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**ibs**  
기초과학연구원  
Institute for Basic Science

**ibs School**  
UST 과학기술연합대학원대학교  
UNIVERSITY OF SCIENCE & TECHNOLOGY

***“Internationally recognized scholars of IBS conduct world-leading research with advanced infrastructure.”***

**Foster leaders in basic science**

*World-class scholars from IBS centers teach students and advise their research.*

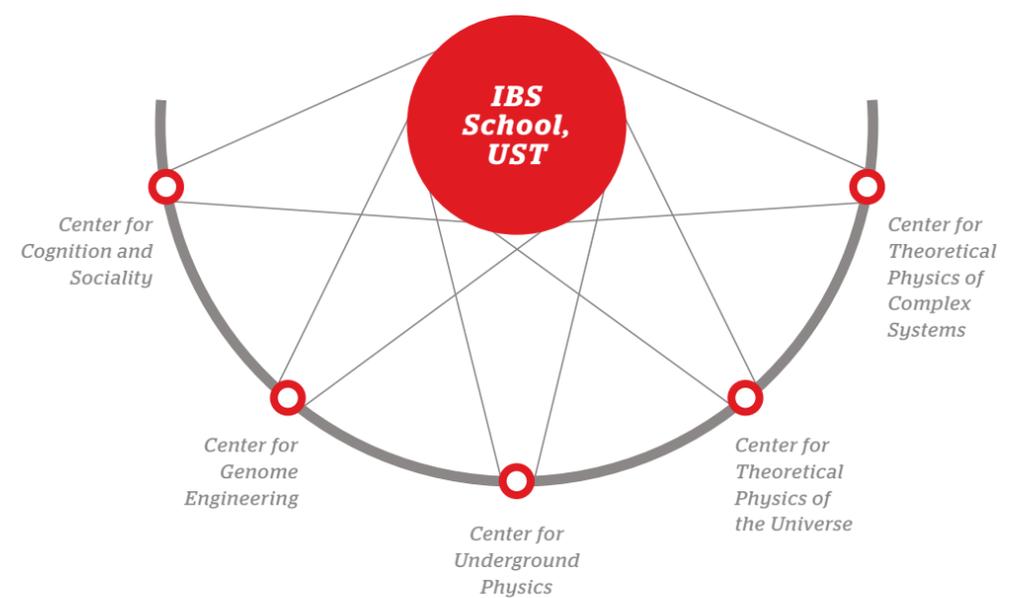
**World-class infrastructure and research environment**

*Advanced research facilities and infrastructure of the IBS provide the ideal environment for research.*

**Research-centered education**

*IBS provides research-centered education for students to participate in cutting-edge research during their degree.*

**Research Areas**





***“ IBS School provides research-oriented education for students to participate in world-leading research. ”***

***Excellence of researchers***

*Attract leading scientists around the world and foster talent by providing world-class education.*

***Creativity of research theme***

*Place a high priority on innovative research and education that leads a paradigm shift in basic science.*

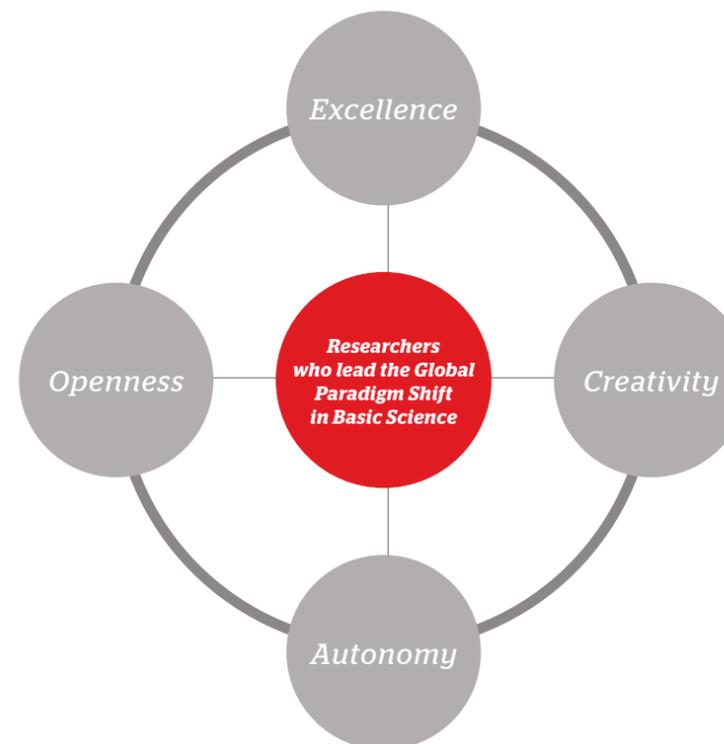
***Autonomy of research activity***

*Cultivate an environment that maximizes the researchers' autonomy in conducting their research.*

***Openness of research collaboration***

*Establish research collaborations beyond the boundaries of nations and academic disciplines.*

***Philosophy***



## Greetings

*We will do our best to realize your dream in IBS School, UST*

The Institute for Basic Science (IBS) was established in November 2011 as South Korea's national research hub in basic science in order to contribute to the national development and make groundbreaking discoveries for humanity.

IBS has been undertaking large-scale, mid- to long-term, group-based research that is currently unavailable at universities and other government-funded research institutions based on our four guiding principles - scientific excellence of researchers, openness through research collaboration, creativity of research themes, and autonomy in research.

IBS makes every effort to enable world-leading researchers to perform their research to the utmost of their abilities. We provide a research environment with competent support staff and advanced infrastructure where researchers can fully engage in creative research motivated solely intellectual curiosity.

IBS now aims to foster the next generation of global leaders in basic science. To achieve this goal, IBS and University of Science & Technology (UST) co-established IBS School, UST - a graduate school program specialized in basic science. Courses will commence in September 2015 with the curriculum content mainly provided by IBS HQ research centers.

With its world-renowned faculty and advanced educational infrastructure, IBS School aims to be the nation's most competitive graduate school program in basic science. In particular, IBS directors who are highly-established scholars in their respective fields have joined IBS School as faculty members.

By providing an internationally-recognized graduate school program in basic science, IBS School, UST will ensure that future Einsteins are able to unleash their creative potential and pursue their dreams.

IBS President Doochul Kim




*To foster global leaders in basic science, we provide advanced education and infrastructure*

Welcome to IBS School, UST.

IBS School, UST begins its first school year in September 2015. IBS School is a graduate program specialized in basic science and was co-founded by Institute for Basic Science (IBS) and University of Science and Technology (UST).

IBS School attracts the best students from around the world and provides them with its exceptional educational programs that will help them to play a leading role in global basic research.

Within IBS School, IBS directors will provide courses in basic science that are associated with the major research areas of IBS. Students will directly participate in research projects conducted at IBS centers.

Through research activities that utilize IBS' cutting edge research infrastructure, students will be able to achieve world-class research outcomes, as well as cultivate and acquire strong competencies and capabilities.

Students will also gain extensive knowledge from courses provided by our partner universities. Comprised of IBS researchers, our faculty members actively take part in the overall process of selecting students, supervising their research and developing curriculums.

IBS School prides itself on providing students with the highest level of support. We do this by offering full scholarships, stipends, awards for the best research paper and opportunities to participate in overseas training and exchange programs. These benefits, we feel, are paramount in helping our students develop into outstanding researchers.

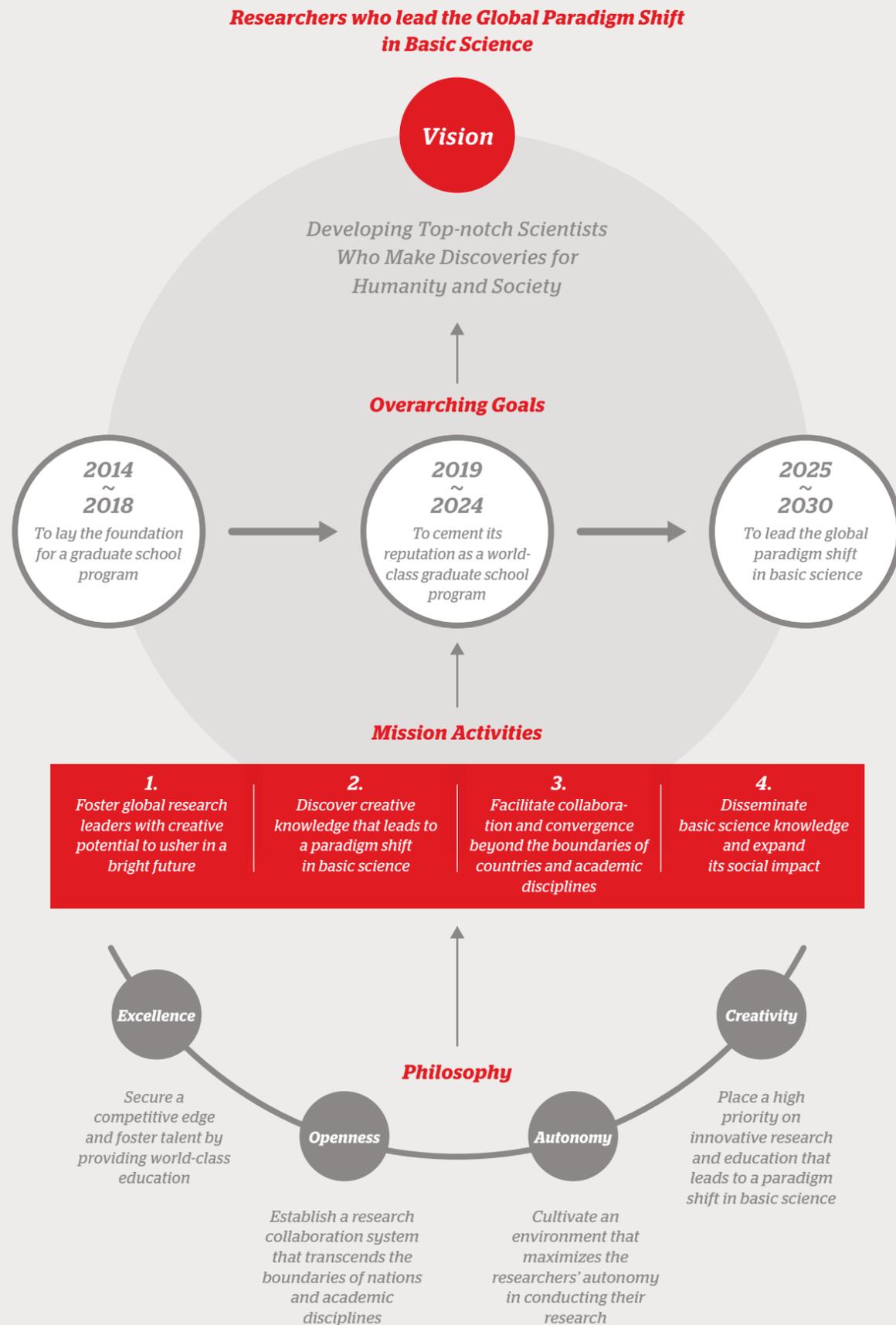
We encourage you to embark on your academic career with us. We look forward to helping you achieve your goals to be the next generation of leaders in basic science.

Thank you very much.

Professor Hee-Sup Shin  
Dean, IBS School

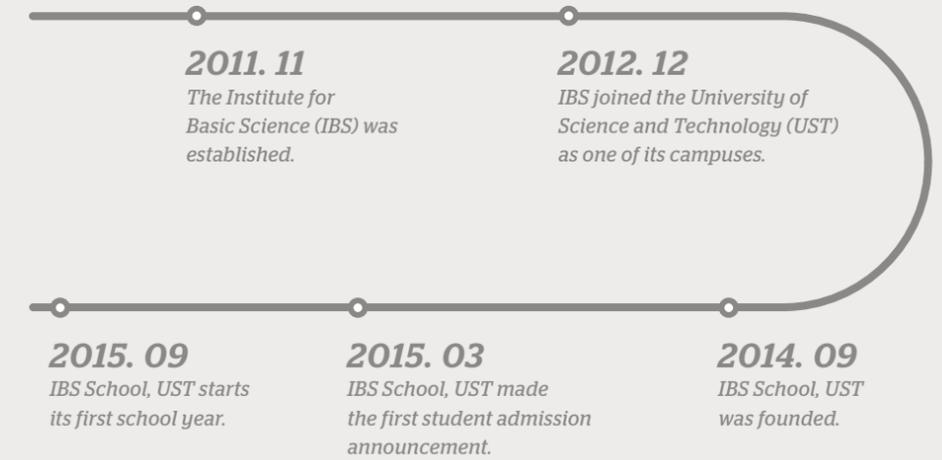



## Vision & Mission



## History & Introduction

### History



### IBS School, UST



The Institute for Basic Science (IBS) was established in November 2011 by the South Korean government with the purpose of driving forward the development of basic science. With its internationally recognized researchers and research infrastructures, IBS conducts world-leading research comparable with those global research institutes such as the Max Planck Society in Germany and RIKEN in Japan.



In order to foster the next generation of leaders in basic science, IBS established 'IBS School, UST', a graduate school program, in September 2014. IBS School selects the best students in the world and provides them with research-centered education by allowing them to participate in IBS' leading research. At IBS School, distinguished researchers from across the globe teach and advise students on research.



IBS School provides all students with a generous stipend, tuition grants, dormitory, and other benefits. Moreover, students have the opportunities to participate in overseas training at global universities and research institutions, as well as international academic conferences and workshops. IBS School operates the integrated MS/Ph.D. program and Ph.D. Program in basic science for outstanding students from around the world. IBS School provides basic science related courses that are associated with the major research areas of IBS research centers, and students who complete the course will receive an IBS School, UST degree.

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To unravel the neural mechanism of behavior

## Center for Cognition and Sociality

### Director / Prof. Hee-Sup Shin [shin@ibs.re.kr](mailto:shin@ibs.re.kr)

Prof. Hee-Sup Shin researches nerve mechanism that controls cognition and sociality by applying various fields like genetics, physiology, optogenetics, imaging, behavior, etc. In 2006, he was named the first Korean National Scientist. He is a member of the 'National Academy of Sciences, Republic of Korea' and the 'National Academy of Science, USA'.

### Education

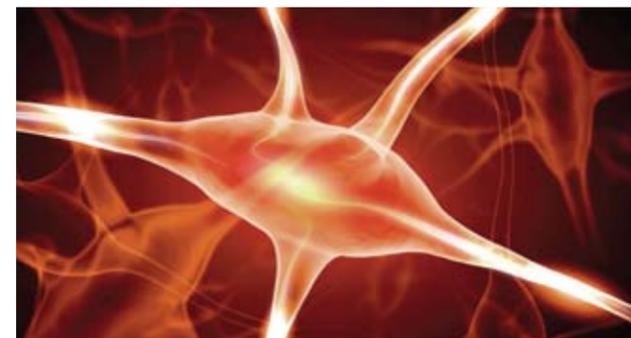
MD, Seoul National University (1974)  
PhD, Cornell University (1983)

### Major Experience

- 1978-1980 Postdoctoral Fellow in Immunology, Sloan-Kettering Institute for Cancer research
- 1983-1985 Research Associate in Genetics, Sloan-Kettering Institute for Cancer Research
- 1985-1991 Assistant Professor, Dept. of Biology, MIT/Associate Member, Whitehead Institute for Biomedical Research
- 1991-2001 Associate Professor, Professor, Dept. Life Science, POSTECH
- 1996-1998 Director, Biotechnology Research Center, POSTECH
- 1997-2003 Director, National CRI Center for Calcium and Learning
- 2001-2012 Principal Research Scientist, KIST
- 2005-2011 Director, Center for Neural Science, KIST
- 2011-2012 Director-General, Brain Science Institute, KIST
- 2012- Director, Center for Cognition and Sociality, IBS

### Major Publication

- Phospholipase C isozymes selectively couple to specific neurotransmitter receptor, *Nature* 389 (1997) 290
- Thalamic control of visceral nociception mediated by T-type Ca<sup>2+</sup> channels, *Science* 302 (2003) 117
- Observational fear learning involves affective pain system and Cav1.2 Ca<sup>2+</sup> channels in ACC, *Nat Neurosci* 13 (2010) 482
- Bidirectional modulation of fear extinction by mediodorsal thalamic firing in mice, *Nat Neurosci* 15 (2011) 308
- Rebound burst firing in the reticular thalamus is not essential for pharmacological absence seizures in mice, *PNAS* 111 (2014) 11828



### About Center

What we call the mind is enabled by the brain. How this happens in the brain is what we would like to understand. How consciousness is controlled, how we learn and remember things and events, how the emotion is controlled, how we make decisions when needed..... these are among the questions we pursue. We are particularly interested in asking these questions in the context of social behavior: where the name, Center for Cognition and Sociality, came from.

Open collaboration with scientists from diverse disciplines is an essential component of our strategy. We believe important clues to cure various neuropsychiatric diseases as well as approaches to improve human society will be obtained.

Furthermore, our center is to help young neuroscientists to grow to their fullest capacity. We believe, accomplishing this aim will be the most rewarding experience for our center.

### Research Area

- Study on the thalamo-cortical system in control of fear memory
- Study on neural mechanisms of empathy behavior
- Understanding brain mechanisms for social behavior at molecular, cellular, circuits, and systems levels



### Faculty



### Prof. Yee-Joon Kim

[joon@ibs.re.kr](mailto:joon@ibs.re.kr)  
PhD, Northwestern University (2008)  
Research Fellow / Center for Cognition and Sociality



### Prof. Charles-Francois Vincent Latchoumane

[charles@ibs.re.kr](mailto:charles@ibs.re.kr)  
PhD, KAIST (2010)  
Research Fellow / Center for Cognition and Sociality

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*The whole  
genome is under  
our control*



## Center for Genome Engineering

**Director : Prof. Jin-Soo Kim** jskim01@snu.ac.kr

Prof. Jin-Soo Kim is an entrepreneur and chemist-turned-biologist. He graduated from Seoul National University in 1987 with a major in chemistry. He then earned a master's degree in chemistry from Seoul National University in 1989 and a Ph.D. in biochemistry from the University of Wisconsin-Madison in 1994. After postdoctoral training at Howard Hughes Medical Institute/Massachusetts Institute of Technology, he came back to Seoul in 1997 to serve as Principal Investigator at Samsung Biomedical Research Institute. He co-founded a biotechnology company, ToolGen, Inc., in 1999 focusing on zinc finger technology and served as CEO and CSO for the subsequent 6 years. He joined the faculty of the Department of Chemistry at Seoul National University in 2005. He now serves as the Director of Center for Genome Engineering at the Institute for Basic Science. He has published over 60 articles and filed 20 patent applications, mostly in the field of gene regulation and genome editing. He has been a member of the Faculty of 1000 since May, 2013.

### Education

BS, Seoul National University (1987)

MS, Seoul National University (1989)

PhD, University of Wisconsin-Madison (1994)

### Major Experience

- 1994-1997 Research Associate, Howard Hughes Medical Institute/MIT
- 1997-1999 Principal Investigator, Samsung Biomedical Research Institute
- 1999-2005 CEO and CSO, ToolGen, Inc
- 2005- Assistant/Associate/Full Professor, Seoul National University
- 2014- Director, Center for Genome Engineering, IBS

### Major Publication

- Targeted genome engineering in human cells with the Cas9 RNA-guided endonuclease, *Nature Biotechnol.* 31 (2013) 230
- A library of TAL effector nucleases spanning the human genome, *Nature Biotechnol.* 31 (2013) 251
- Microhomology-based choice of Cas9 nuclease target sites, *Nature Methods* 11 (2014) 705
- A guide to genome engineering with programmable nucleases, *Nature Reviews Genetics* 15 (2014) 321
- Digenome-seq: Genome-wide profiling of CRISPR-Cas9 off-target effects in human cells, *Nature Methods* 12 (2015) 237



### About Center

We focus on developing programmable nucleases that enable genome editing in plants, animals, and cultured cells including human pluripotent stem cells. For the last ten years or so, we have developed three different types of programmable nucleases, namely, zinc finger nucleases (ZFNs), transcriptional activator-like effector nucleases (TALENs), and RNA-guided engineered nucleases (RGENs) derived from the type II CRISPR/Cas prokaryotic adaptive immune system. We will continue our efforts to improve and expand genome editing technologies. In addition, we plan to use these powerful tools to discover new genes associated with various disease phenotypes such as viral replication and cancer and to develop novel methods of gene and cell therapy for the treatment of both acquired and genetic diseases. We also focus on developing value-added crops and animals such as genome-engineered pigs appropriate for organ transplantation.

### Research Area

- Target identification and validation for drug discovery using genome-scale collections of TALENs and CRISPR-Cas9 RNA-guided nucleases
- Genome editing in human stem and somatic cells for the treatment of genetic and acquired disorders
- Development of genome-engineered pigs appropriate for organ transplantation
- Creation of value-added crops using programmable nucleases



### Faculty



#### Prof. Sang-Gyu Kim

sgkim@ibs.re.kr  
PhD, Seoul National University (2009)  
Research Fellow / Center for Genome Engineering



#### Prof. Taeyoung Koo

taeyoungkoo@ibs.re.kr  
PhD, Royal Holloway of London, UK (2010)  
Research Fellow / Center for Genome Engineering

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To resolve the most  
challenging issues  
in modern physics

## Center for Underground Physics



### Director : Prof. Yeongduk Kim ydkim@ibs.re.kr

Prof. Yeongduk Kim began the KIMS (Korea Invisible Mass Search) project to search the dark matter directly and is representing KIMS group since 2012. He has also actively participated in the neutrino oscillation experiment (RENO), which has successfully measured the 3rd mixing angle of the neutrinos. He is also interested in the neutrinoless double beta decay using scintillating crystals, and is a executive member of AMoRE experiment.

### Education

BS, Seoul National University (1985)  
PhD, Michigan State University (1991)

### Major Experience

- 1991-1992 Researcher, Indiana University
- 1992-1995 Researcher, High Energy Accelerator Research Organization, Japan
- 1995-1998 Researcher, Seoul National University
- 1998- Professor, Department of Physics, Sejong University
- 2005-2006 Visiting Scholar, Columbia University
- 2013-2013 Visiting Scholar, Lawrence Livermore National Laboratory
- 2013- Director, Center for Underground Physics, IBS

### Major Publication

- Lifetime measurement of  $(\Lambda)C-12$ ,  $(\Lambda)Si-28$ , and  $(\Lambda)Fe$  hypernuclei, *Phys. Rev. Lett.* 81 (1998) 4321
- Limits on WIMP-nucleon cross section with CsI(Tl) crystal detectors, *Phys. Rev. Lett.* 99 (2007) 091301
- Scintillator-based detectors for dark matter searches I, *New J. Phys.* 12 (2010) 075003
- Observation of reactor electron antineutrino disappearance in the RENO Experiment, *Phys. Rev. Lett.* 108 (2012) 191802
- New limits on interactions between weakly interacting massive particles and nucleons obtained with CsI(Tl) crystal detectors, *Phys. Rev. Lett.* 10 (2012) 181301
- Tests on NaI(Tl) crystals for WIMP search at the Yangyang Underground Laboratory, *Astro. Part. Phys.* 62 (2015) 249



### About Center

The goal of our research center is to gain a better understanding of the origin and structure of the Universe. In particular, we want to understand the characteristics of the mysterious "dark matter" that accounts for 80% of the Universe's mass, and the basic nature of the still poorly understood neutrinos. This requires experimental searches for processes that occur very rarely, such as interactions of dark matter particles with ordinary matter and decays of certain nuclei that involve two electrons but zero neutrinos. Since these processes, if they occur at all, are expected to be extremely rare, it is essential to develop large, hundred-kilogram-scale crystal detectors with extremely low contaminations of radioactive impurities, and operate them deep underground, where they are well shielded from naturally occurring cosmic radiation. At present we have two pilot experiments operating in a 700-meter-deep laboratory that is located under a mountain near YangYang, Korea. Since the purity levels that are required for our future experiments surpass those that have ever been achieved, we are actively developing new techniques for material purification and ultra-pure crystal growing.

### Research Area

- Discovery for dark matter and neutrinoless double beta decay
- Fundamental knowledge about the origin and structure of the universe
- Application to radiation, nuclear measurement, and medical technology through the research on the new detectors

### Faculty



**Prof. Yong-Hamb Kim**  
yhk@ibs.re.kr  
PhD, Brown University (2004)  
Group Leader / Center of Underground Physics



**Prof. Hyang-Kyu Park**  
hkpark@ibs.re.kr  
PhD, Carnegie Mellon University (1998)  
Research Fellow / Center of Underground Physics



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To explore the  
fundamental laws of  
the Universe

## Center for Theoretical Physics of the Universe

### Director: Prof. Kiwoon Choi [kchoi@ibs.re.kr](mailto:kchoi@ibs.re.kr)

Prof. Kiwoon Choi was a professor in KAIST as a theoretical particle physicist. In 2007, he was named 'Science foundation- Thomson scientific Scientist' by 'Korea Science and Engineering Foundation' and 'Thomson Scientific'. In the same year, he was named 'National scholar' by 'Ministry of Education & Human Resource Development' and 'Korea Academic Promotion Foundation'. Also in 2011, he won the 'Korea Science Award' from 'Ministry of Science, ICT and Future Planning' and 'National Research Foundation of Korea'.

### Education

BS, Seoul National University (1981)  
PhD, Seoul National University (1986)

### Major Experience

- 1986-1987 Visiting Postdoctoral Research Associate, Harvard University
- 1987-1992 Postdoctoral Research Associate, Johns Hopkins University, Carnegie-Mellon University, UC at San Diego
- 1992-1994 Research Professor, Chonbuk National University
- 1994-1996 Assistant Professor, KAIST
- 1996-2001 Associate Professor, KAIST
- 2001-2013 Full Professor, KAIST
- 2013- Director, Center for Theoretical Physics of the Universe, IBS

### Major Publication

- String theoretic QCD axions in the light of PLANCK and BICEP2, *JHEP* 1407 (2014) 092
- Higgs phenomenology in the Peccei-Quinn invariant NMSSM, *JHEP* 1401 (2014) 072
- Cosmological moduli problem in large volume scenario and thermal inflation, *JCAP* 1303 (2013) 011
- Higgs mixing and diphoton rate enhancement in NMSSM models, *JHEP* 1302 (2013) 090
- Peccei-Quinn NMSSM in the light of 125 GeV Higgs, *JHEP* 1211 (2012) 118



### About Center

The Standard Model of particle physics and General Relativity provide an accurate description of almost all known physical phenomena. But there exists evidences that the Standard Model is not the fundamental theory. The prime theme of our research is new physics beyond the Standard Model, which can provide answers to the questions which cannot be answered by the Standard Model.

### Research Area

- Theoretical study of particle physics and the early Universe
- Model building for new physics beyond the Standard Model of particle physics
- Collider physics and low energy rare processes predicted by new physics beyond the Standard Model
- Cosmology associated with dark matter, cosmic inflation, and exotic particles such as string moduli, axion, gravitinos
- Dynamical symmetry breaking and low energy hadron physics
- String phenomenology



### Faculty



### Prof. Kenji Kadota

[kadota@ibs.re.kr](mailto:kadota@ibs.re.kr)  
PhD, University of California, Berkeley (2004)  
Research Fellow / Center for Theoretical Physics of the Universe

pcs.ibs.re.kr

*From complexity to universality:  
Cross-fertilizing  
condensed matter,  
optics and nonlinear  
science*



## Center for Theoretical Physics of Complex Systems



**Director : Prof. Sergej Flach** [sflach@ibs.re.kr](mailto:sflach@ibs.re.kr)

Prof. Sergej Flach is a condensed matter theoretical physicist. He previously worked at the Max Planck Institute in Germany where he was an associate director and head of their visitors program for 18 years. He moved to New Zealand in 2012 to undertake a professorship in theoretical physics and complex systems at Massey University. Professor Flach is a world-renowned scholar in theoretical condensed-matter physics and is considered to be one of the top researchers in his areas of expertise in nonlinear and complex systems.

### Education

MD, Technical University Dresden (1986)

PhD, Technical University Dresden (1989)

### Major Experience

- 1992-1994 Researcher in Deutsche Forschungsgemeinschaft / Boston University
- 1994-1997 Associate Position in Max Planck Institute for the Physics of Complex Systems
- 1997-2012 Head of visitors program in Max Planck Institute for the Physics of Complex Systems
- 2012 Professor in Massey University
- 2014 Director, Center for Theoretical Physics of Complex Systems IBS

### Major Publication

- Fano resonances in nanoscale structures, *Rev.Mod.Phys* 82 (2010) 2257
- Anderson Localization or Nonlinear Waves: A Matter of Probability, *Phys.Rev.Lett* 107 (2011) 240602
- The weak-password problem: Chaos, criticality, and encrypted p-CAPTCHAs, *Euro.Phys.Lett* 95 (2011) 50007
- Flatbands under Correlated Perturbations, *Phys.Rev.Lett* 113 (2014) 236403
- Tunable transport with broken space-time symmetries, *Phys.Rep* 538 (2014) 77120



### About Center

Our center aims to take up the grand challenge and to create a world-class laboratory for the nonlinear classical and quantum dynamics of nano-structured systems, and to conduct cutting edge research on phenomena at the interfaces of applied and computational theoretical condensed matter physics and optics.

### Research Area

- The nonlinear classical and quantum dynamics of nano-structured systems
- To conduct cutting edge research on phenomena at the interfaces of applied and computational theoretical condensed matter physics and optics
- Cross-fertilize research on exciton-polariton condensates, superconducting networks, quantum dot networks, ultracold atomic gases, optical waveguide networks, topology frustration, flatband physics



교수진



**Prof. Gentaro Watanabe**

[gentaro@ibs.re.kr](mailto:gentaro@ibs.re.kr)

PhD, University of Tokyo (2003)

Research Fellow / Center for Theoretical  
Physics of Complex Systems

# Curriculum

## < Course List >

Classification		Course Name	Credits	Professor	Term
Major Course	In-depth Elective	Genome Engineering	3	Sang-Gyu Kim Taeyoung Koo	Annual/Fall
		Nuclear and Particle Physics I	3	Yeongduk Kim	Annual/Spring
		Nuclear and Particle Physics II	3	Hyang-Kyu Park	Annual/Fall
		Particle Physics and Cosmology I	3	Kenji Kadota	Annual/Spring
		Particle Physics and Cosmology II	3	Kenji Kadota	Annual/Fall
		Nonlinear Matter and Light Waves	3	Sergej Flach	Annual/Spring
		Physics of Cold Atomic Gases	3	Gentaro Watanabe	Biennial/Spring
Field Research	Field Research on Cognitive Behavior Analysis I	4	Hee-Sup Shin	Biennial/Spring	
	Field Research on Cognitive Behavior Analysis II	4	Hee-Sup Shin	Biennial/Fall	
	Field Research on Cognitive Behavior Analysis III	4	Hee-Sup Shin	Biennial/Spring	
	Field Research on Cognitive Behavior Analysis IV	4	Hee-Sup Shin	Biennial/Fall	
	Cognitive Neuroscience Experiment I	2	Yee-Joon Kim	Biennial/Spring	
	Cognitive Neuroscience Experiment II	2	Yee-Joon Kim	Biennial/Fall	
	Cognitive Neuroscience Experiment III	2	Yee-Joon Kim	Biennial/Spring	
	Cognitive Neuroscience Experiment IV	2	Yee-Joon Kim	Biennial/Fall	
	Research on Genome Engineering I	2	Sang-Gyu Kim	Annual/Spring	
	Research on Genome Engineering II	2	Sang-Gyu Kim	Annual/Fall	
	Research on Astro-Particle Experiment I, II, III, IV	4	Yeongduk Kim Yong-Hamb Kim Hyang-Kyu Park	Annual/ Spring · Fall	
	Research on Particle Physics and Cosmology I	2	Kenji Kadota	Annual/Spring	
	Research on Particle Physics and Cosmology II	2	Kenji Kadota	Annual/Fall	
	Seminar	Neuroscience Seminar I	3	Hee-Sup Shin	Biennial/Spring
Neuroscience Seminar II		3	Hee-Sup Shin	Biennial/Fall	
Neuroscience Seminar III		3	Hee-Sup Shin	Biennial/Spring	
Neuroscience Seminar IV		3	Hee-Sup Shin	Biennial/Fall	
Seminar on Genome Engineering I		3	Sang-Gyu Kim	Annual/Spring	
Seminar on Genome Engineering II		3	Sang-Gyu Kim	Annual/Fall	
Seminar for Astro-Particle Physics I		3	Yeongduk Kim Hyang-Kyu Park	Annual/Spring	
Seminar for Astro-Particle Physics II		3	Yeongduk Kim Hyang-Kyu Park	Annual/Fall	
Seminar on Particle Physics and Cosmology I		3	Kenji Kadota	Annual/Spring	
Seminar on Particle Physics and Cosmology II		3	Kenji Kadota	Annual/Fall	

## < Major Courses Introduction >

### ● Genome Engineering

Understanding of genome editing tools and an introduction to the recent application of genome engineering tools for molecular and cellular biology

- Professor : Sang-Gyu Kim, Taeyoung Koo

### ● Nuclear and Particle Physics I

This course covers the fundamentals of nuclear and particle physics with an emphasis on experimental methods and phenomenology. It consists of two parts: nuclear physics and particle physics. In nuclear physics, we will discuss mainly radioactive nuclear decays and nuclear reactions. In particle physics, we will discuss properties of elementary particles and interactions among them.

- Professor : Yeongduk Kim

### ● Nuclear and Particle Physics II

This course is the continuation of the Nuclear and Particle Physics I course. The aim of this course is for students to become familiar with research in the field of astro-particle physics. It will cover the standard model of particle physics, brief introductions of beyond standard models, neutrino physics, standard cosmology and finally dark matter and dark energy. During the course, we may invite experts as guest lecturers.

- Professor : Hyang-Kyu Park

### ● Particle Physics and Cosmology I

The aim of this lecture is to cover the basic concepts of particle physics and cosmology. We present theoretical foundations of the Standard Model of particle physics, which describes electroweak and strong interactions. The lecture also contains an discussion on what the fundamental problems of standard cosmology are and how they are resolved by cosmic inflation.

- Professor : Kenji Kadota

### ● Particle Physics and Cosmology II

This is an advanced course in particle physics and cosmology. We discuss various models for physics beyond the Standard Model of particle physics such as supersymmetry and grand unification. We also study inflation models and cosmological perturbation theory.

- Professor : Kenji Kadota

### ● Nonlinear Matter and Light Waves

This advanced course covers the fundamentals of wave dynamics in interacting ultracold atomic gases, exciton-polariton condensates, and light in structured media. We will first introduce the different physics settings, and arrive at a unifying description using interacting wave equations - both at the classical and quantum level. During the second part we will study the math of these wave equations, and obtain nonlinear excitations - discrete breathers, q-breathers, and their quantum analogues. The third part will cover the impact of external disorder including Anderson localization, Aubry-Andre-localization, Wannier-Stark localization, and dynamical localization.

- Professor : Sergej Flach

### ● Physics of Cold Atomic Gases

This course provides an introduction to the physics of cold atomic gases. The aim of this course is twofold: 1) To deliver basic knowledge in order to be able to conduct research in this field and 2) to provide important concepts in condensed matter physics in general. After an overview of this field, we will discuss atomic properties, Bose-Einstein condensation, superfluidity, optical lattices, and superfluid Fermi gases, etc.

- Professor : Gentaro Watanabe

## Graduation Requirements

### < Courses and Grading >

Classification of Credits		Evaluation	Required Credits	
			Doctoral Program	Integrative Program
Class Work	Common Course	(S/U) or Percentage	3	6
	Major Courses	Percentage	12	24
Research Work	Field Research	Percentage	12	24
	Seminar	(S/U)	2	4
Thesis Work		(S/U)	3	6
Total Credits			32	64

※ (S/U): Satisfactory / Unsatisfactory

※ At least 2 credits should be acquired from lab rotation or internship for graduation.

### < Paper Publication >

When a (or more) thesis of a student, as the first author, is printed in a world-famous journal, such as an SCI journal, or when the president recognizes, through deliberation by the University Committee, the thesis to be such a research achievement as to correspond to those published in internationally well-known journals.

### < Comprehensive Examination >

A student's knowledge of fundamentals and expertise, and his/her application in a major field of study are assessed by a written or oral examination.

### < Foreign Language Examination >

	TOEFL			TOEIC	TEPS	IELTS
	iBT	CBT	PBT			
Score	79	213	550	730	657	6

### < Thesis >

Those who meet the requirements for degree conferral including the minimum credits and the comprehensive examination can ask the Thesis Examination Committee for examination of a degree thesis.

### < Special Screening >

Above 2nd grade at TOPIK



## Course Outline

### < Common Courses >

Classification	Brief Exploration of Courses	Course Period	Courses Registration Period	Credits	Evaluation
Summer/Winter School	Basic Science, refinement and convergence oriented lecture by professionals	3 nights and 4 days each semester	Designated period during the vacation	2	S/U (Satisfactory/Unsatisfactory) or Percentage
Orientation for Incoming Students	Program to guide students as to UST academic rules and help students to adapt to new school lives, targeting incoming students every semester.	Before the semester begins	Designated period before the semester begins	1	
Korean Language Course	Learning Korean for foreign student	Whole semester		0	
Common Liberal Arts	Lectures on common theories of liberal arts			1	

※ Course schedules are subject to change every semester.

### < Major Courses >

Courses Contents	Credit Authorization	Evaluation
Theory lectures on majors	More than 16 hours for 1 credit (3 credits for 1 course, 16 weeks)	Percentage

### < Field Research >

Courses Contents	Credit Authorization	Evaluation
Consists mainly of experiments, practical and theoretical lectures that are related to the study assignments of students	2 credits per 8 weeks / 4 credits per 12 weeks, can be applied up to 6 credits per semester	Percentage

Division	Professor	Documents for Submission	Note
Advisor	Advisor, Common advisor	Field Research Report	—
Other labs	UST professor except advisor and common advisor		Choose one. More than 2 credits are required.
External institute	Other university and company or other research center		

※ When signing up for a field research class, it should be decided whether a lecturer and an academic advisor (including co-advisor) are appropriate or not. Then, it is classified into the field research of the academic advisor and the field research of another laboratory.

※ After the end of the course, students must submit field research report on time. If not, credits cannot be authorized.

### < Seminar >

Courses Contents	Credit Authorization	Evaluation
· Participation in workshops on technology, presentation of research achievements or seminars in or out of the school. · Presentation and discussion by a student on research achievements. · Attendance at more than 8, presentation at more than 1.	3 credits for a course	(S/U)

### < Thesis Work >

Courses Contents	Credit Authorization	Evaluation
Thesis Work	3 credits for a course	(S/U)

※ Only one course is available for a semester.

## Campus Life



### < Support >

#### Scholarship

- All students are provided with a monthly stipend to encourage them to focus on research and study
- Scholarships by Program

Course	Tuition	Stipend
PhD Program	fully funded	KRW 2 million won/ month
Integrative Program		KRW 1.5 million won/ month

※ UST standard : Master's Course - Minimum of 1.2 million won/month, Doctor's Course - Minimum of 1.2 million won/month (from March 2013)

※ Integrative program students will be paid same as doctor's course students from the third-year.

### < Student Welfare >



Medical Check-up

Comprehensive Insurance

Psychology Consultation

Dormitory

### < University Awards >



Thesis Prize

Excellent Faculty Prize

Excellent Lecture Prize

UST Excellent Research Thesis Supervisor Prize

## Exchange Programs



### < Student Support Program >

- Overseas Training Program
  - UST supports outstanding students who attend the internship or co-work in renowned overseas university or research institutes
- Overseas Exchange Program
  - Overseas Academic Exchange Program : UST supports outstanding students who present their papers in international conference
  - Overseas Educational Trend Survey Program : UST assists outstanding students to visit and experience advanced education system in renowned overseas university or research institutes

### < Academic Exchange Program >

- Students can take courses in other universities and institutions signed exchange agreement
- About 30 universities signed for exchange agreement. (SNU, KAIST, Yonsei Univ., Korea Univ., etc.)
- Available courses
  - Graduate school courses allowed for exchange by the university
- Approvable Credits (can be varied by university rules)
  - Korea Univ. : Less than 3 credits for each semester
  - KAIST : Less the 6 credits for each semester
  - Other universities : No limit



# Admission Guide

## < Admission Schedule >

Semester	Admission Period
Spring Semester Admission (Admission in March)	Every year around September
Fall Semester Admission (Admission in September)	Every year around March

※ Check the admission guide for details.

## < Eligibility >

- Eligibility for Special Admission



Foreigners

A person who and whose parents are foreigners and do not have Korean citizenship



Koreans Living Overseas

A person who is a child of overseas Koreans and has attended academic programs there for 16 years or more

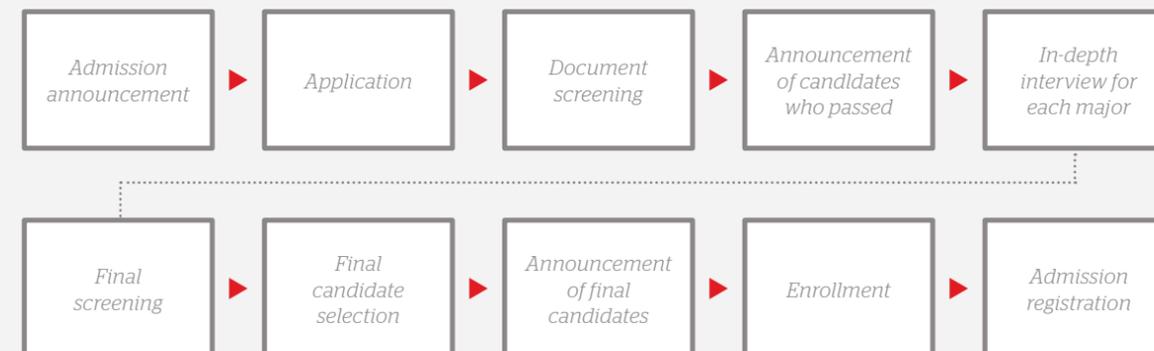
- Required Qualifications for Degree Programs

Degree Program	Qualifications
Doctoral Program	<ul style="list-style-type: none"> <li>· A person who has earned a master's degree or expects to receive a master's degree</li> <li>· A person who has credentials similar to or higher than the above in accordance with the relevant laws and decrees</li> </ul>
Integrative Program	<ul style="list-style-type: none"> <li>· A person who has earned a bachelor's degree or expects to receive a bachelor's degree</li> <li>· A person who has credentials similar to or higher than the above in accordance with the relevant laws and decrees</li> </ul>

### ※ What is an integrative program?

- An integrative program is defined as a graduate program in which students can obtain a doctoral degree
- Those who are admitted through this program should pass a qualification examination for their doctoral program
- Only a master's degree is conferred on those who have met the requirements of the master's degree; if they quit during the program.

## Application Procedure



- 1st phase (document screening): GPA, achievement, research experience, and comprehensive evaluation of fundamental scholastic ability in each field of study, based on studies and research plan.
- 2nd phase (in-depth interview): Overall screening will be conducted in terms of the applicants' capability of completing the degree program, enthusiasm for study and research, potential of scientific experiments and academic communications.

## Official English Score

- Minimum Score Standard

Division	TOEFL			TOEIC	TEPS	IELTS
	iBT	CBT	PBT			
Score	79	213	550	730	657	6

- ※ The TOEIC score is the sum of the Listening & Reading score (TOEIC Speaking is not available).
- ※ The test date should be issued within 2 years of the date of application.
- ※ Authenticity of Official English Score: IBS School, UST will verify official English score through the corresponding testing organizations (If any falsified official English score is found, the corresponding application is considered invalid, the admission is cancelled or the applicant is not allowed to apply for the university for the next five years.)
- ※ Check more detailed exceptions and precautions on the website.

## UST Admissions website

admission.ust.ac.kr



## Meet Our Students

**Autonomy in research made me to choose IBS School.**



Seonghyeok Ye  
The 1st  
Student of  
IBS School

*During my internship at the IBS Center for Genome Engineering, I had the opportunity to participate in innovative research projects conducted at the Center and learn the processes involved in those projects. IBS cultivates a research environment where outstanding researchers from different fields are allowed maximum autonomy in conducting their research. Each researcher can focus on their own research interests. This is the reason I want to be part of IBS so that I can explore research themes that interest me in the best research environment.*

*I have always believed in the power of basic science, and seeing this effect of genome engineering on society gave me confidence in my career as a researcher. I hope that one day the outcomes of basic science bring a paradigm shift and eventually overcome the boundaries of academic disciplines, thereby ushering in a new era throughout society. To realize these goals, I choose to study at IBS School.*

**I will be a researcher that realize the IBS School's vision with other various fields' researchers.**



Taegeun Bae  
The 1st  
Student of  
IBS School

*The primary reason I chose to study at IBS School is that I can work with researchers from various fields within one research center. I started interning in March at the IBS Center for Genome Engineering. I spent several months with experts in different fields such as plants, animals, stem cells and viruses. They were all gathered in one Center conducting collaborative and interdisciplinary research that went beyond the boundaries of academic disciplines. After seeing the diversity and expertise at the Center, I became even more eager to join IBS School.*

*I hope to undertake creative research through collaborations with other researchers who have broad perspectives and expertise in their own respective fields. Above all, during my time at IBS School, I hope to pursue the IBS vision of "Making Discoveries for Humanity and Society" and become a leading researcher who realizes that vision.*

**The future is already here.  
It's just not  
evenly distributed yet.**

-William Gibson