of next-generation biological sciences in the field of cranial nerve aging, damage, and regeneration
- Commercialization of medical diagnosis equipment and preclinical new medicine screening devices
- Understanding and control of initial growth mechanism in nanobio materials

Well-Aging Research Center (Chair Prof. Sang Chul Park)

Basic research and application on diagnosis, prevention and rehabilitation of aging related diseases. Development of the world's leading aging diagnostic technology, age-friendly equipments and industrial anti-aging techniques. Promotion of aging-related business ventures and commercialization of new age-friendly technologies.

- Research on multi-omics based molecular mechanism of aging
- Screening small molecules/genetic factors for control and functional restoration of senescence
- Improving mobility and cognition based on understanding muscle and nerve system in old age
- Identify molecule makers of aging and anti-aging related diseases
- Development of next-generation nano-imaging technology

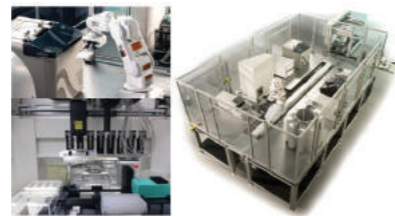
Bio-imaging Core Facility

- Nano surface & interface analysis(TOF-MEIS) for nanoparticles, biomaterials nucleation
- Non-linear nano optical imaging(SR-CARS, NS-CARS) for label free 3D cell & tissue invitro & in-vivo imaging
- Bio interface spectroscopic imaging(SPRIE-TIRF) for cell adhesion & migration imaging
- Ambient mass imaging for live cell tissue mass analysis (bio-SIMS/MALDI/PADI)



Automatic Multi-Omics Facility

- High-tech multi-omics facility for automated transcriptomics, proteomics and metabolomics analysis



Physiological Phenome Facility

- World-top class automated plant growth control system
- Non-invasive and real time monitoring system for plant physiological phenome



Faculty

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Degree Michigan State University, PhD
Research interests Aging and programmed cell death in plants | RNA-based regulation of leaf aging | Synthetic genetics-based aging reprogramming

Career & Major achievements Associate Professor, Jeju National University | Vice-Director, Subtropical Horticulture Research Institute | Rural Development Administration Adjunct Researcher



Byung-Hoon Lee Assistant Professor
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H <http://newbiology.dgist.ac.kr/>
Degree University of Texas Southwestern Medical Center at Dallas, PhD
Research interests Ubiquitin-proteasome system | Protein homeostasis | Small-molecule chemical screening and drug discovery in human disease

Career & Major achievements Postdoctoral scientist, Harvard Medical School | Scientific consultant, Proteostasis Therapeutics Inc. ('11)



Daehee Hwang Professor
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Degree Massachusetts Institute of Technology, PhD
Research interests Systems Biology | Complex Biology
Career & Major achievements Professor, POSTECH | Director, National Core Research Center for Systems Bio-Dynamics | Young Scientist Award, Korea Society for Bioinformatics and System Biology('12) | Director of KOGO, KHUPO and KSBSB



Daewon Moon DGIST Fellow
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Degree Penn State University, PhD
Research interests Nano Surface Imaging with Ion Beams(SIMS, TOF-MEIS) | Non-linear optical imaging of cells & biointerfaces(CARS, SPRIE) | NanoBio Imaging of Cells and Tissues

Career & Major achievements Member, Korean Academy of Science and Technology | KRISS Fellow | Award of Best Ten Scientists in 2004 by MOST and Dong-A Press, Korea('04) | National Science and Technology Medal(Do-Yak-Jang), Korea Government('05)



Hong Gil Nam DGIST Fellow
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Degree University of North Carolina, Chapel Hill, PhD
Research interests Plant Senescence and Life History | Complex Biology | Comparative Aging
Career & Major achievements Ho-Am Prize in Science('14) | Director, Center for Plant Aging Research, Institute for Basic Science ('12) | The National Scientist('10) | Director, National Core Research for Systems Bio-Dynamics ('04-'10) | POSCO TJ Park Prize in the field of Science ('09) | The 10th Presidential Science Award, Korea ('06) | Member, Korean Academy of Science and Technology

Career & Major achievements Assistant Professor, University of Maryland | Member, Society for Neuroscience | Member, Association for Chemoreception Science | IUBMB World Congress Young Scientist Award | Published several seminal papers on chemical sensory/system including 3 articles in JCN(top journal in the field)



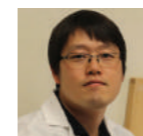
Hye Ryun Woo Associate Professor
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H <http://complexbiology.dgist.ac.kr/>
Degree POSTECH, PhD
Research interests Genome biology | Epigenomics | Plant senescence
Career & Major achievements Assistant Professor, Chungnam National University | The Blue Ribbon Lecture Award('10)

Career & Major achievements Assistant Professor, University of Maryland | Member, Society for Neuroscience | Member, Association for Chemoreception Science | IUBMB World Congress Young Scientist Award | Published several seminal papers on chemical sensory/system including 3 articles in JCN(top journal in the field)



JaeHyung Koo Associate Professor
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H http://jkoo001.dgist.ac.kr
Degree Yonsei University, PhD
Research interests Chemoreception(olfaction taste), odorant G protein-coupled receptors(GPCRs) in brain/endocrine/immune systems, and Applications

Career & Major achievements Assistant Professor, University of Maryland | Member, Society for Neuroscience | Member, Association for Chemoreception Science | IUBMB World Congress Young Scientist Award | Published several seminal papers on chemical sensory/system including 3 articles in JCN(top journal in the field)



Jaemin Lee Assistant Professor
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Degree University of Michigan, PhD
Research interests Metabolism, diabetes and obesity | Endocrinology, hormonal regulation of metabolism | Cellular stress and signal transduction responses
Career & Major achievements Research fellow, Harvard Medical School and Boston Children's Hospital

Career & Major achievements Research fellow, Harvard Medical School and Boston Children's Hospital



Jong Kyoung Kim Assistant Professor
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Degree POSTECH, PhD
Research interests Single-cell genomics | Bioinformatics
Career & Major achievements Research scientist, EMBL-EBI



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H <http://kwaklab.org/umd>
Degree POSTECH, PhD
Research interests Systems Genetics and Environmental Interactions
Career & Major achievements Professor, University of Maryland, College park | Editorial Board member, J.Plant Biology



Minseok S. Kim Assistant Professor
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Degree KAIST, PhD
Research interests Nanobiotechnology | Nanomedicine | Aging recovery technology | In vitro diagnostics | Biomimetic system | BioMEMS
Career & Major achievements Assistant Professor, Konyang University | Senior researcher, Samsung Advanced Institute of Technology | Director of The Korean BioChip Society (KBSC) | Gold prize in Samsung Human Tech Paper Competition ('10)

Career & Major achievements Assistant Professor, Konyang University | Senior researcher, Samsung Advanced Institute of Technology | Director of The Korean BioChip Society (KBSC) | Gold prize in Samsung Human Tech Paper Competition ('10)



Young-Sam Lee Assistant Professor
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Degree University of Texas at Austin, PhD
Research interests DNA replication and repair | Restoration of cellular senescence | Structural and functional relationship of proteins
Career & Major achievements Senior research staff, Samsung Advanced Institute of Technology

Career & Major achievements Senior research staff, Samsung Advanced Institute of Technology

Sang Chul Park Distinguished Chair Professor E blueocean2016@dgist.ac.kr

Current Position Director, Well-Aging Research Center, DGIST
Research interests Human longevity | Biochemistry

Won Bae Jeon Adjoint Professor E wbjjeon@dgist.ac.kr

Current Position Principal Researcher, Division of Nano-Energy Convergence Research, DGIST
Research interests Biochemistry | Cellular engineering | Tissue repair and regeneration

Dong Ha Lee Adjoint Professor E dhlee@dgist.ac.kr

Current Position Director, Convergence Research and Technology Center for Wellness, DGIST
Research interests Cyber Physical Systems | Ambient Intelligence and Artificial Intelligence | Wellness Humancare Platform

Suleyman I. Allakhverdiev Adjoint Professor E suleyman@ibbp.psu.ru

Current Position Head of the Laboratory of Controlled Photobiosynthesis at the Institute of Plant Physiology(IPP) | Russian Academy of Sciences(RAS)
Research interests Photochemistry and Plant Physiology

Yousin Suh Adjoint Professor E yousin.suh@einstein.yu.edu

Current Position Professor, Department of Genetics and Medicine, Albert Einstein College of Medicine
Research interests Genetics of aging and aging-related disease | Development of biomarkers for disease diagnostics and risk assessment | Functional Genomics of Aging

Jan Vijg Adjoint Professor E jan.vijg@einstein.yu.edu

Current Position Chair, Department of Genetics and Medicine, Albert Einstein College of Medicine
Research interests Genome Instability in Aging and Disease | Animal Aging

Kyung Sang Lee Advisory Professor E KyungLee@mail.nih.gov

Current Position Senior Investigator, Laboratory of Metabolism, Center for Cancer Research, NCI, NIH
Research interests Aging and its relationship with various cell proliferation processes

Gynheung An Advisory Professor E genean@khu.ac.kr

Current Position Chair, Department of Plant Systems Biotechnology, Kyung Hee University | Director, Crop Biotech Institute
Research interests Differentiation & development, multifunctional isolation of rice genes | Mechanism of environmental response tissue specific genes

William J. Lucas Advisory Professor E wjlucas@ucdavis.edu

Current Position Distinguished professor, Chair, Department of Plant Biology, UC Davis
Research interests Plasmodesmata & the Supracellular Nature of Plants

Richard N. Zare Advisory Professor E zare@stanford.edu

Current Position Distinguished professor, Chair, Department of Chemistry, Stanford University
Research interests Cell Imprinting | Mass Spectrometry | Reaction Dynamics, Nanoparticles

Overview

Vision

Towards Our Science beyond My Science

Innovative Features of Department of the New Biology

What is New Biology?

The term "New Biology" has been adopted from "A NEW BIOLOGY FOR THE 21ST CENTURY," a report published by the National Research Council of the United States National Academies in 2009. The report describes New Biology as follows : "A New Biology approach - one that depends on greater integration within biology, and closer collaboration with physical, computational, and earth scientists, mathematicians and engineers - be used to find solutions to four key societal needs : sustainable food production, ecosystem restoration, optimized bio fuel production, and improvement in human health."

- **DGIST's New Biology** goes beyond technological and practical aspects to create new academic trends in biological sciences by establishing a new paradigm in fields such as complex biology and quantum biology, so as to analyze, understand, and explore applications of biological phenomena.
- **New Biology for Sustainable Humanity**
The New Biology department pursues the technological, practical, and academic implementation of New Biology. Through world-class convergence research and establishment of an educational culture for biological sciences, DGIST seeks to make significant contributions to sustainable humanity.

- **Companionship** : Introduction of convergence learning from bonding through science culture and education based on mutual respect among members and interdisciplinary cooperation
- **Wall-less Operation** : Creation of agora type for establishing borderless education and research culture, and participating convergence research by sharing expertise, intelligence, and facilities
- **Boundary-less thinking and Challenge** : Cultivation of world-class talents and creation of a new paradigm for next-generation biological sciences for the advancement of humanity

Four-year PhD Program

Conduct intensive curricula and laboratory practices during the first year.
Focus on the research program from the second to fourth years

Scholarships

- **Payeon Fellowship** : This fellowship is provided for current graduate students who perform outstanding research and outstanding new graduate students
 - 1) Before passing the qualify exam : Annual stipend of \$ 21,000
 - 2) After passing the qualify exam : Annual stipend of \$ 26,000
- **DGIST-IBS Fellowship** : This DGIST-IBS Ph.D Program offers IBS fellowships for graduate students aiming to conduct creative and original research
 - 1) Before passing the qualify exam : Annual stipend of \$ 16,000
 - 2) After passing the qualify exam : Annual stipend of \$ 21,000

World-best Innovative Education

- **Creativity-oriented education** : Students are trained as future leaders who are capable of raising creative questions instead of merely solving given problems and creating knowledge
- **Holistic education** : Classes are offered on scientific creativity and logic, scientific communication, and the history of scientific discoveries
- **Academic advisor** : Lifelong mentoring is provided throughout and after the Ph.D program

Education Track

- **Interdisciplinary New Biology (INB) Track**
places graduate students at the forefront of fundamental convergence biological research and provides access to New Biology's cutting-edge core science and technology and modern biology laboratories.
- **Translational New Biology (TNB) Track**
places graduate students at the forefront of application of convergence biological research to biological, biotechnical, and medical fields and provides access to New Biology's collaboration partners (e.g. hospitals, biotechs, etc).

Agora type for convergence in Education & Research

– Creation of agora type where all the faculty members, students and researchers join together and share their scientific knowledge, technologies and facilities

Specialized Research Fields

Convergence with Other Disciplines

Interview Contents

- Establishment of borderless education and research culture, and participation in joint convergence research by sharing expertise, intelligence, and facilities
- Companionship, Wall-less Operation, Boundary-less Thinking and Challenge

Lifelong Mentoring

Students are offered lifelong mentoring throughout and after the Ph.D program.

Collaborative Research Environment in association with Major Research Operations

- Institute for Basic Sciences(Academy of New Biology for Plant Senescence and Life History)
- DGIST Flagship Research Institute(Nanobio Imaging Research Group)

Plan: Cooperative Ph.D Program & Research Program

- The Cooperative Ph.D program will award MSc and PhD degrees and train its students for senior positions in academia, research, and industry.
- The Program will provide an extraordinary framework for the graduate students to work in, and be a great advantage in interdisciplinary research projects, or in projects that require special knowledge and equipment.

• C4 Aging

- Comparative Aging: Our research group aims to create an innovative paradigm for understanding the regulatory systems and for fostering the intervention of aging and senescence phenomena by revealing common and specific principles underlying aging and senescence of various organisms including plants, animals, and human toward an evitable death as a part of life history program through comparative and New biological approaches, which eventually should contribute to the wisdom and welfare for sustainable humanity.
- Computational Aging: Reprogramming of aging networks delineating dynamic interplays among fundamental pathways of aging at the molecular level.
- Cognitive Aging: With rapidly developing aging society, basic understanding on the cognitive aging and degenerative brain disease is required.
- Curative Aging: Creation and implementation of a new paradigm for healthy aging and controlling senescence through challenging, innovative, integrated approaches.

• C4 Farming

- Cell and Molecular Farming: This program seeks to address fundamental biological questions at the molecular level by establishing and using a specific cellular model system, thereby contributing to sustainability.
- Computational Farming: Developing a quantitative model to predict the phenotype of plants by defining molecular factors involved in plant growth and aging
 - The learned model is used to improve crop productivity and quality.
- Conservative Farming: We would like to provide the solutions to global energy and food security that is essential for sustainable humanity through convergence studies based on epigenomics and multi-omics approaches in plant systems.
- Creative Farming: We address these issues that increase the quality and quantity of agricultural production using creative technology to make farms more "intelligent" and more connected through the so-called "sustainable agriculture" also known as 'smart farming'.

- Participation in education and research aimed at acquiring groundbreaking technology to contribute to sustainable humanity(food, energy, medicine, environment, etc.) based on matrix-structured interdisciplinary pursuits with other departments at DGIST
- Engagement in convergence research projects across various disciplines including nanobio, IT convergence, robot systems, and energy (Example) Nerve Aging and Regeneration Research(DGIST Flagship) / Big Data Convergence Supercomputing / Space Farm / Quantitative Measurements and Control of Human Body Activities Including Aging / New Habitat

- Interview (10 min) : Qualification evaluation of personality, leadership and communication skills including English, creativity, and knowledge required for study of convergence biology.
- Oral Presentation : Each applicant will be asked to give a 20 min presentation, which includes a 5 min Q&A. Presentation topic will be announced a week before the presentation.
- Online interview can be arranged for students residing outside Korea, by early request.
- ※ Accommodation can be provided if needed.
- ※ Applicants should arrive 30 min before the interview.
- ※ Detailed guidelines will be provided prior to the interview.

DGIST Graduate Student Interview



• Xinghao Hu

- Major and course : Emerging Materials Science, Ph.D.
- Nationality : China
- Assigned Lab : Lab for NanoBiomaterials & SpinTronics (Prof. CheolGi Kim)

Q1. What made you choose DGIST?

I am interested in convergence research, which my present lab is studying, and DGIST offers unique education and research philosophy to become 'A world-leading convergence research university'.

Q2. What are the strong points of DGIST and the department of Emerging Materials Science?

DGIST is a research-oriented university with full support of the Korean government, with modern facilities, high tech research equipment, and a bilingual study environment.

In the Emerging Materials Science department, there are diverse interesting research topics including quantum materials, nano-bio materials, and computational science. It has achieved remarkable success, including numerous papers published in high-impact journals such as Nature Materials, Nature Photonics, Nature Communication, Journal of the American Chemical Society and Physical Review Letters, amongst others.

Q3. Explain your research field and purpose at DGIST.

My major area of research at DGIST is developing magnetic manipulation technology using micro-patterned magnetic structures for synchronous manipulation and separation of multiple bio-functionalized particles and cells. This technology presents a promising direction for complex automation of biological experiments, leading to a novel platform for in-situ digital manipulation of bio-functionalized particles and cells in the multiplex arrays required in next-generation bio- and cell-chips.

Q4. What are you doing after graduation?

After graduation I am planning to be a postdoctoral researcher for two/three years abroad, and then will try to find a good research position in China. After 20 years I hope I will be a well-known researcher worldwide.

Q5. Please advise our applicants.

Graduate programs in Emerging Materials Science can provide a firm foundation for multidisciplinary future research to all students with strong motivation for high quality research. Lectures in various levels ranging from introductory to advanced topics will put students at a customized starting point depending on their needs, leading to the successful completion of graduate degrees, of M.S. and Ph.D.. The department of Emerging Materials Science has achieved remarkable success, including numerous papers published in high-impact journals such as Nature Materials, Nature Photonics, Nature Communication, Journal of the American Chemical Society and Physical Review Letters, amongst others.

• Bahareh Behboodi

- Major and course : Information & Communication Engineering, M.S.
- Nationality : Iran
- Assigned Lab : Lab of Communication and Signal Processing (Prof. Ji-Woong Choi)

Q1. What made you choose DGIST?

The most important considerations were finding scholarships and an open position in a laboratory whose research focus is aligned with my interests. DGIST was a suitable option for me as I got a fully funded Master student position that covered both my tuition and living expenses. These days, it is getting increasingly difficult to find funded master degree positions in many parts of the world. Furthermore, I was lucky to find a laboratory in neuroimaging, which is a field that I love. In a nutshell, I had a fully funded position in a field I loved, so I just went for that and applied to DGIST.

Q2. What are the strong points of DGIST and the department of Information & Communication Engineering?

DGIST has a great amount of available facilities. At DGIST, you can easily have access to any device that you may need in your field of research. Especially, in the lab I am working in, we have a yearly allocated budget for buying new devices that we need for research. We are encouraged to submit

papers to reputed international conferences and journals. If our papers are accepted, we get the opportunity to attend that conference, all expenses paid. I had a chance to attend a conference in Paris in the first year I joined DGIST and it was an amazing learning experience.

Q3. Explain your research field and purpose at DGIST.

My background is in biomedical engineering and my research interest is neuroimaging using functional magnetic resonance imaging (fMRI) as well as functional near-infrared spectroscopy (fNIRS). At DGIST, I am working on signal processing of fNIRS-based brain-computer interfaces (BCI), which is a promising neuroimaging modality useful for patients suffering from motor impairments.

Q4. What are you doing after graduation?

My goal is to become an expert in my field of research. For this reason, I would like to pursue further education. After I graduate from DGIST, I would like to find a Ph.D. position and continue my research in the area that I am studying now.

Q5. Please advise our applicants.

As a friendly suggestion, for attending DGIST, first you need to find a laboratory with a research field compatible to yours, then just make contact with its supervisor. Supervisors at DGIST have strong backgrounds in their fields and kindly consider international attendees as well as Korean students. I hope you will find the most suitable laboratory for your study and get scholarship benefits at DGIST.

• Arumugam Sivanantham

- Major and course : Energy Systems Engineering, Ph.D.
- Nationality : India
- Assigned Lab : Lab of Advanced Energy Materials (Prof. Sangaraju Shanmugam)

Q1. What made you choose DGIST?

I wanted to join a growing research institute that has wide research opportunities with learning. I believe that science and technology is a key in today's diverse world, and provides convergence between a well-versed education and research in numerous fields.

DGIST is young and dynamic place, and provides a convergence educational system with advanced research activities, including technology development and transfer. DGIST holds a very powerful appeal for those who love the outdoors. The beauty of the landscape mountain views, green environment, and quality of fresh air and blue skies combine to make different DGIST truly a land of enchantment.

Q2. What are the strong points of DGIST and the department of Energy Systems Engineering?

DGIST is one of the best Convergence Universities for both study and research, including many bilingual activities. DGIST provides various kinds of learning opportunities by organizing weekly seminars, distinguished lectures, international workshops and conferences. DGIST encourages its students in numerous ways, including various cultural activities.

The Energy Systems Engineering department has multiple research activities on hot topics and offers various kinds of facilities, including theoretical investigation. It provides a good opportunity to learn and improve the skills in multiple directions. So, it is a good place to gather the knowledge and improve research skills by interacting with expert professors. Interestingly, our department has many international people from different countries, which makes it a new environment for learning about diverse findings.

Q3. Explain your research field and purpose at DGIST.

The goal of my research is to develop non-precious electrode materials for the replacement of precious catalysts in large-scale production of alternative and renewable hydrogen energy, I'm also interested in in-depth study of the mechanism of oxygen and hydrogen evolution reactions for non-precious catalyst surfaces during water electrolysis. Electrochemical water splitting is an energy efficient and eco-friendly method to produce large amounts of pure hydrogen with zero pollution. However, the commercialization of water electrolysis faces some limitations, such as the scarcity of precious materials, material durability, and lack of knowledge of the precise mechanisms of non-precious catalysts. For these reasons, to overcome the current limitations of hydrogen production, energy efficient water electrolysis techniques require alternative and cheap electrode materials with clear reaction mechanisms. I eagerly took this up challenge as my research goal at DGIST.

Q4. What are you doing after graduation?

Research will be my life passion. So, I will be a researcher in the renewable energy world. At DGIST, particularly, the department of Energy Systems Engineering is a good platform for my future research career in the field of renewable energy production/conversion/storage.

Q5. Please advise our applicants.

DGIST is one of the best universities for students to get an education via a high class teaching and learning system. DGIST offers enough financial support to give a high class student life, including accommodation. Also, to encourage students, DGIST offers various fellowships with opportunities abroad.

Especially, our department encourages inter and intra related learning and research opportunities for students. Accordingly, DGIST can make a new, more comfortable environment in your education and life career based on the 4C (Creativity, Challenge, Collaboration, Care)

DGIST Graduate Student Interview



• Inah Park

- Major and course : Brain & Cognitive Science, Ph.D.

- Nationality : Canada

- Assigned Lab : Lab of Brain & BioClock
(Prof. Kyung-Jin Kim)

Q1. What made you choose DGIST?

Since my undergraduate program, I have wanted to pursue my future career related to the field of neuroscience. Among many graduate school programs in Korea, DGIST offered in-depth programs specific to the brain and cognition. The program consists of the latest scientific research topics taught by distinguished faculty members who are focusing on neural networks, sensory systems, neurodegeneration, emotion, and cognition.

Not only is DGIST well-known for delivering quality education, they also offer full scholarships and accommodation, with financial support, to all admitted students. Also, they provide accesses to cutting edge equipment for students for their research. Furthermore, the school retains its close links with other academic researchers through collaborations with field professionals and an extensive academic networks.

Also, since DGIST is a newly established institution, students are granted the opportunity to give their opinions in shaping their course structures and programs. This flexibility toward students allows a multidisciplinary approach for collaborative research between various departments.

The professionalism, opportunities, and flexibility offered at DGIST were the strongest points that I considered when I decided to enroll.

Q2. What are the strong points of the department of Brain & Cognitive Science?

The department of Brain & Cognitive Sciences (BCS) provides students with a quality learning environment and great training opportunities through open-laboratory settings and collaborations with other research labs, which is unusual at other schools. This arrangement encourages open discussions with other lab members including their principal investigators. Other great opportunities provided for BCS graduate students

are seminars presented by noted speakers including Dr. Erwin Neher who is a pioneer of electrophysiology and a Nobel Prize winner in Physiology or Medicine (1991). Lectures offered by the department cover areas from the basics to advanced contents, including knowledge-based applications, which are comprehensible for students who have a background in any academic field. The lectures are available and beneficial for any passionate student eager to learn the latest neuroscientific knowledge.

One distinguishing advantage of the department of Brain & Cognitive Sciences is its association with the Korea Brain Research Institute (KBRI). Due to their close affiliation, collaborative research between the two institutes is encouraged and students are given opportunities to experience top-notch science in their prospective fields.

Q3. Explain your research field and purpose at DGIST.

Most of my lab work is biology based experiments which include cell and animal models. With my previous educational background in circadian rhythms during my undergraduate and Master's degrees, I would like to continue focusing on details of biological rhythms, and on the hypothalamic-hypophyseal-adrenal (HPA) axis — which is well-known as a central stress response system. Interestingly, many researchers have found oscillatory expressions of ACTH (adrenocorticotrophic hormone) from the pituitary gland, and cortisol release from the adrenal gland. However, what causes these hormonal expressions to display their circadian oscillatory profiles is still elusive. During my Ph.D. course, I would like to study how the circadian rhythm regulates the HPA axis by examining the link between CRH (corticotrophin-releasing hormone) and circadian outputs from SCN (suprachiasmatic nucleus), at a higher level of the HPA axis. This would allow us to understand the importance of circadian rhythm in regulating stress hormones and related physiological conditions to HPA expressions.

Q4. What are you doing after graduation?

After working hard in the Ph.D. research program, my next aim is to build my research experience as a post-doctorate in the US or Canada. The ultimate goal for me is to become an independent neuroscientist who can contribute in the fields of

science and medicine. During my post-doctorate training, I will not only focus on neuroscience, but also try to communicate with other scientists in various fields. One thing that I learned from DGIST is that no one can work and research alone. Everyone has to share their ideas and communicate with their colleagues to achieve their fullest potential. There are myriad people suffering from mood or anxiety disorders, regardless of their health condition. Unfortunately, there are no particular drugs or therapies to treat these disorders yet. I hope to be a scientist who can contribute in developing more suitable therapeutics that serve the well-being of humanity.

Q5. Please advise our applicants.

I understand the uncertainty of making a decision on whether to continue to graduate school. It is more difficult especially when one has only limited experiences and information about the department one is interested in. Most senior graduate students at BCS suggest that new applicants join an internship program before they make the big decision. DGIST offers semi-annual internships in January and July for anyone interested in applying to the graduate program. I believe the internship allows trainees to make their decisions with more confidence. If you are not available for a one-month internship, there are also open-lab tours held on request. During the open-lab events, students can get a guided tour of the BCS lab area and have the chance to consult with principal investigators. Please do not hesitate to contact the department of BCS.

• Jiali Zhu

- Major and course : New Biology, Integrated M.S. & Ph.D.

- Nationality : China

- Assigned Lab : Lab of Cell signaling and Sustainability
(Prof. June M. Kwak)

Q1. What made you choose DGIST?

First, I feel that this institute is the best of its kind, combining a unique research angle with a training program that will meet my professional needs. Second, I have also heard great things about the student culture and fieldwork opportunities at DGIST. I thought it would be great to be student at DGIST. Third, my work is in the field of plant biology. I became interested in this field when I was in undergraduate school. Training and teaching in the department of New Biology perfectly fit my interests in biology and the department has state-of-art facilities for research, which make it a great place for me to study.

Q2. What are the strong points of DGIST and the department of New Biology?

DGIST has a unique education system that combines basic course teaching with research training with the aim of cultivating world-leading researchers in a variety of fields. It has the most advanced research equipments, strong technical team which is composed of senior experts who holds advanced technologies.

Training and research in the department of New Biology range from general biology to more specialized fields of biological studies to solve challenging problems for convergence science. In our department, we have concentrations in aging biology, nanobio imaging systems, complex biology, and sustainability biology, thus providing students with a solid background and an integrated scientific perspective.

Q3. Explain your research field and purpose at DGIST.

I am mainly studying epigenetic regulation in plant development. Our lab is interested in understanding how environment changes cause adjustments to plant growth, aging, and death using multidisciplinary approaches including systems analysis genetics, and cell and molecular biology. Our study will help to predict physiological and genetic changes in plants during plant life span due to global climate change, and also to aid in preparing for the future ecological reshaping.

Q4. What are you doing after graduation?

I feel my Ph.D. project can open up new lines of inquiry for this field and want to use it as the foundation for a fruitful research career. So, I hope I can continue my research after graduation and develop as a professional researcher in a related field.

Q5. Please advise our applicants.

There are many advantages if you chose DGIST. First, DGIST is a convergence university that has fine-grained majors(DGIST MIREBrain program), so a large range of disciplines are taught, and you will have a lot more choices of major. Moreover, within a single field of inquiry, you'll find many fine-tuned variations. For example, in the department of New Biology, you can choose aging biology, nanobio imaging, systems biology, or sustainability biology. Second, there are state-of-art facilities for teaching and research to support you in accomplishing your project. Third, you can network with distinguished and well-placed people in the field. This is a great way to get established in a field and launch yourself in a career.