9:00〜11:30
1SP　**コロイドから生体分子まで：生物物理学の誕生と発展**
From Colloids to Biomolecules: the Birth of Biophysics and its Development

オーガナイザー：岡本 祐幸（名古屋大学），郷 通子（長浜バイオ大学/中部大学）
Organizers: Yuko Okamoto (Nagoya University), Mitiko Go (Nagahama Institute of Bio-Science and Technology/ Chubu University)

One of big flow of biophysics research in Japan was started by Professor Fumio Oosawa. His first research field was colloids, which led to the depletion force of Asakura-Oosawa Theory. He then moved to study the transitions between the G-actin and F-actin, which gave one of the earliest results of biophysics research in Japan. In this Symposium, leaders of colloid and biophysics research will look back the paths that Professor Oosawa took and present their latest results that came out from Oosawa's works.

はじめに
Opening Remarks
岡本 祐幸（名古屋大学大学院理学研究科物質理学専攻(物理系)）
Yuko Okamoto (*Department of Physics, Nagoya University*)

1S-P-1　**ソフトマター物理と大沢**
Contribution of Fumio Oosawa to Soft Matter Physics
○栗原 和枝（東北大, 未来科学技術共同研究センター）
Kazue Kurihara (*NICHe, Tohoku Univ.*)

1S-P-2　Asakura-Oosawa **理論とその広がり**
Variations on a Theory by Asakura and Oosawa
○秋山 良（九州大学大学院理学研究院化学部門）
Ryo Akiyama (*Department of Chemistry, Kyushu University*)

1S-P-3　**生物運動の仕組みを解く：大沢さんから学んだもの**
Unraveling the Mechanism of Biological Movement: What I Learned from Oosawa-san
○石渡 信一（早稲田大学理工学術院物理学科）
Shin'ichi Ishiwata (*Waseda University, Faculty of Science and Engineering, Department of Physics*)

1S-P-4　**アクチン ATP 加水分解反応のメカニズム：ATPase 蛋白質の共通性と独自性**
Reaction mechanism of actin ATP hydrolysis: as compared with other ATP hydrolysis proteins
○前田 雄一郎（名古屋大学大学院情報学研究科）
Yuichiro Maeda (*Nagoya University, Graduate School of Informatics*)

1S-P-5　**筋収縮とイオン能動輸送**
Muscle contraction and ion active transport
○神山 勉（名古屋大学大学院理学研究科物理学専攻）
Tsutomu Kouyama (*Nagoya Univ. Graduate School of Science*)

1S-P-6 揺らぎと生命機能
Fluctuation and the function of life
○柳田 敏雄 [1,2]（[1]大阪大学大学院生命機能研究科, [2]情報通信研究機構 脳情報通信融合研究センター）
Toshio Yanagida[1,2] ([1]*Osaka University Graduate school of Frontier Biosciences*, [2]*NICT CiNet*)

1S-P-7 アクチン重合の熱力学測定～ギブスの平行論に沿って～
Thermodynamic quantities of actin polymerization ~along Gibbs' equilibrium theory~
○菊本 真人 [1], 大澤 文夫 [2,3]（[1]名大理生命分 3 成田 G, [2]名大／阪大名誉教授, [3]故人）
Mahito Kikumoto[1], Fumio Oosawa[2,3] ([1]*NaritaG, Bio., Sci., Nagoya-u.*, [2]*Prof.Emertis,Nagoya/Osaka-u.*, [3]*Deceised*)

1S-P-8 筋収縮とその制御におけるアクチン繊維の構造と役割
Actin filament in muscle contraction and regulation
○難波 啓一 [1,2,3]（[1]大阪大学大学院生命機能研究科, [2]理研生命機能科学研究センター・放射光科学研究センター, [3]大阪大学 日本電子 YOKOGUSHI 協働研究所）
Keiichi Namba[1,2,3] ([1]*Graduate School of Frontier Biosciences, Osaka University*, [2]*RIKEN Center for Biosystems Dynamics Research and Spring-8 Center*, [3]*JEOL YOKOGUSHI Research Alliance Laboratories, Osaka University*)

おわりに
Closing Remarks
郷 通子（長浜バイオ大学、中部大学）
Mitiko Go (*Nagahama Institute of Bio-Science and Technology/Chubu University*)

13:30～16:00
1S-1 共催：新学術領域研究「高速分子動画」
生体機能の分子動画を撮像する革新的アプローチ
New Approaches towards molecular movies of biological functions

オーガナイザー：庄司 光男（筑波大学），久保 稔（兵庫県立大学）
Organizers: Mitsuo Shoji (University of Tsukuba), Minoru Kubo (University of Hyogo)

Time-resolved (TR) crystallography using X-ray free electron lasers (XFEL) is being established as a technique for making “molecular movies” of biological molecules over the past few years. As a next step, to deepen our understanding of how dynamically proteins work, the collaborative analyses of “molecular movies” with various kinds of biophysical methods, including the latest theoretical approaches, are required. In this session, we will share recent challenges and achievements of TR-crystallography and other state of the art experimental and theoretical techniques, to build up the dynamic pictures of proteins from the microscopic to macroscopic points of view.

1S-1-1 Protein dynamics structures revealed by time-resolved serial femtosecond crystallography
Eriko Nango[1,2] ([1]*IMRAM, Tohoku Univ.*, [2]*RIKEN RSC*)

1S-1-2 分子動画に基づく量子分子動力学シミュレーションによるバクテリオロドプシンにおけるプロトン移動の微視的機構の解明
Microscopic mechanisms of proton transfers in bacteriorhodopsin revealed by quantum molecular dynamics method based on molecular movies
○小野 純一 [1,2]（[1]京大学際融合センター, [2]早大理工総研）
Junichi Ono[1,2] ([1]*C-PIER, Kyoto Univ.*, [2]*WISE, Waseda Univ.*)

1S-1-3 分子シミュレーションによるタンパク質の機能活性化過程の原子論的解明
Atomistically Deciphering Functional Activation Processes of Proteins with Molecular Simulations
○林 重彦（京大院理）
Shigehiko Hayashi (*Grad. Sch. Sci., Kyoto Univ.*)

1S-1-4 Observation of protein dynamics with solution scattering
Masaaki Sugiyama, Rintaro Inoue (*Kyoto University*)

1S-1-5 SPring-8 におけるシリアル放射光結晶解析法の開発
Develpment of serial synchrotron crystallography at SPring-8
○熊坂 崇（（公財）高輝度光科学研究センター タンパク質結晶解析推進室）
Takashi Kumasaka (*Prot. Cryst. Anal. Div., Jpn. Sync. Rad. Res. Inst.*)

1S-1-6 SACLA を用いたチャネルロドプシンの時分割構造解析によって明らかになったイオン透過経路形成の初期構造変化
Time-resolved serial femtosecond crystallography reveals early structural changes in channelrhodopsin
○西澤 知宏（東京大学）
Tomohiro Nishizawa (*The Univ. of Tokyo*)

13:30〜16:00
1S-2 共催：新学術領域研究「「生命金属科学」分野の創成による生体内金属動態の統合的研究」最先端計測技術で拓く「生命金属科学」の新たなフロンティア
New Frontiers of “Bio-metal Science” Opened with Cutting-Edge Techniques

オーガナイザー：石森 浩一郎（北海道大学），澤井 仁美（兵庫県立大学）
Organizers: Koichiro Ishimori (Hokkaido University), Hitomi Sawai (University of Hyogo)

Trace amounts of “bio-metals” are essential for maintaining our life, but we have not yet fully understood molecular mechanisms of how they function in proteins, cells, organs, and bodies. Extensive researches of “bio-metals” have been explored by the development of precise biophysical measurements and visualization of trace metals in biological materials. Cuttingedge developments of NMR, EPR, mass spectrometry, chemical imaging, and nuclear resonance vibrational spectroscopy (NRVS) are now opening the door for new strategies to understand “bio-metals” and establish “bio-metal science”. In this symposium, pioneers of the measurements and exploitation of “bio-metals” are invited to introduce their marvelous techniques and discuss recent achievements toward medical and environmental applications.

1S-2-1 Native mass spectrometry for Bio-Metal Science
Satoko Akashi (*Grad. Sch. Med. Life Science, Yokohama City Univ.*)

1S-2-2 X-ray Crystallography and EPR Spectroscopy Reveal Active Site Rearrangement of Cold-Adapted Inorganic Pyrophosphatase
Masaki Horitani[1], Hiroshi Sugimoto[2], Keiichi Watanabe[1] ([1]*Saga Univ., Dept of Appl Biochem & Food Sci*, [2]*RIKEN, SPring-8 Center*)

1S-2-3 Exploiting paramagnetic metal ions for protein structural study in solution
Tomohide Saio, Koichiro Ishimori (*Faculty of Science, Hokkaido University*)

1S-2-4 **複数の異なる NMR データの統合解析によるタンパク質 multi-state 立体構造解析**
Multi-state protein structure determination by integrated analysis of several NMR data sets
○池谷 鉄兵, 伊藤 隆（東京都立大学理学研究科）
Teppei Ikeya, Yutaka Ito (*Graduate School of Science, Tokyo Metropolitan University*)

1S-2-5 **核共鳴振動分光法による鉄含有酵素の元素選択的測定 -世界最強強度の放射光源を利用した最近の進展-**
Atom-selective measurement of iron enzymes by nuclear resonance vibrational spectroscopy
○依田 芳卓（（公財）高輝度光科学研究センター 精密分光推進室）
Yoshitaka Yoda (*Japan Synchrotron Radiation Research Institute*)

1S-2-6 **量子ビームによる細胞内生命金属動態**
Application of quantum beam elemental analyses for dynamics of cellular distribution of bio-metals
○武田 志乃（量子科学技術研究開発機構放射線医学総合研究所）
Shino Homma-Takeda (*National Institutes for Quantum and Radiological Sciences*)

2 日目（9 月 17 日（木））／Day 2（Sep. 17 Thu.）

9:00〜11:30
2S-1 **共催：新学術領域研究「情報物理学でひもとく生命の秩序と設計原理」**
生命現象の情報物理学
Information physics of living matters

オーガナイザー：石島 秋彦（大阪大学），岡田 康志（東京大学）
Organizers: Akihiko Ishijima (Osaka University), Yasushi Okada (The University of Tokyo)

Information or signaling has been one of the core concepts to understand the biological systems. Recent progress in technologies has enabled quantitative measurements of biological phenomena even at a single molecule level. However, theoretical framework(s) are still missing that can handle information in biological systems in a quantitative and unified manner. Meanwhile, a new physics theory is emerging at the interface of the thermodynamics and the information theory. Now, information can be treated as a physical quantity just like heat or mechanical works. In this symposium, we aim to establish a new interdisciplinary research field by applying this new information physics to biological systems.

はじめに
Opening Remarks
岡田 康志（東京大学）
Yasushi Okada (*The University of Tokyo*)

2S-1-1 Thermodynamic inequalities and applications to biological systems
Andreas Dechant, Shin-ichi Sasa (*Grad. Sch. Sci., Kyoto U.*)

2S-1-2 **ERK MAPK 活性化の熱力学コストを定量化する情報幾何学的手法**
Information-geometric method to quantify the thermodynamic cost of ERK MAPK activation
芦田 慶太 [1], 青木 一洋 [2], ○伊藤 創祐 [1,3]（[1]東京大学 理学系研究科 生物普遍性研究機構, [2]自然科学研究機構 生命創成探究センター, [3]JST 戦略的創造研究推進事業, さきがけ）
Keita Ashida[1], Kazuhiro Aoki[2], **Sosuke Ito**[1,3] ([1]*Universal Biology Institute, the University of Tokyo*, [2]*Exploratory Research Center on Life and Living Systems (ExCELLS), National Institutes of Natural Sciences*, [3]*JST PRESTO*)

2S-1-3 高密度バクテリア集団研究のための広域マイクロ灌流系と、それによる細胞集団の統計物理学・情報物理学実験の試み
Extensive microperfusion system for dense bacterial populations and its applications for statistical physics of cells with information
○竹内 一将（東大・理 物理）
Kazumasa A. Takeuchi (*Dept. Physics, Univ. Tokyo*)

2S-1-4 バクテリア走化性の情報物理学
Information Physics of Bacterial Chemotaxis
○小林 徹也 [1,2], 中村 絢斗 [2]（[1]東京大学 生産技術研究所 小林(徹)研究室, [2]東京大学 情報理工学系研究科 数理情報学専攻）
Tetsuya Kobayashi[1,2], Kento Nakamura[2] ([1]*Institute of Industrial Science, the University of Tokyo*, [2]*Department of Mathematical Informatics, Graduate School of Information Science and Technology, the University of Tokyo*)

2S-1-5 アクティブマター系でのレヴィ・フライトのミクロ導出
Microscopic theory for Levy flights in active suspension
○金澤 輝代士（筑波大学システム情報系）
Kiyoshi Kanazawa (*Faculty of Engineering, Information and Systems, University of Tsukuba*)

2S-1-6 Condensed matter concepts in collective cell dynamics
Kyogo Kawaguchi[1,2,3] ([1]*RIKEN CPR*, [2]*RIKEN BDR*, [3]*UBI, Univ. Tokyo*)

9:00〜11:30
2S-2 共催：JST さきがけ「生命機能メカニズム解明のための光操作技術」光操作による生命機能研究の新展開
New horizon of bio-function studies by light control

オーガナイザー：片岡 幹雄（奈良先端科学技術大学院大学），永田 崇（東京大学）
Organizers: Mikio Kataoka (NAIST), Takashi Nagata (The University of Tokyo)

The recent remarkable advances in optogenetics, which are not limited to brain research, made it possible to further advance our understanding of many biological systems and functions. In addition to optogenetics utilizing light-sensitive proteins, various other techniques to observe, measure, analyze and control biological processes by light have also been developed one after another. In this symposium, researchers who are making remarkable contributions to life sciences by developing or applying light control techniques will discuss the present and future of the light control techniques to shed new light on their possibilities and expandability from basic biology to medical application.

2S-2-1 Optogenetic control of intracellulary expressed functional antibodies
Fuun Kawano[1,2] ([1]*The University of Tokyo*, [2]*JST PRESTO*)

2S-2-2 オプトメカニカル画像走査による高速ライトシート顕微鏡
High-speed light-sheet microscopy using optomechanical image scanning
○三上 秀治 [1,2,3]（[1]北大電子研, [2]東大理, [3]JST さきがけ）
Hideharu Mikami[1,2,3] ([1]*RIES, Hokkaido Univ.*, [2]*Sc. Sci., UTokyo*, [3]*PRESTO, JST*)

2S-2-3　フェムト秒レーザー誘起衝撃力による細胞操作とその物理
Single cell manipulations utilizing femtosecond laser impulse and the physics
○細川 陽一郎（奈良先端科学技術大学院大学物質創成科学領域）
Yoichiroh Hosokawa (*Divison of Materials Science, Nara Institute of Science and Technology*)

2S-2-4　Optogenetic control of phospholipids flipping and related biomembrane functions in budding yeast
Tomomi Suzuki[1,2], Tetsuo Mioka[3], Kazuma Tanaka[3], Akira Nagatani[1] ([1]*Grad. Sch. Sci, Kyoto Univ.*, [2]*JST, PRESTO*, [3]*Genetic Medicine Inst., Hokkaido Univ.*)

2S-2-5　植物の高速シグナル伝達を視る
Shining light on rapid signal transduction in plants
○豊田 正嗣（埼玉大・院理工）
Masatsugu Toyota (*Dept. Biochem. & Mol. Biol., Saitama Univ.*)

2S-2-6　光による不随意運動疾患根治法
Optogenetic neuromodulation for movement disorders
○吉田 史章（佐賀大・医）
Fumiaki Yoshida (*Saga Univ.Med.Sch.*)

おわりに
Closing Remarks

9:00〜11:30
2S-3　細胞の力学受容による多細胞システム恒常性の発現
Cell mechanosensing underlies homeostasis of multicellular systems

オーガナイザー：平田 宏聡（名古屋大学），野々村 恵子（基礎生物学研究所）
Organizers: Hiroaki Hirata (Nagoya University), Keiko Nonomura (NIBB)

Development and homeostasis of tissues depend on spatiotemporal control of constituent cell behaviors. Cells in tissues interact not only chemically but also mechanically with their surrounding environments including interstitial and vascular fluids, neighboring cells, and extracellular matrices. In this symposium, we discuss, from both experimental and theoretical viewpoints, how cells detect mechanical inputs from surroundings and integrate them with chemical information to achieve homeostatic regulation of multicellular systems.

2S-3-1　角化細胞の増殖の接触阻害には接着結合の引張力が必須である
Tensile force at adherens junctions is responsible for contact inhibition of keratinocyte proliferation
○平田 宏聡, Dobrokhotov Oleg, 曽我部 正博（名大・院医）
Hiroaki Hirata, Oleg Dobrokhotov, Masahiro Sokabe (*Grad. Sch. Med., Nagoya Univ.*)

2S-3-2　細胞間シグナル–上皮リモデリングのフィードバックループが制御する神経管閉鎖ジッパリング
Dynamic integration of signaling, force generation and tissue remodeling control zippering and neural tube closure
○橋本 秀彦[1], ロビン フランソワ[2], シェラード クリスティン[1], ムンロ エドウィン[1]（[1]シカゴ大学, [2]ソルボンヌ大学）
Hidehiko Hashimoto[1], Francois Robin[2], Kristin Sherrard[1], Edwin Munro[1] ([1]*University of Chicago*, [2]*Sorbonne University*)

2S-3-3 Strain-triggered mechanical feedback in self-organizing epithelial morphogenesis
Satoru Okuda (*Nano Life Science Institute, Kanazawa University*)

2S-3-4 Cell dynamics under high hydrostatic pressure conditions
Masatoshi Morimatsu[1], Masayoshi Nishiyama[2], Keiji Naruse[1] ([1]*Grad. Sch. of Med., Dent. and Pharma. Sci., Okayama Univ.*, [2]*Department of Physics, Kindai Univ.*)

2S-3-5 Mechanical stress by extracellular confinement trigger a mode transition of neuronal migration
Naotaka Nakazawa[1], Gianluca Grenci[2], Mineko Kengaku[1,3] ([1]*iCeMS, Kyoto University*, [2]*Mechanobiology Institute, National University of Singapore*, [3]*Graduate School of Biostudies, Kyoto University*)

2S-3-6 リンパ管の弁の形成における Piezo1 を介した空間的に規定されたメカノトランスダクション
Spatially defined mechanotransduction via Piezo1 involved in lymphatic valve formation
○野々村 恵子 [1], 勝田 紘基 [2], 蟹江 朱美 [1], Patapoutian Ardem[3], 藤森 俊彦 [1] ([1]基礎生物学研究所, [2]名古屋大学大学院医学系研究科, [3]スクリプス研究所)
Keiko Nonomura[1], Hiroki Katsuta[2], Akemi Kanie[1], Ardem Patapoutian[3], Toshihiko Fujimori[1] ([1]*National Institute for Basic Biology*, [2]*Nagoya Univ. Grad. Sch. Med.*, [3]*The Scripps Institute*)

9:00〜11:30
2S-4 中国-日本交流シンポジウム：膜分子ダイナミクスの最前線
China-Japan Joint Symposium: Frontline of membrane dynamics

Organizers: Junjie Hu (Institute of Biophysics, CAS), Rikiya Watanabe (RIKEN), Hiroko Bannai (Waseda University)

Basic principle underlying the membrane self-assembly, membrane fusion, and membrane transport between different organella, has been a long-time question in the field of biophysics. In this symposium, we aim to exchange knowledge and cutting-edge technologies on membrane dynamics between researchers from China and Japan, to opening up new horizons in membrane dynamics research. Four leading biophysicists from China will present their recent studies on intracellular membrane trafficking, organella shaping and remodeling, and membrane protein interactions. Researchers from Japan will introduce imaging and simulation studies at single-molecule resolution contributing to elucidate the molecular mechanism underlying membrane dynamics and membrane protein functions.

Opening Remarks
Rikiya Watanabe[1], Hiroko Bannai[2] ([1]*RIKEN*, [2]*Waseda University*)

2S-4-1 Molecular mechanisms that regulate secretion of sonic hedgehog
Yusong Guo (*Division of Life Science, Hong Kong University of Science and Technology*)

2S-4-2 自己組織化による細胞極性形成の 1 分子粒度シミュレーション
Self-organization in cellular polarity signaling reconstituted by single-molecule-imaging based single-particle simulation
○松岡 里実 [1,2,3], 上田 昌宏 [1,2] ([1]阪大・院生命機能, [2]理研・生命機能科学, [3]科学技術振興機構さきがけ)
Satomi Matsuoka[1,2,3], Masahiro Ueda[1,2] ([1]*Grad. Sch. Frontier Biosciences, Osaka Univ.*, [2]*BDR, RIKEN*, [3]*PRESTO, JST*)

2S-4-3 Towards the mechanism of mitochondrial outer membrane fusion
Song Gao (*Sun Yat-sen University Cancer Center*)

2S-4-4　1 分子イメージングによる生細胞膜中の GPCR シグナロソーム計測
Single-molecule imaging of GPCR signalosome in living cell membrane
○柳川 正隆（独立行政法人 理化学研究所 佐甲細胞情報研究室）
Masataka Yanagawa (*Cellular Informatics Lab., Riken*)

2S-4-5　A proximity labeling method to resolve membrane protein interaction networks
Min Zhuang (*School of Life Science and Technology, ShanghaiTech University*)

2S-4-6　1 分子イメージングで明らかになったラフト組織化と機能
Raft organization and function as revealed by single-molecule imaging
○鈴木 健一 [1,2]（[1]岐阜大・G-CHAIN, [2]東海国立大学機構糖鎖生命コア研究拠点）
Kenichi Suzuki[1,2] ([1]*G-CHAIN, Gifu Univ.*, [2]*Tokai National Higher Education System, iGCORE*)

2S-4-7　Fusion of the inner mitochondrial membrane
Junjie Hu (*Institute of Biophysics, CAS*)

Closing Remarks
Junjie Hu (*Institute of Biophysics, CAS*)

9:00〜11:30
2S-5　光受容体の構造と機能を分光学で解き明かす
Spectroscopic approach for exploring structure and function of photoreceptor proteins

オーガナイザー：海野 雅司（佐賀大学），田母神 淳（松山大学）
Organizers: Masashi Unno (Saga University), Jun Tamogami (Matsuyama University)

Understanding protein function at the atomic level is an important challenge for biophysics. Such an attempt requires the high-resolution structural information including protons as well as an electronic structure of a cofactor molecule embedded in protein environments to realize how proteins work. Spectroscopic and theoretical studies are crucial to gather these insights. In this symposium, recent state-of-the-art investigations of photoreceptor proteins such as cyanobacteriochromes, microbial rhodopsins, and flavin-containing BLUF proteins are presented, and we will discuss future perspectives of the related research fields.

はじめに
Opening Remarks
海野 雅司（佐賀大学）
Masashi Unno (*Saga University*)

2S-5-1　ビリン結合光受容体の多様な吸収波長の分子基盤
Molecular basis of spectral tuning of the bilin-based photosensors
○広瀬 侑（豊橋技術科学大学）
Yuu Hirose (*Toyohashi Univ. of Tech.*)

2S-5-2　GAF ドメインの結晶構造解析と NMR 解析
Crystallography and NMR Studies of GAF domain
○三島 正規（東京都立大学 理学研究科）
Masaki Mishima (*Grad. Sch. Sci., Tokyo Metro. Univ.*)

2S-5-3 フラッシュフォトリシス法を用いた微生物ロドプシンの光反応解析
Photoreaction analysis of microbial rhodopsin by flash photolysis techniques
○菊川 峰志 [1,2]（[1]北大・院先端生命, [2]北大・国際連携研究教育局）
Takashi Kikukawa[1,2] ([1]*Fac. Adv. Life Sci., Hokkaido Univ.*, [2]*GI-CoRE, Hokkaido Univ.*)

2S-5-4 ラマン光学活性を利用したプロトンポンプ型ロドプシンにおける発色団の立体構造解析
Three-dimensional chromophore structures in proton-pumping microbial rhodopsins from Raman optical activity
○藤澤 知績（佐大理工）
Tomotsumi Fujisawa (*Fac. Sci. Eng., Saga Univ.*)

2S-5-5 FTIR 分光法で示されたフラビン結合光受容体における特異的な水素結合の形成
Unique hydrogen-bonding formation in Flavin-binding photoreceptors revealed by FTIR spectroscopy
○岩田 達也（東邦大学薬学部）
Tatsuya Iwata (*Phar. Sci. Toho Univ.*)

2S-5-6 分光学による光受容体の構造・機能解析：将来展望
Future perspective of spectroscopic study on structure and function of photoreceptor proteins
○田母神 淳（松山大・薬）
Jun Tamogami (*College Pharm. Sci., Univ. Matsuyama*)

9:00〜11:30
2S-6 タンパク質のフォールディング・ミスフォールディング・凝集の物理科学研究とその生命科学的背景
Biophysical studies on protein folding / misfolding and aggregation with regard to life sciences

オーガナイザー：黒田 裕（東京農工大学），新井 宗仁（東京大学）
Organizers: Yutaka Kuroda (Tokyo University of Agriculture and Technology), Munehito Arai (The University of Tokyo)

Because most proteins can function only when they are natively folded, protein aggregation and folding/misfolding is indeed deeply associated to most aspects of life sciences and research in this field is attracting a renewed attention. In this symposium, we will discuss new concepts of protein aggregation, folding and misfolding from a biophysical, conformational and structural viewpoint, and discuss their possible consequences on the biological/physiological function of a protein.

2S-6-1 デング・エンベロープ蛋白質第 3 ドメインのミスフォールディングと凝集
Misfolding and aggregation of the dengue envelop protein domain 3
○黒田 裕, 早乙女 友則（東京農工大学工学研究院）
Yutaka Kuroda, Tomonori Saotome (*Tokyo Univ Agr and Tech*)

2S-6-2 再構築型無細胞タンパク質合成系を用いたタンパク質凝集の網羅解析
Comprehensive analysis of protein aggregation by using a reconstituted cell-free translation system
○丹羽 達也, 田口 英樹（東京工業大学 科学技術創成研究院）
Tatsuya Niwa, Hideki Taguchi (*Institute of Innovative Research, Tokyo Institute of Technology*)

2S-6-3 Molecular basis for diversification of amyloid conformation
Yumiko Ohhashi[1], Motomasa Tanaka[2] ([1]*Grad.Sch.Sci., Kobe Univ.*, [2]*CBS, RIKEN*)

2S-6-4　6 M 塩化グアニジニウム中で変性したユビキチンの DMSO-停止 2D NMR 法による H/D 交換反応解析
The H/D-Exchange Kinetics of Unfolded Ubiquitin in 6 M Guanidinium Chloride Studied by the DMSO-Quenched 2D NMR Techniques
○桑島 邦博 [1,2], 矢木-内海 真穂 [3,4], 谷中 冴子 [3,4], 加藤 晃一 [3,4]（[1]東大・理, [2]韓国高等科学院, [3]分子研, [4]生命創成探究セ）
Kunihiro Kuwajima[1,2], Maho Yagi-Utsumi[3,4], Saeko Yanaka[3,4], Koichi Kato[3,4] ([1]*Univ. Tokyo*, [2]*KIAS*, [3]*IMS*, [4]*ExCELLS*)

2S-6-5　タンパク質のフォールディングとデザインへの理論的アプローチ
Theoretical approaches to protein folding and design
○新井 宗仁 [1,2]（[1]東大・総合文化・生命環境, [2]東大・理・物理）
Munehito Arai[1,2] ([1]*Dept. Life Sci., Univ. Tokyo*, [2]*Dept. Phys., Univ. Tokyo*)

9:00〜11:30
2S-7　共催：新学術領域研究「シンギュラリティ生物学」
免疫とがんにおけるシンギュラリティの検出と新たなイメージング技術
Detection of Singularity in Immunity and Cancer by Novel Imaging Techniques

オーガナイザー：花岡 健二郎（東京大学），竹馬 俊介（慶應義塾大学）
Organizers: Kenjiro Hanaoka (The University of Tokyo), Shunsuke Chikuma (Keio University)

It is known that a very small number of cells that can be counted in the fingers become singularities and dramatically change the biological system. In this symposium, we focused on the establishment of the immune response and the carcinogenic process, approached the essential understanding of the mechanism from the viewpoint of singularity. We also selected the topics of the latest imaging technologies that enable the detection of rare events in the body. Using these as inputs, we will comprehensively discuss the singularity in biology.

2S-7-1　Singularity in Immunity: Immune-aging associates with a defect in Chromatin Regulation on Immune Cells
Shunsuke Chikuma (*Microbiology and Immunology, Keio University School of Medicine*)

2S-7-2　Which cells initiate lymph node formation?
Shinichiro Sawa (*Medical Institute of Bioregulation, Kyushu University*)

2S-7-3　Live imaging of epidermal sensory nerves and keratinocyte tight junctions
Takaharu Okada[1,2] ([1]*RIKEN IMS*, [2]*Grad School of Med Life Sci, Yokohama City Univ*)

2S-7-4　がん細胞が出現した正常間質組織でのシンギュラリティ現象
Singularity at emergence of cancer cells in normal stroma
○昆 俊亮（東京理科大学 生命医科学研究所）
Shunsuke Kon (*Tokyo University of Science, Research Institute for Biomedical Sciences*)

2S-7-5　シンギュラリティを捉えるためのダイナミックレンジの広い光音響イメージングの研究開発
Development of photoacoustic imaging to study a singularity in high dynamic range measurement
○石原 美弥（防衛医科大学校）
Miya Ishihara (*National Defense Medical College*)

2S-7-6 りん光寿命イメージング顕微分光法による組織内低酸素細胞の可視化
Visualization of hypoxia cells in tissues by using phosphorescence lifetime imaging microscopy
○吉原 利忠（群馬大・院理工）
Toshitada Yoshihara (*Grad. Sch. Sci. and Tech., Univ. Gunma*)

2S-7-7 動物体内での pH 測定を目指した近赤外レシオ型蛍光プローブの開発
Development of a near-infrared ratiometric fluorescent probe for pH inside the body
○花岡 健二郎（東大院薬）
Kenjiro Hanaoka (*Grad. Sch. of Pharm. Sci., The Univ. of Tokyo*)

13:30〜16:00
2S-8 Happy な細胞に聞いた生命のしくみ―井上信也博士に捧げる
Listening to happy cells through the microscope -a tribute to Shinya Inoué

オーガナイザー：谷 知己（産業技術総合研究所），前島 一博（国立遺伝学研究所）
Organizers: Tomomi Tani (AIST), Kazuhiro Maeshima (NIG)

Shinya Inoué had revealed the basic mechanisms of spindles for chromosome segregation through the observation of weak birefringence in living cells. Preparing “Happy Cells” was his central “mantra” for successful imaging and the analysis that lead to fundamental understanding of many biological events. This symposium aims to gather scientists from different research fields with their unique approaches for imaging and the analysis and to share with the audience the excitement to learn the mechanisms of life through the imaging of “Happy Cells”, together with Shinya’s works that he left for us.

2S-8-1 導入；井上信也博士の仕事の紹介
An introduction to the works of Shinya Inoué
○谷 知己（産業技術総合研究所）
Tomomi Tani (*AIST*)

2S-8-2 遠心偏光顕微鏡(CPM)を用いた核を細胞中央へ運ぶ力の測定
Measurement of cellular forces bringing the nucleus to the cell center using the Centrifuge Polarization Microscope (CPM)
○木村 暁 [1,2,3]（[1]遺伝研, [2]ウッズホール海洋生物学研究所, [3]総研大・遺伝学）
Akatsuki Kimura[1,2,3] ([1]*Natl Inst Genet*, [2]*Marine Biological Lab, USA*, [3]*Dept Genet, Sokendai*)

2S-8-3 Cellular machinery for controlling actomyosin contractility in vivo
Asako Shindo (*Grad.Sch.Sci., Univ. Nagoya*)

2S-8-4 植物の紡錘体形成における微小管の起源
Origin of mitotic spindle microtubules in plant cells
○村田 隆 [1,4,5], 大友 康平 [2,3,4], 根本 知己 [2,3,4], 長谷部 光泰 [4,5]（[1]神奈川工科大・応用バイオ, [2]生理研・バイオフォトニクス, [3]自然科学研究機構・生命創成探求セ, [4]総研大・生命科学, [5]基生研・生物進化）
Takashi Murata[1,4,5], Kohei Otomo[2,3,4], Tomomi Nemoto[2,3,4], Mitsuyasu Hasebe[4,5] ([1]*Appl. Biosci., Kanagawa Inst. Tech.*, [2]*Div. Biophoto., NIPS*, [3]*ExCELLS, NINS*, [4]*Sch. Life Sci., Sokendai*, [5]*Div. Evol. Biol., NIBB*)

2S-8-5 植物のスピンドルと染色体の動きについて
Spindle and chromosome motility in plant cells
○五島 剛太 [1,2]（[1]名大・菅島臨海実験所, [2]名大・生命理学）
Gohta Goshima[1,2] ([1]*Sugashima MBL, Nagoya Univ.*, [2]*Div. Bio-Sci, Nagoya Univ.*)

2S-8-6 Toward understanding the real chromatin organization present in the cell
Kazuhiro Maeshima (*National Institute of Genetics*)

13:30〜16:00
2S-9 膜タンパク質を「生きた」状態で再構成・解析・利用するための新しい脂質膜テクノロジー
New lipid membrane technologies for reconstitution, analysis, and utilization of 'living' membrane proteins

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）
Organizers: Kazuma Yasuhara (NAIST), Kenichi Morigaki (Kobe University)

Biomembranes contribute to various essential cellular functions such as signal transduction, material transport, and energy production through the interplay of membrane proteins and lipid bilayers. There is a great need for native-like artificial membranes for reconstituting membrane proteins and their complexes to understand the nature of biomembranes from a biophysical viewpoint. In this symposium, we will focus on novel lipid-based technologies, including artificial lipids, surfactants, micro processing, and advanced measurements that enable the reconstitution and analysis of membrane proteins in a 'living' state.

はじめに
Opening Remarks
安原 主馬（奈良先端科学技術大学院大学）
Kazuma Yasuhara (*NAIST*)

2S-9-1 部分フッ素化リン脂質膜
Partially Fluorinated Phospholipid Membrane
○園山 正史 [1,2,3]（[1]群馬大・院理工, [2]群馬大・未来先端, [3]群馬大・食健康セ）
Masashi Sonoyama[1,2,3] ([1]*Div. Mol. Sci., Gunma Univ.*, [2]*GIAR, Gunma Univ.*, [3]*GUCFW, Gunma Univ.*)

2S-9-2 有機-無機ハイブリッド型メゾ構造を有する脂質キュービック相の構築
Design of lipid cubic phase possessing organic-inorganic hybrid mesostructure
○尾本 賢一郎, 刈谷 未来, 安原 主馬, 林 有吾, 上久保 裕生, ラッペン ゲナエル（奈良先端大・先端科技）
Kenichiro Omoto, Miki Kariya, Kazuma Yasuhara, Yugo Hayashi, Hironari Kamikubo, Gwenael Rapenne (*Grad. Sch. of Sci. and Tech., NAIST*)

2S-9-3 脂質ベシクル系における不均一性と線張力
Heterogeneity and line tension in lipid vesicle system
○瀧上 隆智（九州大学）
Takanori Takiue (*Kyushu University*)

2S-9-4 抗菌ペプチドや細胞透過ペプチドの作用機構を解明するための単一巨大リポソーム法
The Single GUV Method for Revealing Mode of Action of Antimicrobial Peptides (AMPs) and Cell-Penetrating Peptides (CPPs)
○山崎 昌一 [1,2,3]（[1]静大・電研, [2]静大・創造院, [3]静大・院理）
Masahito Yamazaki[1,2,3] ([1]*Res. Inst. Ele., Shizuoka Univ*, [2]*Grad. Sch. Sci. Tech., Shizuoka Univ.*, [3]*Grad. Sch. Sci., Shizuoka Univ.*)

2S-9-5 LAiR: rapid reconstitution of integral membrane proteins into lipid bilayers
Christoph Gerle[1], Amer Asseri[5], Albert Godoy-Hernandez[3], Aiden Purugganan[3], Chimari Jiko[2], Carol de Ram[3], Holger Lill[5], Martin Pabst[3], Kaoru Mitsuoka[4], Dirk Bald[5], Duncan G.G. McMillan[3] ([1]*Osaka Univ., IPR*, [2]*Kyoto University*, [3]*TU Delft*, [4]*Osaka Univ.*, [5]*VU Amst.*)

2S-9-6 Microsytem for single molecule analysis of membrane proteins
Rikiya Watanabe (*CPR, RIKEN*)

おわりに
Closing Remarks
森垣 憲一（神戸大学）
Kenichi Morigaki (*Kobe University*)

13:30〜16:00
2S-10 Biomolecular Design to Control their Functions

Organizers: Tetsuya Kadonosono (Tokyo Institute of Technology), Duy Phuoc Tran (Tokyo Institute of Technology)

Biomolecular design is among the attractive research themes toward the Sustainable Development Goals of UNESCO. Recent advances in both computational and experimental methods have boosted the theme toward the controlling biomolecular functions after carefully understanding of their activity. In this symposium, we would like to bring to the audience recent advances in: - Application of the machine learning and simulation methods in protein design. - Transmembrane protein design to control the ion pump. - Protein assembly design: toward bio-machinery. - Disease-targeted antibody design. - Peptide design.

2S-10-1 Biomolecular Functional Design: an Introduction to Recent Advances
Duy Phuoc Tran (*TokyoTech, LifeSciTech*)

2S-10-2 配列空間をうまく絞り込むライブラリーデザインサイクル：酵素・抗体の設計アシスト
Library design cycle for efficient exploring in sequence space: design assist for enzyme and antibody
○梅津 光央 [1,2]（[1]東北大学大学院工学研究科, [2]理化学研究所革新知能統合研究センター）
Mitsuo Umetsu[1,2] ([1]*Department of Biomolecular Engineering, Tohoku University*, [2]*Center for Advanced Intelligence Project, RIKEN*)

2S-10-3 微生物ロドプシンの機能と色の制御
Control of functions and colors of microbial rhodopsins
○井上 圭一（東京大学・物性研究所）
Keiichi Inoue (*Inst. Solid State Phys., Univ. Tokyo*)

2S-10-4 機械学習による機能ペプチドの自動設計
Designing functional peptides with machine learning
○津田 宏治（東京大学新領域）
Koji Tsuda (*GSFS, University of Tokyo*)

2S-10-5 ナノ機能化へ向けたタンパク質結晶設計
Protein Crystals for Designing Multiple Nanofunctions
○上野 隆史（東京工業大学　生命理工学院）
Takafumi Ueno (*Tokyo Tech*)

2S-10-6 合理設計による新規タンパク質フォールドの探索
Exploration of novel protein folds by de novo design
○古賀 信康 [1,2,3]（[1]自然科学研究機構・生命創成探究センター, [2]自然科学研究機構・分子科学研究所, [3]総合研究大学院大学）
Nobuyasu Koga[1,2,3] ([1]*NINS, ExCELLS*, [2]*NINS, IMS*, [3]*SOKENDAI*)

2S-10-7 A smart design of target-binding small proteins for molecular target therapy
Tetsuya Kadonosono (*Tokyo Tech*)

13:30〜16:00
2S-11 光生物学研究の多様性〜分子から生物個体まで〜
Diversity of photobiology; from molecules to organisms

オーガナイザー：小島 慧一（岡山大学），山田 大智（兵庫県立大学）
Organizers: Keiichi Kojima (Okayama University), Daichi Yamada (University of Hyogo)

Living organisms utilize light as an energy source and environmental signals. Biological, physical and chemical researches from molecules to organisms have been actively performed to obtain the answer to how organisms rationally utilize light. Recently, understanding of the mechanisms by photobiological researches is accelerating the development of optogenetics and bioimaging technology, and contributed to the field of biophysics. In this symposium, the active (mainly young) researchers from diverse background will present their recent progress and findings in photobiology. We will discuss the future aspect of photobiology.

2S-11-1 赤外分光法を用いた光受容タンパク質の分子機構研究
The molecular mechanism of photoreceptor proteins by infrared spectroscopy
○山田 大智（兵庫県大・院生命理学）
Daichi Yamada (*Grad. Sch. Life Sci., Univ. Hyogo, Japan*)

2S-11-2 Triggers of Primary Protein Dynamics in Photoreceptor Proteins
Shinya Tahara (*Laboratory for Biophysical Chemistry, Osaka University*)

2S-11-3 Analysis of photoinduced reactions in UV-damaged DNA repair of photolyases
Ryuma Sato (*RIKEN*)

2S-11-4　**酵素型ロドプシンの構造基盤**
Structural insights into the mechanism of rhodopsin phosphodiesterase
○志甫谷 渉[1], 生田 達也[1], 杉浦 雅大[2], 吉田 一帆[2], 渡 雅仁[2], 戸叶 貴也[3], 片山 耕大[2], 角田 聡[2], 内橋 貴之[3], 神取 秀樹[2], 濡木 理[1]（[1]東大院理生物, [2]名工大院工生命, [3]名大院理物理）
Wataru Shihoya[1], Tatsuya Ikuta[1], Masahiro Sugiura[2], Kazuho Yoshida[2], Masahito Watari[2], Takaya Tokano[3], Kota Katayama[2], Satoshi Tsunoda[2], Takayuki Uchihashi[3], Hideki Kandori[2], Osamu Nureki[1] ([1]*Dept. of Biol., Grad. Sch. Sci., Univ. of Tokyo*, [2]*Life Sci. Appl. Chem., Grad. Sch. Eng., NIT*, [3]*Dept. of Phys., Grad. Sch. Sci., Nagoya Univ.*)

2S-11-5　**光スイッチの開発を目指したシアノバクテリオクロムの分子基盤**
Molecular basis of cyanobacteriochromes for developing photoswitches
○伏見 圭司, 成川 礼（静大・理学・生物）
Keiji Fushimi, Rei Narikawa (*Biol. Sci., Shizuoka Univ.*)

2S-11-6　**概日時計制御における CRYPTOCHROME の役割**
Function of CRYPTOCHROME in regulation of the circadian clock
○平野 有沙[1,2], 櫻井 武[1,2], Ptacek Louis[3], Fu Ying-Hui[3]（[1]筑波大学医学医療系, [2]筑波大学, WPI-IIIS, [3]カルフォルニア大学サンフランシスコ校）
Arisa Hirano[1,2], Takeshi Sakurai[1,2], Louis Ptacek[3], Ying-Hui Fu[3] ([1]*Faculty of Medicine, University of Tsukuba*, [2]*International Institute for integrative Sleep medicine (WPI-IIIS), University of Tsukuba*, [3]*University of California, San Francisco*)

2S-11-7　**植物の光受容体フォトトロピンのシグナル伝達とモデルケースとしての気孔開口**
Plant photoreceptor phototropin signaling and stomatal opening as a model case
○井上 晋一郎（名古屋大学大学院理学研究科生命理学専攻植物性理学グループ）
Shin-ichiro Inoue (*Division of Biological Science, Graduate School of Science, Nagoya University*)

2S-11-8　**生命機能の理解と制御に向けたロドプシン研究**
Analysis of rhodopsins for a rational understanding and controlling of biological functions
○小島 慧一（岡山大・院・医歯薬(薬)）
Keiichi Kojima (*Grad. Sch. of Med. Dent. Pharm. Sci., Okayama Univ.*)

13:30〜16:00
2S-12　生体分子と薬剤の構造ゆらぎの生命機能科学
Biofunctional Science of the Structural Fluctuations of Biomolecules and Drugs

オーガナイザー：米澤 康滋（近畿大学），宮下 尚之（近畿大学）
Organizers: Yasushige Yonezawa (Kindai University), Naoyuki Miyashita (Kindai University)

Bio-molecules, proteins and drugs, in living cells are thermally fluctuated. It is not surprising that almost all of drugs recognize and bind the fluctuated protein. Many studies showed fluctuation movement of proteins is important for the molecular function. Then, drugs inhibit the functional movement, attract much attention. In this symposium, advanced studies on the interaction mechanism between drugs and proteins, mainly provided by young scientists are widely discussed.

2S-12-1 1分子計測と分子シミュレーションを用いたタンパク質構造ダイナミクスの統合モデリング
Integrative modeling of protein dynamics from single-molecule experiments and molecular dynamics simulations
○松永 康佑 [1,2], 大金 智則 [1,2]（[1]埼玉大学, [2]JST CREST）
Yasuhiro Matsunaga[1,2], Tomonori Ogane[1,2] ([1]*Saitama University*, [2]*JST CREST*)

2S-12-2 新しいペプチド薬と、ターゲットタンパク質と新しい薬の分子動力学シミュレーション
New Peptide Drug and the Molecular Dynamics Simulations of Target Protein and the New Drug
○松倉 里紗 [1], 宮下 尚之 [1,2], 瀧 真清 [2], 渡辺 信一 [2]（[1]近大・生物理工, [2]電通大・情報理工）
Lisa Matsukura[1], Naoyuki Miyashita[1,2], Masumi Taki[2], Shinichi Watanabe[2] ([1]*BOST., KINDAI Univ.*, [2]*Eng. Sci., UEC*)

2S-12-3 アンサンブルドッキングを用いたタンパク質相互作用プロファイル解析
Profile analysis of protein interaction surfaces with ensemble rigid-body docking process
○内古閑 伸之 [1], 松崎 由理 [2]（[1]明治大・総数, [2]東工大・ToTAL）
Nobuyuki Uchikoga[1], Yuri Matsuzaki[2] ([1]*Sch. Interdiscip. Math. Sci., Meiji Univ.*, [2]*ToTAL, Tokyo Tech.*)

2S-12-4 Turn-on / keep-on fluctuated fluorescent molecules as targeted binders
Masumi Taki (*UEC*)

2S-12-5 Analysis of an effect of mutations on the structure of CDR-H3 in the anti-HIV neutralizing antibody PG16
Hiroko X. Kondo[1,2], Ryo Kiribayashi[2], Daisuke Kuroda[3], Kouhei Tsumoto[3,4], Yu Takano[2] ([1]*Fac. Eng., Kitami Inst. Tech.*, [2]*Grad. Sch. Info. Sci., Hiroshima City Univ.*, [3]*Grad. Sch. Eng., Univ. Tokyo*, [4]*IMS, Univ. Tokyo*)

2S-12-6 Autoencoder-based analyses of dynamic allostery on GPCR
Yuko Tsuchiya[1], Kei Taneishi[2], Yasushige Yonezawa[3] ([1]*AIRC, AIST*, [2]*RIKEN*, [3]*KINDAI univ.*)

2S-12-7 タンパク質の熱力学的安定性における主要因子
Dominant factor in thermodynamic stability of protein
○墨 智成 [1], 今村 比呂志 [2]（[1]岡山大・基礎研, [2]立命館大・生命科学）
Tomonari Sumi[1], Hiroshi Imamura[2] ([1]*Res. Inst. Interdiscip. Sci., Okayama Univ.*, [2]*Dep. Appl. Chem., Ritsumeikan Univ.*)

13:30〜16:00
2S-13 核酸が拓く新・生物物理研究
Frontier of Nucleic Acid Biophysics

オーガナイザー：岡部 弘基（東京大学），瀧ノ上 正浩（東京工業大学）
Organizers: Kohki Okabe (The University of Tokyo), Masahiro Takinoue (Tokyo Institute of Technology)

In recent years, it has become clear that DNA and RNA act as the protagonists of intracellular structures and environmental fields in the physicochemical understanding of the intracellular environments, while bioengineering focused on the chemical characteristics of DNA and RNA has also developed innovative nanotechnology. In this symposium, we will take an overview of the latest physics, chemistry, and biology research on nucleic acids, and discuss the future image of biophysics, whose original discipline was to investigate the properties of biopolymers.

2S-13-1　RNA 顆粒内 mRNA の直接観察
Direct observation of mRNA inside of RNA granules
○岡部 弘基（東京大学大学院 薬学系研究科）
Kohki Okabe (*Grad Sch Parm Sci, Univ Tokyo*)

2S-13-2　エピジェネティック修飾がクロマチン転写に及ぼす影響を定量化する
Quantifying the effect of epigenetic modification on chromatin transcription
○梅原 崇史（理化学研究所 生命機能科学研究センター エピジェネティクス制御研究チーム）
Takashi Umehara (*RIKEN BDR*)

2S-13-3　Gene expression and artificial cells: Revisiting the role of active interface
Yusuke T. Maeda (*Department of Physics, Kyushu University*)

2S-13-4　分子の状態と形態を考慮したクロマチン構造の統合的モデリングを目指して
Towards Comprehensive Models of Chromatin Structures Considering the State and Shape of Molecules
○冨樫 祐一 [1,2]（[1]広島大・統合生命, [2]理研・BDR）
Yuichi Togashi[1,2] ([1]*Grad. Sch. Integr. Sci. Life, Hiroshima Univ.*, [2]*RIKEN BDR*)

2S-13-5　合成生命システム創成に向けた RNA-タンパク質複合体の活用
RNA-Protein complexes for synthetic living systems
○齊藤 博英（京都大学 iPS 細胞研究所）
Hirohide Saito (*Center for iPS Cell Research and Application, Kyoto University*)

2S-13-6　相分離とエマルションによる DNA マイクロ液滴の生物物理学
Biophysics on DNA microdroplet technology by phase separation and emulsion
○瀧ノ上 正浩（東京工業大学 情報理工学院）
Masahiro Takinoue (*Department of Computer Science, Tokyo Institute of Technology*)

13:30〜16:00
2S-14　共催：JST さきがけ「生体における微粒子の機能と制御」
多様な細胞外微粒子の生体機能を探る
Open up extracellular nanoparticles! -Their diversity and biodynamics-

オーガナイザー：白崎 善隆（東京大学），田代 陽介（静岡大学）
Organizers: Yoshitaka Shirasaki (The University of Tokyo), Yosuke Tashiro (Shizuoka University)

Various exogenous and endogenous fine particles are commonly found in a living body and those functions gain increasingly attention recent years. The strategic object of the research area is to elucidate biological system of extracellular fine particles. In the research area, we are studying their diversity, dynamics, biological functions, and association with diseases, and developing techniques to observe and measure fine particles. This symposium discusses new cutting edge results regarding extracellular fine particles from the perspective of biophysics.

はじめに
Opening Remarks
中野 明彦（理化学研究所 光量子工学研究センター）
Akihiko Nakano (*RIKEN*)

2S-14-1 Exosome-based therapy and biomarker development for the polyglutamine diseases
Toshihide Takeuchi[1,2] ([1]*Grad Sch Med, Osaka Univ*, [2]*JST-PRESTO*)

2S-14-2 **細菌が形成する細胞外小胞の多様性**
Diversity of bacterial extracellular vesicles
○田代 陽介 [1,2]（[1]静大・院総合科技, [2]JST さきがけ）
Yosuke Tashiro[1,2] ([1]*Grad. Sch. Integr. Sci. Technol., Shizuoka Univ.*, [2]*JST PRESTO*)

2S-14-3 Overlooked redox property of outer membrane vesicle surface
Akihiro Okamoto (*National Institute for Materials Science*)

2S-14-4 Amphipathic helical peptide-based fluorescent probes for exosomes by membrane curvature recognition
Yusuke Sato[1,2] ([1]*Grad. Sch. Sci., Tohoku University*, [2]*JST-PRESTO*)

2S-14-5 **ナノ流体デバイスを用いたエクソソームの簡便単離、1 粒子配列及び統合解析**
Simple isolation and integrated analysis of single exosomes on an aifA chip
○許 岩 [1,2,3]（[1]阪府大・院工, [2]JST さきがけ, [3]阪府大・NanoSquare 研）
Yan Xu[1,2,3] ([1]*Grad. Sch. Eng., Osaka Pref. Univ.*, [2]*PRESTO, JST*, [3]*N2RI, Osaka Pref. Univ.*)

2S-14-6 Collection of Extracellular Vesicles from Single Cell Using Nanopipette
Hiroki Ida[1,2,3,4], Yasufumi Takahashi[5], Akichika Kumatani[3], Yuji Nashimoto[1,6], Hitoshi Shiku[6], Takeshi Yoshida[5], Rikinari Hanayama[5] ([1]*Tohoku Univ., FRIS*, [2]*JST, PRESTO*, [3]*Tohoku Univ., AIMR*, [4]*Tohoku Univ., Grad. Sch. Env. Stu.*, [5]*Kanazawa Univ., WPI-NanoLSI*, [6]*Tohoku Univ., Grad. Sch. Eng.*)

2S-14-7 **細胞外小胞放出の 1 細胞解析**
Single Cell analysis of release dynamics of Extracellular Vesicles
○白崎 善隆（東大・院薬）
Yoshitaka Shirasaki (*Grad. Sch. Pharm. Sci., Univ. Tokyo*)

おわりに
Closing Remarks

16:30〜19:00
2S-15 膜のリモデリングと組織化の分子基盤
Molecular basis for membrane remodeling and organization

オーガナイザー：竹田 哲也（岡山大学），末次 志郎（奈良先端科学技術大学院大学）
Organizers: Tetsuya Takeda (Okayama University), Shiro Suetsugu (NAIST)

Cells and subcellular organelles in living organisms exhibit unique shapes adapted to their respective functions that change dynamically as cells divide, differentiate, migrate and invade. The dynamic morphological changes of cells and organelles require coordinated function of proteins that interact with and remodel (deform or sever) cellular membranes. Dysfunction of the membrane remodeling is tightly linked to pathogenesis of diseases including cancer and developmental defects. In this symposium, we will present and discuss about the latest knowledges on molecular mechanism of membrane remodeling and pathogenesis of diseases caused by its defects.

2S-15-1 Curvature induction and sensing of the F-BAR protein Pacsin1 on lipid membranes via molecular dynamics simulations
Md. Iqbal Mahmood[1], Hiroshi Noguchi[2], **Kei-ichi Okazaki**[1] ([1]*IMS*, [2]*ISSP, Univ. of Tokyo*)

2S-15-2 Molecular mechanisms linking actin cytoskeleton to the plasma membrane
Yosuke Senju (*RIIS, Univ. Okayama*)

2S-15-3 The extracellular vesicle formation by filopodial scission for cell migration
Tamako Nishimura, Takuya Oyama, Hooi Ting Hu, **Shiro Suetsugu** (*Nara Institute of Science and Technology*)

2S-15-4 Molecular mechanisms underlying dynamic behavior of membrane blebbing
Junichi Ikenouchi (*Kyushu Univ., Fac Sci, Dept. of Biol*)

2S-15-5 Proper membrane shaping during autophagosome biogenesis is required for non-selective sequestration of cytoplasmic components
Hitoshi Nakatogawa (*Sch. of Life Sci. & Tech.*)

2S-15-6 Dysregulated membrane remodeling in pathogenesis of congenital diseases
Tetsuya Takeda[1], Kenshiro Fujise[1], Mariko Okubo[2], Tadashi Abe[1], Hiroshi Yamada[1], Ichizo Nishino[2], Satoru Noguchi[2], Kohji Takei[1] ([1]*Okayama Univ. Grad. Sch. Med. Dent. Pharm. Sci.*, [2]*NCNP*)

2S-15-7 The structure-based targeting of alpha-synuclein to mitochondria promotes cellular health
Harvey T. McMahon (*MRC Laboratory of Molecular Biology*)

16:30〜19:00
2S-16 新時代に突入した DNA-タンパク質研究
Beginning of a new era for investigation of DNA-protein systems

オーガナイザー：Vaclav Brazda（ASCR, Czech），鎌形 清人（東北大学）
Organizers: Vaclav Brazda (ASCR, Czech), Kiyoto Kamagata (Tohoku University)

DNA-protein interactions are essential requirements for existence of life. They are involved in basic cellular processes and biological functions. Recent development of analysis and design methods open a new era in investigation of DNA-protein systems. The developed methodology includes crystal structural analysis, dynamics analysis based on single-molecule microscopy in vitro and in vivo or molecular dynamics simulations, and artificial design of DNA origami to study DNA-protein functions. Also, the improvement of genome editing tools is required for medical applications. We will invite specialists for each technique regarding DNA-protein studies and discuss recent hot topics.

2S-16-1 Watching, controlling, and designing of function and phase separation of DNA-binding protein
Kiyoto Kamagata (*IMRAM, Tohoku Univ.*)

2S-16-2 Molecular principles for optimizing protein-DNA interactions
Yaakov Levy (*WIS*)

2S-16-3 CRISPR-Cas 酵素の構造、機能、分子進化
Structure, mechanism and evolution of CRISPR-Cas enzymes
○西増 弘志（東京大学）
Hiroshi Nishimasu (*The University of Tokyo*)

2S-16-4 Construction of DNA nanostructures exhibiting modulated structural transformation
Yuki Suzuki (*FRIS, Tohoku Univ.*)

2S-16-5 RNA 転写/DNA 複製の過程で生じる局所的なクロマチンの運動
Local chromatin motion during RNA transcription/DNA replication
○伊藤 優志, 永島 崚甫, 日比野 佳代, Babokhov Michael, 鐘巻 将人, 前島 一博（遺伝研）
Yuji Itoh, Ryosuke Nagashima, Kayo Hibino, Michael Babokhov, Masato T. Kanemaki, Kazuhiro Maeshima (*NIG*)

2S-16-6 Interactions of local DNA structures and proteins using biophysical and molecular biology approaches
Vaclav Brazda[1,2] ([1]*Institute of Biophysics, Czech Academy of Sciences*, [2]*Brno University of Technology, Faculty of Chemistry*)

16:30〜19:00
2S-17 もっと面白くなる細菌べん毛研究〜残された宿題への挑戦〜
Past, present, and future of the bacterial flagella~ Towards the remaining challenges~

オーガナイザー：中村 修一（東北大学），加藤 貴之（大阪大学）
Organizers: Shuichi Nakamura (Tohoku University), Takayuki kato (Osaka University)

The discovery of the bacterial rotary nanomachine more than 40 years ago has been inspiring researchers to address the well-organized self-assembly, cation-driven high-power rotation, chemically stimulative allosteric reversal, mechanosensitive stator dynamics, and others. These astonishing mechanisms will be an insight into the infection with motile pathogens and are expected to be a significant step forward to the development of artificial micro-/nano machines. However, despite longstanding strenuous studies, there remain abundant mysteries. For discussing what we should do for fully understanding the bacterial flagella, this symposium will provide a historical review of the flagellar studies and talks on recent experimental and theoretical knowledge that has been obtained in terms of structure, single molecule, genetics, physics, and infectious disease by innovative progress.

はじめに
Opening Remarks
中村 修一（東北大学）
Shuichi Nakamura (*Tohoku University*)

2S-17-1 細菌べん毛研究を振り返る：これまでに何がわかったのか？
Historical overview of the bacterial flagellar studies: what do we know about "flagella" so far?
○小嶋 誠司（名古屋大学大学院理学研究科生命理学専攻超分子機能学講座生体膜機能グループ）
Seiji Kojima (*Div. Biol. Sci., Grad. Sch. Sci., Nagoya Univ.*)

2S-17-2 細菌べん毛モータータンパク質の自然な構造の解析
Structure of the native form of the bacterial flagellar motor component
○加藤 貴之 [1], 牧野 文信 [2], 宮田 知子 [3], 木下 実紀 [3], 南野 徹 [3], 難波 啓一 [3,4,5]（[1]阪大・蛋白研究, [2]日本電子, [3]阪大・生命機能, [4]SPring-8・生命機能, [5]日本電子 YOKOGUSHI 協働研）
Takayuki Kato[1], Fumiaki Makino[2], Tomoko Miyata[3], Miki Kinoshita[3], Tohru Minamino[3], Keiichi Namba[3,4,5] ([1]*IPR/Osaka Univ.*, [2]*JEOL*, [3]*Grad. Front. Biosci./Osaka Univ.*, [4]*BDR / SPring-8 Center*, [5]*JEOL YOKOGUSHI Lab.*)

2S-17-3 バクテリアべん毛蛋白質輸送エンジンのゲート開閉機構
Gating mechanism of the bacterial flagellar protein export engine
○木下 実紀 [1], 宮田 知子 [1], 加藤 貴之 [2], 難波 啓一 [1,3,4,5], 南野 徹 [1]（[1]大阪大・生命機能, [2]大阪大・蛋白研, [3]大阪大・日本電子 YOKOGUSHI, [4]理研・ SPring-8, [5]理研・ 生命機能）
Miki Kinoshita[1], Tomoko Miyata[1], Takayuki Kato[2], Keiichi Namba[1,3,4,5], Tohru Minamino[1] ([1]*Grad. Sch. Frontier Biosci, Osaka Univ.*, [2]*IPR, Osaka Univ.*, [3]*JEOL YOKOGUSHI, Osaka Univ.*, [4]*RIKEN SPring-8*, [5]*RIKEN BDR*)

2S-17-4 Bacterial flagellar rotation at low load
Yoshiyuki Sowa[1,2], Tsubasa Ishida[2] ([1]*Dept. Frontier Biosci., Hosei Univ.*, [2]*Grad. Sch. of Sci. & Eng., Hosei Univ.*)

2S-17-5 Patterns and randomness: Tools for studying bacterial navigation
Erick E. Rodriguez Salas, Emma E. Brock, **Laurence G. Wilson** (*Department of Physics, University of York*)

2S-17-6 数理モデルを用いた細菌の走化性強さの推定
Estimation of the intensity in bacterial Chemotaxis by Using a Mathematical Model
○中井 唱, 後藤 知伸（鳥取大）
Tonau Nakai, Tomonobu Goto (*Tottori Univ.*)

2S-17-7 Studies on bacterial motility as the virulence factor
Jun Xu (*Dept. Bacteriol., Grad. Sch. Med., Univ. Ryukyus.*)

おわりに
Closing Remarks
中村 修一（東北大学）
Shuichi Nakamura (*Tohoku University*)

3 日目（9 月 18 日（金））／Day 3（Sep. 18 Fri.）

9:00〜11:30
3S-1 膜の海を旅するペプチド〜 脂質膜とペプチドの相互作用研究の新展開
New developments in studies on interactions between membranes and peptides

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）
Organizers: Izuru Kawamura (Yokohama National University), Tomoyasu Aizawa (Hokkaido University)

Membrane-bound peptides and lipid molecules are involved in crucial biological functions over lipid bilayers, including antimicrobial activity, signaling, and membrane fusion. To under these functions at the molecular level, it is important to elucidate the structure and dynamics of the rational-designed peptides having higher activity. This symposium will cover the current biophysical researches of membrane-bound peptides using the production method of a recombinant peptide, rational design of antimicrobial and nano-pore forming peptides for multi-drug resistance bacteria, and experimental/computational approaches.

はじめに
Opening Remarks

3S-1-1 遺伝子組換え抗菌ペプチドの生産技術の開発と応用
Development and application of novel overexpression systems of antimicrobial peptides
○相沢 智康（北大・先端生命）
Tomoyasu Aizawa (*Fac. Adv. Life Sci., Hokkaido Univ.*)

3S-1-2 ヘリカル構造制御に基づく抗菌ペプチドフォルダマーの開発
Development of helix-stabilized antimicrobial peptide foldamers
○出水 庸介 [1,2]（[1]国立衛研, [2]横市大院・生命医科学）
Yosuke Demizu[1,2] ([1]*NIHS*, [2]*Grad. Sch. Med. Life Sci., Yokohama City Univ.*)

3S-1-3 Cryptdin-4 conformations and interaction with membrane studied by membrane self-assembly molecular dynamics simulations
Takao Yoda (*Nagahama Institute of Bio-Science and Technology*)

3S-1-4 膜貫通αヘリックスペプチドバレルの理論設計
Rational design of membrane-spanning alpha-helical peptide barrels
○新津 藍 [1], Thomson Andrew R.[2], Scott Alistair J.[2], Sengel Jason T.[3], 杉田 有治 [1], Wallace Mark I.[3], Bayley Hagan[4], Woolfson Derek N.[2]（[1]理研・和光, [2]Bristol 大, [3]ロンドン大キングスカレッジ, [4]Oxford 大）
Ai Niitsu[1], Andrew R. Thomson[2], Alistair J. Scott[2], Jason T. Sengel[3], Yuji Sugita[1], Mark I. Wallace[3], Hagan Bayley[4], Derek N. Woolfson[2] ([1]*Wako Inst., Riken*, [2]*Univ. Bristol*, [3]*KCL*, [4]*Univ. Oxford*)

3S-1-5 Analysis of transmembrane peptides using a lipid bilayer system
Ryuji Kawano (*Department of Biotechnology and Life Science, Tokyo University of Agriculture and Technology (TUAT)*)

3S-1-6 両生類由来カチオン性抗菌ペプチドの生体膜との相互作用
Interaction of amphibian-derived cationic antimicrobial peptides with model membrane
○川村 出（横国大 院理工）
Izuru Kawamura (*Grad. Sch. Eng. Sci., Yokohama Natl. Univ.*)

9:00〜11:30
3S-2 共催：新学術領域研究「発動分子科学：エネルギー変換が拓く自律的機能の設計」 リニアモーターと細胞骨格が生む秩序と制御
Order and control: linear motors and cytoskeleton 2020

オーガナイザー：古田 健也（情報通信研究機構），矢島 潤一郎（東京大学）
Organizers: Ken'ya Furuta (NICT), Junichiro Yajima (The University of Tokyo)

Linear motor proteins and cytoskeleton together generate dynamic processes such as directional transport, contraction and oscillation in living cells. To maintain out-of-equilibrium dynamics, each component continuously converts incoming chemical fuels into mechanical work. This symposium focuses on self-organization, regulatory mechanisms and cooperative phenomena emerged from these systems and will be an opportunity to discuss what is known and what needs to be learned to help improve our understanding of such dynamic motor-driven processes.

3S-2-1 キネシン 1 の運動と細胞骨格が生む無秩序なゆらぎ
Kinesin-1 Movement and Cytoskeletal Disordered Fluctuations
○有賀 隆行（山口大・医）
Takayuki Ariga (*Grad. Sch. Med., Yamaguchi Univ.*)

3S-2-2 紡錘体の形成と機能を支える微小管のメソスケールメカニクス
Mesoscale microtubule mechanics controlling the assembly and function of the chromosome segregation machinery
○島本 勇太 [1,2]（[1]国立遺伝学研究所, [2]総研大）
Yuta Shimamoto[1,2] ([1]*Nat'l Inst Genetics*, [2]*SOKENDAI*)

3S-2-3 繊毛の制御機構
How to control cilia movement
○吉川 雅英（東京大・医・生体構造）
Masahide Kikkawa (*Grad. Schl. of Med. Univ. of Tokyo*)

3S-2-4 ダイニン運動性の制御 -細胞質ダイニンの自己阻害とその調節機構
Regulation of dynein motility -Autoinhibition of cytoplasmic dynein and the regulatory mechanism
○豊島 陽子 [1,2]（[1]東京大学大学院総合文化研究科広域科学専攻生命環境科学系, [2]東京大学大学院総合文化研究科先進科学研究機構）
Yoko Toyoshima[1,2] ([1]*Dept of Life Sciences, Grad Sch of Arts and Sciences, The Univ of Tokyo*, [2]*Komaba Institute for Science, Grad Sch of Arts and Sciences, The Univ of Tokyo*)

3S-2-5 プログラマブルなサルコメア設計から紐解く筋ミオシン集団の協調的な力発生
Coordinated force generation of muscle myosin dissected by a programmable sarcomere design
○岩城 光宏 [1,2], 鷲尾 巧 [3], 柳田 敏雄 [2,4]（[1]理研・生命機能科学研究セ, [2]阪大・院生命機能, [3]東大・新領域, [4]脳情報通信セ）
Mitsuhiro Iwaki[1,2], Takumi Washio[3], Toshio Yanagida[2,4] ([1]*RIKEN, BDR*, [2]*Grad. Sch. Front. Biosci., Osaka Univ.*, [3]*Grad. Sch. Front. Sci., Univ. of Tokyo*, [4]*CiNet*)

3S-2-6 Long range allostery in actin filaments, and its differential requirement in force generation by actomyosin II and V
Taro Uyeda (*Dept Phys, Waseda Univ*)

9:00〜11:30
3S-3 磁覚と磁気応答生体物質の生物物理学
Biophysics of magnetoreception and magnetic responsive biomaterials

オーガナイザー：新井 栄揮（量子科学技術研究開発機構），岡野 俊行（早稲田大学）
Organizers: Shigeki Arai (QST), Toshiyuki Okano (Waseda University)

Many species including birds, mammals, reptiles, amphibians, fish, crustaceans, insects, plants, magnetotactic bacteria, etc. have an ability to detect Earth's magnetic field. This ability is called "magnetoreception". Cryptochrome (Cry) and magnetosome in cells act as receptors of the external magnetic information. Moreover, several biomaterials are known to orientate along the external magnetic force, which might relate to the magnetoreception. In this symposium, we will introduce an overview of the basics and latest findings in this research field. Here we will discuss the quantum and molecular mechanisms of the magnetoreception.

3S-3-1 クリプトクロムを介した光駆動性磁気受容
Light-driven magnetoreception mediated by cryptochromes
○岡野 俊行（早大・先進理工）
Toshiyuki Okano (*Grad. Sch. Adv. Sci. Eng., Waseda University*)

3S-3-2 クリプトクロムタンパク質の光誘起構造変化ダイナミクス
Understanding the photoinduced structural dynamics of cryptochrome proteins
○アンテル ルイス [1,2], 坂田 一郎 [3], 畠山 晋 [3], 前田 公憲 [1]([1]埼玉大学 基礎化学科, [2]科学技術振興機構さきがけ, [3]埼玉大学 生体制御学科)
Lewis M. Antill[1,2], Ichiro Sakata[3], Shin Hatakeyama[3], Kiminori Maeda[1] ([1]*Department of Chemistry, Saitama University*, [2]*PRESTO, Japan Society and Technology Agency (JST)*, [3]*Department of Regulatory Biology, Saitama University*)

3S-3-3 磁場効果から見たタンパク質バインディングポケット中でのラジカル対挙動
Radical pair dynamics in binding pockets of proteins probed by magnetic field effects
岩田 菜々 [1], アンテル ルイス [1,2], ○前田 公憲 [1]([1]埼玉大学理工, [2]JST PRESTO さきがけ)
Nana Iwata[1], Lewis Antill[1,2], **Kiminori Maeda**[1] ([1]*Graduate School of Science and Engineering*, [2]*JST PRESTO*)

3S-3-4 Magnetic field sensitivity of cellular photochemistry
Noboru Ikeya, **Jonathan R. Woodward** (*The University of Tokyo, Graduate School of Arts and Sciences*)

3S-3-5 細菌の磁気コンパス–マグネトソーム形成の生細胞イメージング–
A magnetic compass within a bacterium – Live-cell imaging of magnetosome formation –
○田岡 東 [1,2], 福森 義宏 [2]([1]金沢大・理工, [2]金沢大・ナノ生命)
Azuma Taoka[1,2], Yoshihiro Fukumori[2] ([1]*Inst. Sci. and Eng., Kanazawa Univ.*, [2]*NanoLSI, Kanazawa University*)

3S-3-6 溶液中の超分子の配向挙動：磁場強度，濃度，有効電荷に対する依存性
Orientational behavior of supramolecules in solution depending on magnetic field strength, concentration, and effective charge
○平井 光博（群馬大学大学院理工学府）
Mitsuhiro Hirai (*Graduate School of Science and Technology, Gunma University*)

3S-3-7 磁気受容蛋白質第二候補 ISCA1 の分子挙動
Molecular behavior of the second magnetorecepter candidate protein ISCA1
○新井 栄揮 [1], 清水 瑠美 [1], 安達 基泰 [1], 味戸 聡志 [2,3], 平井 光博 [3]（[1]（国）量研・量子生命科学領域, [2]（国）原子力機構, [3]群馬大・院理工）
Shigeki Arai[1], Rumi Shimizu[1], Motoyasu Adachi[1], Satoshi Ajito[2,3], Mitsuhiro Hirai[3] ([1]*Institute for Quantum Life Science, QST*, [2]*JAEA*, [3]*Department of Physics, Gunma Univ.*)

9:00〜11:30
3S-4 タンパク質の多様な存在形態　―その機能状態、動態から病態まで―
The Multiple Modes of Proteins – From Molecular Dynamics to Pathogenesis -

オーガナイザー：谷中 冴子（分子科学研究所），小川 覚之（東京大学）
Organizers: Saeko Yanaka (Institute for Molecular Science), Tadayuki Ogawa (The University of Tokyo)

Proteins undergo a variety of protein structures such as a monomer, complex, polymer and aggregation, which can display their multiple “modes” of their function in response to the specific contexts throughout their lives. This session focuses on the mechanism of protein functions driven by their multiple modes and discusses about the comprehensive usage of multiple biophysical approaches that can deepen our knowledge of the fundamental protein behavior in molecular dynamics and pathogenesis.

はじめに
Opening Remarks
谷中 冴子（分子科学研究所）
Saeko Yanaka (*Institute for Molecular Science*)

3S-4-1 High-speed atomic force microscopy as a versatile tool to study dynamical and mechanical properties of proteins
Christian Ganser[1], Kimitoshi Takeda[2], Ryota Iino[2], Koichi Kato[1], Takayuki Uchihashi[3] ([1]*NINS, ExCELLS*, [2]*NINS, IMS*, [3]*Grad. Sch. Sci., Nagoya Univ.*)

3S-4-2 Photon Factory における BioSAXS 活用した相関構造解析
Recent hybrid methods approach utilizing Biological Small Angle X-ray Scattering at the Photon Factory
○米澤 健人 [1], 古川 亜矢子 [2], 安達 成彦 [1], 千田 俊哉 [1], 清水 伸隆 [1], 西村 善文 [2,3]（[1]高エネ機構・物構研, [2]横浜市大・生命, [3]広島大・統合生命）
Kento Yonezawa[1], Ayako Furukawa[2], Naruhiko Adachi[1], Toshiya Senda[1], Nobutaka Shimizu[1], Yoshifumi Nishimura[2,3] ([1]*IMSS, KEK*, [2]*Grad. Sch. Med. Life Sci., Yokohama city Univ.*, [3]*Grad. Sch. Integ. Sci. Life, Hiroshima Univ.*)

3S-4-3 カルボニルストレスを伴う統合失調症における CRMP2 タンパク質の機能異常解析
Enhanced carbonyl stress induces irreversible multimerization of CRMP2 in schizophrenia pathogenesis
○蒋 緒光 [1], 豊島 学 [2], 小川 覚之 [1], 吉川 武男 [2], 廣川 信隆 [1]（[1]東大・院医, [2]理研 CBS）
Xuguang Jiang[1], Manabu Toyoshima[2], Tadayuki Ogawa[1], Takeo Yoshikawa[2], Nobutaka Hirokawa[1] ([1]*Grad. Sch. Med., Univ. Tokyo*, [2]*Riken CBS*)

3S-4-4 Impacts of the N-glycan variation of antibodies on their dynamic structures of functional relevance
Saeko Yanaka[1,2,3], Rina Yogo[1,2,3], Hirokazu Yagi[3], Koichi Kato[1,2,3] ([1]*ExCELLS, Natl. Inst. Nat. Sci.*, [2]*IMS., Natl. Inst. Nat. Sci.*, [3]*Grad. Sch. Pharma. Sci., Nagoya City Univ.*)

3S-4-5 超遠心分析および光散乱によるタンパク質の溶液挙動の解析
Characterization of Protein Assembly by Analytical Ultracentrifugation and Light Scattering
○有坂 文雄（東工大・生命理工）
Fumio Arisaka (*Grad Sch Biosci Bioeng, Tokyo Tech*)

おわりに
Closing Remarks
小川 覚之（東京大学）
Tadayuki Ogawa (*The University of Tokyo*)

9:00〜11:30
3S-5　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」
クロマチンの物理生物学
Physical Biology of Chromatin

オーガナイザー：木村 暁（国立遺伝学研究所），坂上 貴洋（青山学院大学）
Organizers: Akatsuki Kimura (NIG), Sakaue Takahiro (Aoyama Gakuin University)

Genomic DNAs in eukaryotes are complexed with various macromolecules and organized into chromatin structures inside the cell nucleus. Chromatin is a long polymer molecule, and its physical properties are closely related to the regulation of gene expression. Currently, there are many interesting attempts to unveil the structure and dynamics of chromatin from the viewpoint of polymer physics. This symposium aims to gather researchers from interdisciplinary fields ranging from molecular and cellular biology, polymer physics to information science, and discuss various aspects of chromatin physics and its implication for biological functions.

3S-5-1　クロマチン濃度により制御されるクロマチン運動
Chromatin mobility controlled by chromatin concentration
○坂上 貴洋（青学大・ 理工）
Takahiro Sakaue (*Aoyama Gakuin Univ.*)

3S-5-2　Measurements of physical properties underlying the chromatin mobility in interphase nuclei
Noritaka Masaki, Akatsuki Kimura (*Cell Arch. Lab., NIG*)

3S-5-3　動的 3 次元ゲノム組織化の物理的理解にむけて
Toward a physical understanding of the dynamic 3D genome organization
○新海 創也 [1], 大浪 修一 [1], 中戸 隆一郎 [2]（[1]理研 BDR, [2]東大 定量研）
Soya Shinkai[1], Shuichi Onami[1], Ryuichiro Nakato[2] ([1]*RIKEN BDR*, [2]*IQB, Univ. Tokyo*)

3S-5-4　1 分子イメージングで迫るヒトゲノムクロマチンの動的組織化
Single nucleosome imaging sheds light on the dynamic organization of the human chromosomes
○日比野 佳代 [1], 境 裕二 [2], 鐘巻 将人 [1], 前島 一博 [1]（[1]遺伝研・総研大, [2]東大）
Kayo Hibino[1], Yuji Sakai[2], Masato Kanemaki[1], Kazuhiro Maeshima[1] ([1]*NIG and SOKENDAI*, [2]*Univ. Tokyo*)

3S-5-5　エントロピー駆動のクロマチン相分離によるゲノム 3D 構造形成
3D genome organization through entropy-driven phase separation of chromatin
藤城 新, ○笹井 理生（名古屋大学工学研究科応用物理学専攻）
Shin Fujishiro, **Masaki Sasai** (*Department of Applied Physics, Nagoya University*)

3S-5-6　DNA contributes to nuclear size control in Xenopus laevis
Shuichi Nakano[1,2], Hiroko Heijo[1], Sora Shimogama[1], Yasuhiro Iwao[2], **Yuki Hara**[1] ([1]*Fac. Sci., Yamaguchi Univ.*, [2]*Grad. Sch. Sci., Yamaguchi Univ.*)

9:00〜11:30
3S-6　共催：新学術領域研究「光圧によるナノ物質操作と秩序の創生」
光圧操作の新展開：生物物理学のための新しいアプローチ
Frontiers in Optical Manipulation: New Approach for Biophysics

オーガナイザー：細川 千絵（大阪市立大学），西山 雅洋（近畿大学）
Organizers: Chie Hosokawa (Osaka City University), Masayoshi Nishiyama (Kindai University)

Since the pioneering works of Nobel laureate Arthur Ashkin in 2018, optical trapping has been widely applied in biophysics for manipulating cells and measuring forces between biomolecules. Recent studies are about to realize optical force technologies for mechanical manipulation such as trapping, transportation, positioning, and aligning of individual nano-materials in a direct and selective way. In this symposium, researchers from various fields related to optical trapping will present the latest results and discuss future prospects of optical manipulation in biophysics.

3S-6-1　異なる圧力下での光操作
Optical Manipulation at Different Pressures
○西山 雅祥（近畿大）
Masayoshi Nishiyama (*Kindai Univ.*)

3S-6-2　May the Red Force be with Educational Unit of Optical Tweezers
Yuichi Inoue (*OptoSigma*)

3S-6-3　3 次元位置検出顕微鏡と光ピンセットを用いた、“繊毛 1 本” のトラッキングとマニピュレーション
Tracking and manipulation of a cilium by the 3-D tracking microscopy and optical tweezers
○加藤 孝信（理化学研究所 生命機能科学研究センター）
Takanobu A Katoh (*BDR, Riken*)

3S-6-4　心筋および骨格筋ミオシンの個性とその機能を探る
Exploring the characteristics of cardiac and skeletal myosins and their functions
○茅 元司（東京大学 院理物理）
Motoshi Kaya (*Dept of Physics, Univ of Tokyo*)

3S-6-5　Nanostructure-assisted optical tweezers for soft matter manipulation
Tatsuya Shoji (*Fac. Sci., Kanagawa Univ.*)

3S-6-6　生化学反応の光誘導加速システムが拓く生物物理の新展開
Prospects of Biophysics Created by Light-induced Acceleration System for Biochemical Reaction
○飯田 琢也 [1,2], 床波 志保 [1,3], 中瀬 生彦 [1,2]（[1]大阪府立大学 理学系研究科, [2]大阪府立大学 LAC-SYS 研究所, [3]大阪府立大学 工学研究科）
Takuya Iida[1,2], Shiho Tokonami[1,3], Ikuhiko Nakase[1,2] ([1]*Grad. Sch. Sci., Osaka Pref. Univ.*, [2]*Res. Inst. for LAC-SYS, Osaka Pref. Univ.*, [3]*Grad. Sch. Eng., Osaka Pref. Univ.*)

3S-6-7　集光レーザービームを用いたタンパク質集合体の作製
Fabrication of Highly Ordered Protein Assembly by Focused Laser Beam
○吉川 洋史（埼玉大院・理工）
Hiroshi Yoshikawa (*Dept. Chem., Saitama Univ.*)

3S-6-8 **光圧による細胞表面分子の直接操作と神経活動制御への応用**

Optical manipulation of cell surface molecules for direct control of neuronal activity

○細川 千絵（大阪市大・院理学）

Chie Hosokawa (*Grad. Sch. Sci., Osaka City Univ.*)