



Research Topics

CENTER FOR THEORETICAL
PHYSICS OF COMPLEX SYSTEMS

TERAHERTZ SOURCES AND DETECTORS
QUANTUM RATCHETS
QUANTUM EMBEDDING THEORIES
TOPOLOGICAL INSULATORS
THERMODYNAMIC PHASE TRANSITIONS
QUANTUM THERMODYNAMICS
QUANTUM STOCHASTIC DYNAMICS
FLUCTUATION RELATIONS
DISORDER AND INTERACTIONS
OPTICAL VORTICES
OPTICAL WAVEGUIDE NETWORKS
STRONGLY CORRELATED ELECTRONIC LATTICES
FLOQUET SYSTEMS
FINITE SYSTEMS
EXCITON-POLARITON CONDENSATES
FLATBANDS
SPIN SYSTEMS
FANO RESONANCES
KAM
NON-HERMITIAN SYSTEMS
MANY BODY LOCALIZATION
METAL-INSULATOR TRANSITIONS
NON-HERMITIAN SYSTEMS
DIRAC CONES
QUANTUM CHAOS
NON-HERMITIAN SYSTEMS
TOPOLOGY
ULTRACOLD ATOMIC GASES
FANO RESONANCES
OPEN QUANTUM SYSTEMS
METASTABILITY
MACHINE LEARNING
MULTI-ORBITAL KONDO PHYSICS
GRAPHENE PHYSICS
DETERMINISTIC CHAOS
COHERENCE AND DECOHERENCE
IMPURITY SOLVERS
DISSIPATIVE SOLITONS
QUANTUM OPTICS
NON-HERMITIAN SYSTEMS

PCS IBS

Hanbit Tower
한빛 탑

bus stop
Shinsegae department store
신세계백화점

bus stop
Hanbit Tower
한빛 탑

EXPO-ro 엑스포로 55

Expo Bridge
엑스포 다리

JOIN US

Applications are accepted continuously

- We offer fellowships (Ph.D., postdoctoral, sabbatical), as well as short- and long-term visiting positions
- We invite applications for support in the organization of seminars, advanced study groups and workshops

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CENTER FOR THEORETICAL
PHYSICS OF COMPLEX SYSTEMS

pcs Center for Theoretical
Physics of Complex Systems

ibs Institute for Basic Science

PHYSICS
COMPLEX
SYSTEMS



Message from the Director

Today the eyes looking for novel technologies and new generation devices focus on nano-structured materials with unprecedented electrical, mechanical, optical and other properties – like graphene, nanotubes, quantum dot arrays, metamaterials, trapped atomic condensates, superconducting networks, plasmonic and nanophotonic structures. There is an increasingly strong demand for new theoretical concepts, approaches and computational tools for uncovering fundamental non-linear and quantum many-body processes in such systems and designing efficient methods of their control.

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

- This leaflet was prepared in May 2023.



Sergey Flach
Director



Research Teams and Visitor Program

One Departmental and four Junior Research Teams, together with an efficient Visitor and Workshop Program, ensure finest research and training standards, thus developing the Center into a leading institution able to successfully compete within a quickly globalizing science network. By becoming a research and meeting hub for the Korean and global scientific communities, the Center offers young scientists an excellent research environment and connections with the worldwide leaders in a broad variety of emerging research fields.



Events 2023

CENTER FOR THEORETICAL
PHYSICS OF COMPLEX SYSTEMS

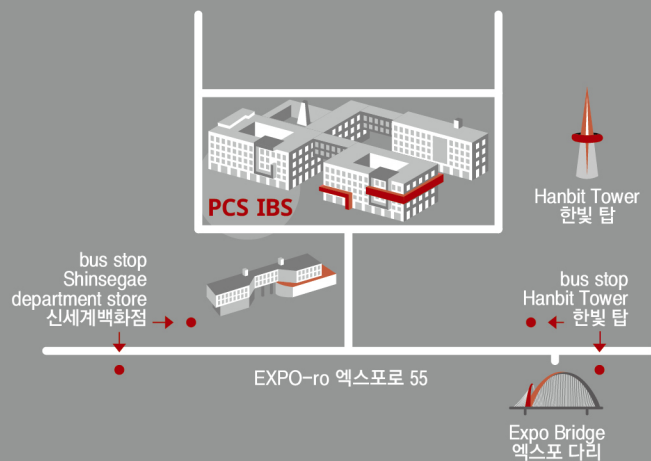


International Meetings

- *Condensed Matter Solitons*
- *Numerical Methods in Theoretical Physics 2023*
- *Computational Approaches to Magnetic Systems*
- *Polaritons in Emerging Materials*
- *Asian Network School and Workshop on Complex Condensed Matter Systems 2023*

Advanced Study Groups

- *Quantum-Functional Mesoscopic Weak Links*
- *Unusual Order in Incommensurately Stacked Multilayers*
- *Entanglement and Dynamics in Quantum Matter*
- *Tensor Network Approaches to Many-Body Systems*
- *Computational Study on Strongly Correlated Low-Dimensional Magnetic Systems*



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The PCS offices are located on the 3rd floor
 of the Theory Building (entrance on the left)
 at the Institute for Basic Science (IBS).



PCS Timeline

Apr. - May, Sep. - Nov. 2023	Advanced Study Group <i>Quantum-Functional Mesoscopic Weak Links</i>
May - Aug., 2023 Nov. 2023 - Jan. 2024	Advanced Study Group <i>Unusual Order in Incommensurately Stacked Multilayers</i>
Jun., Sep., Dec. 2023	Advanced Study Group <i>Entanglement and Dynamics in Quantum Matter</i>
Jun. 2023	International Workshop <i>Condensed Matter Solitons</i>
Jul. - Aug. 2023 Jan. - Feb. 2024	Advanced Study Group <i>Tensor Network Approaches to Many-Body Systems</i>
Jul., Dec. 2023 Feb. 2024	Advanced Study Group <i>Computational Study on Strongly Correlated Low-Dimensional Magnetic Systems</i>
Jul. 2023	<i>Numerical Methods in Theoretical Physics 2023</i>
Aug. 2023	International Workshop <i>Computational Approaches to Magnetic Systems</i>
Sep. 2023	International Workshop <i>Polaritons in Emerging Materials</i>
Nov. 2023	<i>Asian Network School and Workshop on Complex Condensed Matter Systems 2023</i>

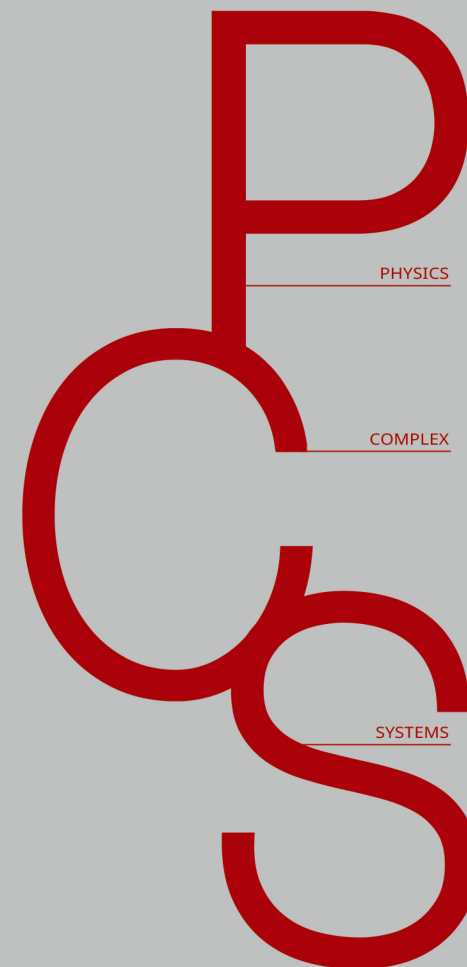


PCS Research Teams

- Complex Condensed Matter Systems
- Quantum Many-Body Interactions and Transport
- Light-Matter Interaction in Nanostructures
- Quantum Chaos in Many-Body Systems
- Topological and Correlated Quantum Matter
- Optics of Quantum Fluids and Nanomaterials
- Superconducting Hybrid Quantum Systems
- Topological Quantum Matter

CENTER FOR THEORETICAL PHYSICS OF COMPLEX SYSTEMS

2023 Announcements





The Institute for Basic Science (IBS), established in November 2011, is Korea's first dedicated basic science research institute. Currently, 33 research centers and 4 research institutes in physics, chemistry, mathematics, life sciences, earth science, and interdisciplinary fields operate under the IBS. For more information see ibs.re.kr.

The Center for Theoretical Physics of Complex Systems (PCS), operated under the IBS, was founded in December 2014, with scientific activities starting in May 2015. Besides hosting resident researchers, the PCS runs an active Visitor and Workshop Program aimed at providing young scientists with an excellent research environment and connections with worldwide leaders in a broad variety of emerging fields.



Call for **applications** for multiple **positions** in condensed matter physics, topological and correlated quantum matter, quantum chaos in many-body systems, mesoscopics, and physics of light

(applications are considered **continuously**)

PCS Center for Theoretical
Physics of Complex Systems



Research Fellow / Visiting Research Fellow / Ph.D. Student

Research Fellow positions vary from the postdoctoral to sabbatical level, with flexible duration and competitive salaries. Visiting positions range from a few days to several months (usually up to a year). Salaries are commensurate with experience. Ph.D. fellowships are typically for three years. The research work will focus on modern and important topics in the broadly defined field of theoretical physics of complex systems.

Strong oral and written communication skills, excellent computational skills, and the ability to work effectively and congenially with other PCS members are essential for all positions. Applicants should also have a strong interest to work in a multidisciplinary and dynamic research environment. Interested applicants should provide a single pdf file (including a cover letter, CV, publication list, and a detailed research plan), and arrange for two letters of recommendation to be sent to the PCS Visitor Program at pcs@ibs.re.kr.

Call for **proposals** for **Advanced Study Groups** and **International Workshops** in the broadly defined field of theoretical physics of complex systems

Applications for programs in 2024
should be submitted
preferably by **October 2023**



Advanced Study Groups and International Workshops

Advanced Study Groups (4-10 members) are usually 1-3 months long programs designed to foster intensive collaborations between outstanding scientists and young researchers in residence. Each group consists of several scientists headed by a Principal Investigator (PI). The research work will focus on modern and important topics in the broadly defined field of theoretical physics of complex systems. With the full organizational support of the PCS Visitor Program, the group will attract further shorter-term visitors for seminars, lectures, discussions, and other meetings.

International workshops are on frontier and rapidly developing subjects, as well as new interdisciplinary topics. The PCS organizes focus workshops (2-3 days) and workshops (5 days). The activities cover all research areas related to the broadly defined field of theoretical physics of complex systems. Combinations with Advanced Study Group activities are welcome.

Proposals are to be submitted to the PCS Visitor Program at pcs@ibs.re.kr. More information on the past activities can be found at pcs.ibs.re.kr