3P248 ホヤオプシン 1(Ci-opsin1)の分子特性の解析**Analysis of molecular property of ascidian opsin, Ci-opsin1**

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Opsins are photoreceptive proteins in animals which belong to G protein-coupled receptors (GPCRs). Ci-opsin1, ascidian (*Ciona intestinalis*) opsin, was found to be expressed in the ocellus of ascidian larvae to regulate the swimming behavior. The phylogenetic analysis indicated that Ci-opsin1 was more closely related to vertebrate visual opsins than invertebrate ones. However, the detailed molecular properties of Ci-opsin1 remain unknown. Our spectroscopic analysis indicated that Ci-opsin1 showed intermediate photoreaction and G protein activation efficiency between those of vertebrate and invertebrate visual opsins. Based on our results, we discuss the molecular properties of Ci-opsin1 in the linkage of vertebrate and invertebrate visual opsins.

3P249 脊椎動物の可視光感受性 Opn5 の分子特性解析**Molecular properties of vertebrate visible-light sensitive Opn5**

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Opsins are the universal photoreceptive molecules for visual and non-visual photoreceptions in animals and are classified into seven distinct groups based on their amino acid sequences. Opn5 forms an independent group whose members in vertebrates are diversified into four subgroups. Previously we showed that two subgroups (Opn5m and Opn5L2) are Gi-coupled UV-sensitive bistable pigments. Here we show that Opn5n subgroup found in non-mammalian vertebrates was reconstituted with 11-*cis* retinal to form a visible light-sensitive pigment and activated Gi after *cis-trans* photoisomerization of the retinal. These results suggest that Opn5 group shares G protein coupling property and is diversified based on their spectral sensitivities.

3P250 マウスメラノプシンの分子特性**Molecular Properties of Mouse Melanopsin**

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Melanopsin is the photosensitive pigment of ipRGCs (intrinsically photosensitive Retinal Ganglion Cells), which mediate irradiance detection functions such as pupillary light reflex and photo-entrainment of the circadian rhythm. Although melanopsin's physiological relevance is well established now, its molecular properties remain largely unexplored. In order to address this gap in our understanding, we have characterized melanopsin's molecular properties, using recombinant mouse melanopsin exogenously expressed in culture cells. We have conducted a comprehensive analysis of spectroscopic properties of mouse melanopsin and of its Gq activation properties. Based on these results, we discuss the possible consequences of such molecular properties on irradiance detection.

3P251 双安定性のロドプシン類の分子特性とそれらの光遺伝学への応用の可能性**Molecular properties of animal bistable rhodopsins and their optogenetic potential**

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We previously revealed that most non-visual opsin-based pigments of animals exhibited a bistable nature, photoregeneration ability of the stable photoproduct, unlike vertebrate visual opsin-based pigments. We also showed that some of non-visual opsins bound to retinal isomers ubiquitously present in animal bodies. These properties might contribute to enable non-visual opsins to function as photosensitive pigments in tissues containing not enough 11-*cis* retinal and also suggest optogenetic potential of non-visual opsins. In this study, in order to investigate their optogenetic potential, we tested responsiveness of cultured cells expressing non-visual opsins to light. Obtained results suggested some non-visual opsins might be useful for optogenetic applications.

3P252 光合成反応中心タンパク質で機能する電子移動担体の極低温 1 分子分光**Cryogenic single molecule spectroscopy of the electron transfer cofactor in the photosynthetic reaction center**

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Nature achieved almost 100% electron transfer efficiency in the photosynthetic reaction center (RC). One of the mechanisms to realize the high efficiency is considered to be a local structural change following the light-induced charge separation, which leads to the stabilization of the radical pair. The structural change may affect optical spectra of an electron transfer cofactor. In order to measure optical spectra free from thermal fluctuation and ensemble averaging, we apply cryogenic single molecule spectroscopy to the RC of *Helicobacterium modesticaldum*. Here we present development of microscope setup and a home-built light source, tunable from 500 to 800 nm. The cryogenic fluorescence excitation spectrum of a single Chl a, serving as a cofactor A0, was obtained.

3P253 光化学系 II における励起エネルギーと電子の輸送過程に關する階層的粗視化運動論モデル**Hierarchical coarse-graining kinetic model for excitation energy and electron transfer processes in photosystem II**

Takeshi Matsuoka¹, Shigenori Tanaka¹, Kuniyoshi Ebina² (¹*Graduate School of System Informatics, Kobe University*, ²*Graduate School of Human Development and Environment, Kobe University*)

Photosynthesis is characterized as a multi-scale reaction system. Chlorophyll a fluorescence induction (FI) shows such a property of photosynthesis. To understand this phenomenon, a number of studies based on various mathematical models have been attempted. However, there are problems : (1) understanding of phenomenon based on very complex model is difficult and (2) high computation cost is required for integration over multi-time-scale. Here, a reduction method of coarse-graining in time which resolves these problems is applied to PSII model for exciton and electron transfer kinetics. Analysis of FI based on coarse-grained model of PSII indicates that light-intensity dependent branching off of reaction path occurs.