# シンポジウム一覧

## 1日目 ＜9月28日（水）＞
## 9:00～11:30

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### 1SAA
### Protein aggregation driven by dynamic solution environments
### 動的溶液環境が駆動するタンパク質凝集

オーガナイザー：吉田 紀生（九州大学），菅瀬 謙治（京都大学）

**【学生・博士研究員発表枠あり】**

Summary:

In cells, the solution environment is constantly changing due to varying concentrations of chemicals, mechanical stimuli, and electric fields. In recent years, it has become evident that intrinsically disordered proteins, which do not have specific conformations, undergo liquid-liquid phase separation and amyloid fibrillization in response to the ‘dynamic’ solution environment. This series of self-condensation processes is controlled by the protein-protein and protein-solvent interactions of intrinsically disordered proteins, which have dynamic conformations and solvation states. In this workshop, we will discuss the latest research on the self-condensation process of intrinsically disordered proteins and their future development.

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### 1SBA
### Protein large-scale motions revealed by quantum beams -a new era in understanding protein dynamics-
### 量子ビームでひも解くタンパク質の大きな構造変化 –タンパク質ダイナミクス理解の新潮流-

オーガナイザー：山本 直樹（自治医科大学），関口 博史（高輝度光科学研究センター）

**【学生・博士研究員発表枠あり】**

Summary:

Biological systems function by constantly changing their hierarchical and inter-hierarchical interactions among molecules, cells, and individuals. In order to visualize these dynamics, it is effective to approach them using penetrating quantum beams such as X-rays and neutron beams. This symposium will introduce recent advances in quantum beam techniques for biophysical research, mainly focusing on large structural changes within and between protein molecules. Furthermore, molecular dynamics simulation studies combined with the experimental researches, which deepen the knowledge on molecular mechanisms of the complexed protein systems, will also be shown.

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### 1SCA
### Live-cell imaging of bio-metal species
### 生命金属のライブセルイメージング
### 共催：新学術研究領域「生命金属科学」

オーガナイザー：石森 浩一郎（北海道大学），平山 祐（岐阜薬科大学）

**【学生・博士研究員発表枠あり】**

Summary:

The inorganic ions are essential for life despite their small amounts, in addition to organic macromolecules such as proteins, DNA, carbohydrates, and lipids. The dysfunction of the homeostasis of these inorganic ion species is involved in various pathologies. To understand the dynamics and functions of the inorganic species in living things, the observation of their existence and fluctuation in living cells is necessary. In this symposium, up-and-coming researchers will give talks on innovative methods for imaging inorganic species in living cells. This symposium is a collaborative symposium with Integrated Metal-bioscience.

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### 1SDA
### Unveil glycans’ function from their dynamical structures. – Cutting-edge challenges
### 糖鎖の動的構造から機能へ – 実験・理論解析の最先端

オーガナイザー：李 秀栄（医薬基盤・健康・栄養研究所），山口 芳樹（東北医科薬科大学）

**【学生・博士研究員発表枠あり】**

Summary:

Glycosylation of proteins is a ubiquitous biomolecular process. It adds extra functions or modulates existing functions of proteins, thereby affecting a range of cellular processes and diseases. Despite of the complex and dynamical nature of glycan structures, the recent advances both in experiment and computation enable us to investigate their functions based on the dynamical structures at atomic resolution, as exemplified in the “glycan-shield” of SARS-CoV-2 spike protein. In this symposium, we would like to share the cutting-edge challenges in determining functional structures and dynamics of glycans and discuss the potential future collaborations.

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## 1SEA

## Utilization of Advanced Infrared Sources for Biophysical Studies

## 先端赤外光の利用による生物物理学研究

## 共催：CREST「新たな光機能や光物性の発現・利活用を基軸とする次世代フォトニクスの基盤技術」

オーガナイザー：古谷 祐詞（名古屋工業大学），村越 秀治（生理学研究所）

**【学生・博士研究員発表枠あり】**

Summary:

Infrared (IR) light has been widely utilized for analyzing molecular structure and interaction in biological and organic materials. Nowadays, new infrared light sources have been developed, such as ultrafast pulsed IR lasers, quantum cascade lasers, and fiber lasers. These lasers are applicable not only to vibrational spectroscopy on biological molecules but also to microscopic imaging of biological systems such as tissues and cells. Multi-photon microscopy is one of the most important applications, which can shed light on deep inside brains. In this symposium, we would like to discuss the possibility of new infrared light sources in biophysical studies.

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## 1SGA

## Frontiers of Protocell Research: Exploring the Origin of Life through a Constructivist Approach

## 再構築実験によってアプローチするプロトセル研究と生命の起源への探求

オーガナイザー：車 俞澈（海洋研究開発機構）, Tony Z. Jia（東京工業大学）

**【学生・博士研究員発表枠あり】**

Summary:

The search for the origin of life (OoL) is now entering a new phase, involving researchers from various fields and incorporating new scientific findings. Especially, the study of artificial cells by a constructivist approach and assembly of protocells by liquid-liquid phase separation or other non-“traditional” physical processes have been advocating a new interpretation in OoL studies. This symposium will focus on the frontiers of the construction and assembly of protocells and artificial cells with novel emergent structures and functions relevant to the origins of life.

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## 1SHA

## Autonomous Characteristics of Molecular and Cellular Ensembles: Toward an Understanding of Biological Functions

## 分子集団，細胞集団が織りなす自律特性：生命機能の理解を目指して

オーガナイザー：茅 元司（東京大学），島本 勇太（国立遺伝学研究所）

Summary:

The autonomous characteristics of molecular and cellular assemblies are of a higher order than can be imagined from the characteristic of a single molecule or cell, and are the essence of various biological functions. In this symposium, we will invite researchers who are working on the mechanisms of cell motility, tissue formation, etc., using a variety of advanced approaches. We will discuss how understanding the autonomous characteristics of molecular and cellular ensembles can advance our understanding of biological functions.

# 13:50～16:20

## 1SAP

## Innovation of drug discovery and medical treatment using supercomputer Fugaku

### スーパーコンピューター「富岳」による創薬・医療の革新

### 共催：文部科学省「富岳」成果創出加速プログラム「プレシジョンメディスンを加速する創薬ビッグデータ統合システムの推進」

オーガナイザー：荒木 望嗣（京都大学），池口 満徳（横浜市立大学）

**【学生・博士研究員発表枠あり】**

Summary:

Drug discovery and medical technologies are being innovated by development of high performance computing (HPC). Large-scale molecular dynamics simulations performed on supercomputer Fugaku permit atomic-level observation of “slow” biomolecular processes such as protein conformational transition and protein-drug interaction processes, providing deeper insight into molecular mechanisms of disease and drug design to overcome it. In this symposium, we will discuss about the forefront of next-generation molecular simulation techniques for drug discovery and medical treatment.

## 1SBP

## Structure and function of “meso-entangled bodies” in the cell

### 細胞内メゾ複雑体の構造と機能

### 共催：学術変革領域研究（A）「クロススケール新生物学」

オーガナイザー：杉田 有治（理化学研究所），山本 林（東京大学）

Summary:

Proteins often assemble to form "mesoscopic" complexes – some ordered and some disordered – to exert their functions in the cell. Therefore, elucidating their architectures and physical properties is necessary to understand the molecular mechanisms underlying life phenomena and diseases. In this research area "Cross-Scale Biology", we particularly focus on mesoscopic structures in the range of 20–500 nm (including LLPS condensates), which we define as "meso-entangled bodies (MEBs)", because MEBs are thought to be key factors that determine the fate of organisms through the transition from disordered to ordered states at the mesoscale. In this symposium, researchers working on the MEBs will gather to discuss the latest technologies and findings, including In-cell AFM, cryo-EM, chemical biology, and LLPS.

## 1SCP

## Topological approaches to understand behaviours of complex biological systems

### 複雑システムの振る舞いの解明に向けたトポロジカルアプローチ

オーガナイザー：望月 敦史（京都大学），岡田 崇（理化学研究所）

Summary:

It is considered that biological functions emerge from dynamics of complex systems consisting from interactions of many biomolecules. Obtaining logical understandings for behaviors of network systems is strongly required in life sciences. To meet it, a series of mathematical methods have been developed, by which important aspects of dynamical behaviors are determined from the topology of networks alone. They have been applied to real biological systems and have made unique achievements. Recently, we see a series of technical or theoretical progresses, which broaden the scope of applications of the methods. In this symposium, we will introduce topological approaches to the network system, and discuss future perspectives of them.

## 1SDP

## Phase Separation by Biopolymers: Basics and Applications

### 生体高分子による液液相分離：基礎と応用

オーガナイザー：北原 亮（立命館大学），亀田 倫史（産業技術総合研究所）

Summary:

Although cells organize many biochemical processes in membrane-less compartments via liquid-liquid phase separation (LLPS), physicochemical properties and molecular details of LLPS consisting of proteins and nucleic acids are still largely unknown. This symposium contains lectures on the physicochemical basis of biomolecular LLPS and some recent experimental

and theoretical developments to elucidate its structure and dynamics. For example, pressure perturbation spectroscopy, single-molecule fluorescence microscopy, Raman microscopy, and molecular dynamics simulations for protein LLPS will be introduced.

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## 1SEP

## Physico- and chemical biology using nanomanipulation and micromanipulation technologies

### 微細制御技術を用いたフィジコケミカルバイオロジーへの展開

オーガナイザー：北村　朗（北海道大学），飯塚 怜（東京大学）

**【学生・博士研究員発表枠あり】**

Summary:

Various nano- and micromanipulation technologies provide novel strategies to elucidate nature in many scientific fields such as biophysics, physicobiology, and chemical biology. Here, we introduce the cutting-edge topics using nanomanipulation and micromanipulation technologies with a single molecule sensitivity, chemical biology, optogenetics, and mechanistic measurements for understanding and controlling cells and organisms. Furthermore, research topics in molecular and cellular biology from physicochemical perspectives will be discussed. In addition to the talks provided by the five young scientists including female speakers, poster presentations by the students and postdocs will be selected as speakers.

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## 1SFP

## Biophysical responses and biochemical/chemical controlling of membranes for cellular regulation and future therapy

### 生体膜の生物物理呼応と細胞機能制御への化学的利用

オーガナイザー：中瀬 生彦（大阪公立大学），広瀬 久昭（京都大学）

**【学生・博士研究員発表枠あり】**

Summary:

Biological membranes participate in responses for acceptance/rejection of stimulation and environmental changes from outside/inside cells, leading to signal transduction and cellular responses including e.g., cellular uptake, migration, proliferation, and cell death. The biophysical responses/mechanisms-based membrane controlling systems are highly anticipated to be next-generation therapeutic methodologies for further achievements of disease regulation such as cancers. In this proposal symposium, advanced research technologies and achievements of visualizing and controlling membrane traffic, structures, penetration, and shape-dependent cellular signaling from the fusion viewpoints of biophysics, molecular cell biology, chemistry, and chemical biology will be presented, and membrane-based therapeutic methodology will be discussed.

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## 1SGP

## Uncovering the design principles of supramolecular assemblies through manipulation of the structures, dynamics, and functions

### 高次構造体を自在に操る

**共催：JST さきがけ「細胞の動的高次構造体」**

オーガナイザー：宮﨑 牧人（京都大学），小杉 貴洋（分子科学研究所）

Summary:

Cells contains various types of supramolecular assemblies ranging from nanometer-scale structures such as protein complexes and RNA-protein complexes to micrometer-scale structures such as organelles and liquid droplets. A growing body of evidence suggests that these ordered and dynamic structures regulate various key functions of the cell which were previously unknown or unnoticed. To uncover the design principles of the supramolecular assemblies, not only identification of the molecular components and observation of the dynamics, but also manipulation of their structures, dynamics, and functions will be of crucial importance. In this symposium, we will invite talented early-career researchers in various research fields who are developing cutting-edge technologies to manipulate the supramolecular assemblies.

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## 1SHP

## The Future of *Muscle* is Now

## ”肉”のイマとミライ

**共催：学術変革領域（B）「筋肉トランススケール熱シグナリング」**

オーガナイザー：鈴木 団（大阪大学），大山 廣太郎（量子科学技術研究開発機構）

**【学生･博士研究員発表枠あり】**

Summary:

*Muscle* is one of the main subjects that have been studied extensively in the field of Biophysics. We can now explain how the force is produced and assembled at all levels of the hierarchy in muscle; single protein molecule, molecular assembly (sarcomere), myofibril, cell (fiber) and tissue. Is the end of muscle study approaching? In this symposium, we will review the current status with senior researchers, and foresee the future advances with researchers at their early- and mid-carriers who demonstrate originalities and creativities in new methods. At least two abstracts will be selected from posters for oral presentations. We encourage submissions from students and postdocs.

# 2日目 ＜9月29日(木)＞
# 8:45～11:15

## 2SAA
## NMR Studies in Membrane and Peptide Biophysics
### NMR で迫る膜とペプチドの生物物理

オーガナイザー：川村 出（横浜国立大学），相沢 智康（北海道大学）

**【学生・博士研究員発表枠あり】**

Summary:

Biomembranes and peptides have always been important research targets in the field of biophysics. In particular, their interactions and dynamic properties have not yet been fully elucidated, and many cutting-edge studies have been conducted by applying NMR techniques, which provide information at atomic resolution that is difficult to obtain by other spectroscopic methods. In this symposium, researchers in these fields are invited as speakers to discuss the results of their research using NMR methods.

## 2SBA
## Chromatin function as revealed by cutting-edge technique and theory
### 先端技術と理論で迫るクロマチン機能の理解
### 共催：新学術領域研究「遺伝子制御の基盤となるクロマチンポテンシャル」

オーガナイザー：伊藤 由馬（東京工業大学），木村 宏（東京工業大学）

**【学生・博士研究員発表枠あり】**

Summary:

Recent advance in genomics and imaging technologies have contributed to understanding the function of chromatin for gene regulation beyond the canonical role in genomic DNA packaging. To understand the principles of highly organized and dynamic chromatin architecture, the integrated approaches using various experimental techniques and theoretical modeling are essential. In this symposium, by we aim to promote discussion by sharing the latest research on measuring and modeling the biophysical properties of chromatin and the relevance to gene regulation using state-of-the-art techniques.

## 2SCA
## Tackle “Molecular Engine” by Early-career Researchers
### 発動分子科学への若手研究者による挑戦
### 共催：新学術領域研究「発動分子科学」

オーガナイザー：小杉 貴洋（分子科学研究所），大友 章裕（分子科学研究所）

**【学生・博士研究員発表枠あり】**

Summary:

“Molecular Engine”, design of autonomous functions through energy conversion, has bud by the orchestration of chemists, biologists, and physicists in the last five years. This scientific concept should be passed down to the next generations for further development. To this end, early-career researchers in various research fields are trying to elucidate
the energy conversion mechanism of molecular machines and to design novel ones. In this symposium, budding researchers who will lead this field related to biophysics in the future will give a talk about their latest exciting research results by developing cutting-edge technologies and future prospects.

## 2SDA
## Innovative label-free nanopore sensing toward biophysical studies and applications
### 先端的ラベルフリーナノポア計測による生物物理学への展開と応用

オーガナイザー：山崎 洋人（東京大学），庄司 観（長岡技術科学大学）

**【学生・博士研究員発表枠あり】**

Summary:

The understanding of the biomolecule structural and dynamic properties has provided a plethora of information about the roles of various molecules, and leads to the development of innovative industrial enzymes and pharmaceuticals. Among

technologies uncovering biological molecules, nanopore sensing has become attractive since it can study single molecule properties, such as surface charge, molecular size, shape, chain length, chemical structures and so on. In this symposium, we will organize the session to present the latest nanopore research for biophysics studies and applications.

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## 2SEA

## Unique Spatiotemporal Allostery Emerges in 100nm-Sized Molecular Systems
## 100nm サイズの分子集団で顕在化する非凡な時空アロステリー

オーガナイザー：成田 哲博（名古屋大学），秋山 修志（分子科学研究所）

**【学生・博士研究員発表枠あり】**

Summary:

Is it possible to explain biological phenomena occurring at the cellular level on the basis of the physicochemical properties of molecules? Observations focused on the cellular scale provide little information about molecules, while investigations of molecular structure and dynamics with high spatiotemporal resolution require handling isolated and purified samples in vitro. However, how and what kind of connections do we need in order to understand biological phenomena? In modern life science research, the initial selection of the most suitable model organism has a great impact on the success or failure of later research. In the same way, the selection of an appropriate spatiotemporal scale is important for cutting into the logic of "cross-scale causality". From this perspective, we realize that the smallest unit of the molecular system that shows some correlation with physiological properties at the tissue or cellular level is exclusively concentrated in the 100 nm scale (or several hundred molecules). In this symposium, we will examine the spatiotemporal hierarchy of the 100 nm scale from multiple perspectives of biophysics, structural biology, and computational science, and discuss strategies for the evolution of correlation into causation.

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## 2SFA

## Japan-US symposium on motor proteins and associated single-molecule biophysics

オーガナイザー：Kumiko Hayashi（Tohoku Univ.），Jakia Jannat Keya（NINS）

**【学生・博士研究員発表枠あり】**

Summary:

This is the second symposium between Japan and USA on motor proteins as a continuation of the first one held in 2021 BSJ meeting. Speakers in this symposium are internationally recognized as experts in the field of motor proteins, and their associated proteins. We are planning to prepare enough time to have a deep and detailed discussion among the speakers and audience on these subjects. The symposium topics cover multidisciplinary applications of genetics, bio-engineering, bio-chemistry, medical science, and physics, which will give us new insights into motor proteins, as well as interesting applications of existing single-molecule techniques.

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## 2SGA

## Advanced Imaging Technologies Leading the Way to “Singularity Biology”
## シンギュラリティ生物学を導くイメージング技術

**共催：新学術領域研究「シンギュラリティ生物学」**

オーガナイザー：蛭田 勇樹（慶應義塾大学），渡邉 朋信（理化学研究所）

**【学生・博士研究員発表枠あり】**

Summary:

In order to study the processes that “singularity cells”, considered as minority entities, causing criticality to a multi-cellular system, comprehensive development of imaging technologies is essential because of its necessary for multi-layer and multi-modal observation of the dynamics and functions of the cells and the multi-cellular system. To do the end, the research project “Singularity Biology” have developed a trans-scale microscopy system, AMATERAS, as a basis for imaging. This symposium introduces the microscopy technologies, including AMATERAS, and advanced probe technologies to visualize singularity phenomena. We hope that this symposium will lead to the creation of effective collaboration projects on Singularity Biology.

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## 2SHA

## Next-generation biological manipulation pioneered by biomolecular engineering and low-physical energy logistics

### 生体分子工学と低物理エネルギーロジスティックスで切り拓く新たな生体操作学

### 共催：学術変革領域研究（B）「生体分子工学と低物理エネルギーロジスティクスの融合による次世代非侵襲深部生体操作」

オーガナイザー：井上 圭一（東京大学），今村 博臣（京都大学）

Summary:

Optogenetics enabled us precisely and noninvasively manipulate a variety of biological events in vivo such as neural firing, gene expression, cellular morphological change and so on. To expand the concept of optogenetics toward biological events in deep tissue which are difficult by using visible light, further paradigm shift of manipulation technology is required. To achieve this goal, we are focusing on using photothermal effect, ultrasound and magnetic field as novel external-field technologies to manipulate biological responses even in deep tissues by combining biomolecular engineering of new molecular systems and low-physical energy logistics. In this symposium, we will introduce cutting-edge researches for next generation biological manipulation.

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# 13:50～16:20

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## 2SAP

## Information Physics of multi-cellular systems

### 多細胞系の情報物理学

### 共催：新学術研究領域「情報物理学でひもとく生命の秩序と設計原理」

オーガナイザー：小林 徹也（東京大学），川口 喬吾（理化学研究所），石島 秋彦（大阪大学）

**【学生・博士研究員発表枠あり】**

Summary:

Physical understanding of multi-cellular systems is the unxplored frontier in biophysics. Sparked by the rapid advancements in bioimaging, bioinformatics, symthetic biology and so on, multi-cellular systems are becoming a promising target of biophysics. In this symposium, we showcase the attempts to investigate the design principles of multi-cellular systems by using or integrating the methods of physics, informatics, and other disciplines.

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## 2SBP

## High-performance computational biophysics with supercomputer Fugaku

### 富岳を用いた高性能計算による生物物理

### 共催：「富岳」成果創出加速プログラム「全原子・粗視化分子動力学による細胞内分子動態の解明」

オーガナイザー：松永 康佑（埼玉大学），信夫 愛（理化学研究所）

**【学生・博士研究員発表枠あり】**

Summary:

Computational approaches are becoming increasingly important in biophysics, not only for simulations but also for the detailed interpretation of various measurement data. In particular, with the recent launch of modern supercomputers such as Fugaku, enormous computational resources have become available, and new computational methods and applications that were not computationally feasible in the past are becoming possible. In this symposium, we invite researchers who conduct cutting-edge high-performance computations. We discuss current computational research using supercomputers as well as future directions of computational biophysics.

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## 2SCP

## Design of biomolecules, protein, RNA, and DNA

### 生体分子の人工設計：タンパク質、RNA、DNA

オーガナイザー：古賀 信康（分子科学研究所），神谷 由紀子（名古屋大学）

Summary:

The biomolecules, protein, RNA, and DNA, control cell functions. The design technologies for the biomolecules and

their interactions have been greatly advanced, which made it possible to create a wide range of biomolecules not existing in nature. In this symposium, each of the biomolecular design geeks will present the basics of the design technology and latest results. We then discuss about future perspectives to create novel biomolecules.

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## 2SDP

## Metal-ion regulation of enzyme dynamics

### 金属イオン制御による酵素の動態

オーガナイザー：織田 昌幸（京都府立大学），森川 耿右（京都大学）

**【学生・博士研究員発表枠あり】**

Summary:

Enzyme function closely correlates with its structural dynamics, and is often regulated by metal-ion binding. In many cases, metal-ions bind to enzymes rather weakly, and induce protein conformations or conformational ensembles. This essential structure-function relationship is an attractive but difficult target to be analyzed. The invited speakers present challenging efforts on enzymes, such as cutinase, RNaseH, and DNAzyme, which are regulated by $Ca^{2+}$ or $Mg^{2+}$. We hope that discussions based on presented biophysical data could facilitate us to understand real dynamic views of metal-enzyme interactions.

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## 2SEP

## Dynamic translation: from initiation to the end

### ダイナミックな翻訳　その開始から終わりまで

オーガナイザー：丹澤 豪人（大阪大学），楊 倬皓（大阪大学）

**【学生・博士研究員発表枠あり】**

Summary:

Translation on ribosomes is a fundamental biological phenomenon that requires strict spatiotemporal regulation and quality control. Since translation is a multi-step reaction, it is necessary to clarify the details of each step in order to understand its whole glance. Recently, with advancing and developing analytical methods such as structural analysis, single molecular imaging, and NGS, it has been uncovered that the translation cycle on ribosomes is regulated in various ways. In this symposium, we would like to have young researchers from different fields shed light on and discuss the dynamics of cis/trans-acting translational control on ribosomes from theoretical and experimental perspectives.

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## 2SFP

## Biophysical elucidation of neural network and chemical regeneration of neural tissue

### 生物物理学による脳の理解と化学的再生

**共催：学術変革領域研究（B）「遅延制御超分子化学」**

オーガナイザー：村岡 貴博（東京農工大学），齋尾 智英（徳島大学）

Summary:

In recent years, brain science has made remarkable progress. Understanding neural circuits and elucidation of signal transduction processes at the molecular level are being carried out. Not only neuroscience but also mechanistic biochemical studies on neural diseases are progressing. Neurodegenerative diseases are one representative example, and the structure and dynamics of the causative protein are being elucidated at the single-molecule level. Integrating discussions between biophysical neuroscience and chemical research of the brain should address important unexplored issues such as the precise elucidation of brain function and the development of neuronal tissue regeneration technology.

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## 2SGP

## Physicochemical analyses of structural dynamics for amyloid and gel

### 物理化学的解析から探るアミロイド・ゲルの構造ダイナミクス

オーガナイザー：田中 元雅（理化学研究所），真板 宣夫（量子科学技術研究開発機構）

**【学生・博士研究員発表枠あり】**

Summary:

Disease-associated proteins often form apparently rigid aggregates such as amyloid and gel. Interestingly, however, recent studies have found that amyloid and gel are not the final dead-end products of proteins, but rather undergo dynamic structural changes by cellular proteins and environmental factors, which potentially provide great impacts on cellular

phenotypes. However, compared to static structures of amyloid and gel, the details of their dynamic structural changes remain poorly understood. In this symposium, we would like to share and discuss the latest findings that clarify the structural dynamics of amyloid and gel by physicochemical analysis through the development of new technologies, and contribute to further advances of the research field.

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## 2SHP

## Biophysical approach for multifaced protein world

### マルチファセット・プロテインズへの生物物理アプローチ

**共催：学術変革領域研究（A）「マルチファセットプロテインズ」**

オーガナイザー：渡邉 力也（理化学研究所），太田 元規（名古屋大学）

**【学生・博士研究員発表枠あり】**

Summary:

In recent years, our perception of the "protein world" has been expanding and transforming with the discovery of many aspects that were previously unseen. In this symposium, we would like to discuss the biophysical approaches to clarify the molecular mechanism and physiological significance of the expanding and changing protein world from a "multifaceted" perspective.

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# 3日目 ＜9月30日(金)＞
# 9:00～11:30

## 3SAA
## Toward a standardization of luminescence, fluorescence measurements and light microscopy
### 発光・蛍光計測と光学顕微鏡の標準化を目指して

オーガナイザー：佐々木 章（産業技術総合研究所），近江谷 克裕（産業技術総合研究所）

**【学生・博士研究員発表枠あり】**

Summary:

The quantitative aspect of luminescence, fluorescence measurement and light microscopy is becoming significant. The challenge now lies in improving the accuracy and precision of the data obtained from such measurements. Standardization is the way to achieve precise, reproducible and inter-comparable measurement. Improving these will facilitate the comparison of results between different instruments/institutions and therefore ensure the reproducibility of results. In this symposium, recent standardization effort in the world (e.g. ISO) will be introduced in addition of leading edge researches of the related field.

## 3SBA
## Visualization of structural dynamics of biomolecules using a variety of advanced techniques
### 様々な先端的手法で挑む生体分子の構造ダイナミクスの可視化
### 共催：新学術研究領域「高速分子動画」

オーガナイザー：梅名 泰史（名古屋大学），清水 伸隆（高エネルギー加速器研究機構）

Summary:

Time-resolved serial femtosecond crystallography (TR-SFX) using X-ray free-electron laser (XFEL) has recently been established as one of the approaches to obtain structural dynamics of biological molecules. Furthermore, various biophysical analyses are necessary to understand complicated biological dynamic events properly, and novel methods have been proposed to obtain more detailed interpretations. The integrated collaborations between these methods and TR-SFX will take us to visualize biological processes as "molecular movies" in the future. In this session, we will introduce not only the latest SFX studies but also the various novel approaches to capture dynamic biological events and advance to understand the biomolecular functions through integrative research.

## 3SCA
## Hierarchies of autonomy and spontaneity and adaptation: Molecular-cell-muscle-body-brain linkage of redundancy to action (health)
### 自主・自発の階層と適応：冗長性を行動力(健康)につなげる分子-細胞-筋-身体-脳連携

オーガナイザー：跡見 順子（東京農工大学），岩城 光宏（理化学研究所）

**【学生・博士研究員発表枠あり】**

Summary:

Fumio Osawa, the founder of the Biophysical Society of Japan, saw the essence of life as "independence and spontaneity. Humans, who are at the mercy of fragmented science, technology, and concepts, have lost sight of the larger framework for creating independence and spontaneity. This symposium will explore the path to extend the hierarchy of life's autonomy and spontaneity, in which protein interactions lead to emergence and molecular chaperones lead to adaptation, from the cell to the human body and mind. This will provide the basis for the creation of new health, industry, and medical science and education.

## 3SDA

## New implications of sulfur in protein science

### 硫黄のタンパク質科学の最前線

### 共催：学術変革領域研究（A）「新興硫黄生物学が拓く生命原理変革」

オーガナイザー：増田 真二（東京工業大学），中林 孝和（東北大学）

Summary:

In recent years, attention has been focused on physiological phenomena involving sulfur, such as finding supersulfide molecules consisting of multiple sulfur atoms in mammals, including humans. In this symposium, six presenters introduce their recent results of structure-function relationships of sulfur-related proteins. We would like to discuss how biophysics can be applied to physiological phenomena involving sulfur.

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## 3SEA

## Potential of zero-emission and $CO_2$-utilizing biotechnologies

### 生物を利用したゼロエミッション・$CO_2$ 資源化技術の可能性

### 共催：NEDO ムーンショット型研究開発事業

オーガナイザー：加藤 創一郎（産業技術総合研究所），近藤 英昌（産業技術総合研究所）

Summary:

“Zero-emission”, which will reduce the emission of greenhouse-gases such as $CO_2$, $CH_4$, and $N_2O$ to mitigate climate changes, are being tackled internationally. The technologies attracting attention in recent years are physicochemical methods such as Direct Air Capture (DAC) and $CO_2$ Capture and Storage (CCS). Considering the mitigation of greenhouse gases generated from agriculture and the utilization of $CO_2$, it is necessary to develop new technologies that utilize specific abilities of living organisms. In this symposium, research projects for innovative zero-emission and $CO_2$-utilizing biotechnologies conducted by Moonshot Research & Development Program are introduced.

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## 3SFA

## Unexpected dynamic mechanisms of life uncovered by Cryo-EM

### クライオ電子顕微鏡が魅せる生命の未知なる動的なメカニズム

オーガナイザー：濡木 理（東京大学），西増 弘志（東京大学）

**【学生・博士研究員発表枠あり】**

Summary:

Recent outstanding development of single particle analysis of cryo-EM allows high-resolution structure determinations of huge and flexible supramolecular complexes, which have been never available. In this symposium, we will present and discuss on current topics of unexpected dynamic molecular and cellular mechanisms of protein and nucleic acid supramolecular complexes involved in various life phenomena.

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## 3SGA

## Creation of supramolecular biomembrane by the bottom-up self-assembly: Where material science meets biophysics

### 自己組織化で超分子生体膜を創る：材料科学と生物物理学の接点

オーガナイザー：安原 主馬（奈良先端科学技術大学院大学），森垣 憲一（神戸大学）

**【学生・博士研究員発表枠あり】**

Summary:

In biological systems, unique material properties of the membrane play central roles. The two-dimensional fluid and compartmentalization are essentially important in a variety of biological functions such as signal transduction and energy conversion. Bottom-up approaches based on the self-assembly of materials are promising to reproduce the unique membrane structures and functions, providing insights into the machinery of the biological membrane and enabling to exploit applications in real-life. This symposium will introduce unique studies to create novel artificial biomembranes using not only conventional phospholipids but also synthetic polymers, nanoparticles, and their hybrids to explore the interface between biophysics and material science.

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## 3SHA

# Construction of Higher-ordered Molecular Systems - How to Create Them?

## 高次機能性分子システム～創る方法の解明に向けて～

**共催：学術変革領域研究（A）「超越分子システム」/ 学術変革領域研究（B）「SPEED」**

オーガナイザー：松浦 友亮（東京工業大学），川野 竜司（東京農工大学），鈴木 雄太（京都大学）

Summary:

We would like to take place a joint symposium collaborated with the “Cell-free molecular system” (Grant-in-Aid for Transformative Research Areas (A)) and the “SPEED” (Grant-in-Aid for Transformative Research Areas (B)). This symposium aims to shed light on the bottom-up construction of the cell-free system and the superior protein engineering by evolution and design.