Functional Diversity of Visual Pigments and Photoreceptor cells

Yoshinori Shichida
(Kyoto University, Graduate School of Science, Professor)

【Outline of survey】

Photoreceptor cells of animals contain visual pigments that absorb light and start a light-induced signaling cascade. The functional diversification of photoreceptor cells is thought to originate from the evolution and diversification of the various functional proteins involved in this signaling cascade. Several studies have been carried out to elucidate the molecular properties of the functional proteins and their relationships with the photoreceptor cell responses. However, *in vitro* analyses of functional proteins may sometimes cause these proteins to behave in a manner that is not directly related to physiological cell responses. Therefore, further research efforts should focus on elucidating what are the molecular properties of functional proteins that originate various cellular responses. In this study, by using knock-in mice exogenously expressing a visual pigment, we will identify the amino acids that give rise to the different molecular properties of visual pigments and functional diversity of photoreceptor cells. This approach will bring light to the mechanism of molecular diversification, that in turn gives rise to the diversification of cells and individual organisms. Our approaches will bring a new perspective into the filed of biodiversity research.

【Expected results】

Light signals from the outer environment are important for many living organisms, and the relationship of diversification of animal behavior and of their habitats have been examined through the analysis of photoreceptor function of various animals. In this study we use visual pigments of photoreceptor cells to test the relationship between functional modifications of proteins and functional diversification of cells and individuals by experimental means. This type of research may open a new field in molecular physiology on the basis of functional diversification of organisms and evolution.

【References by the principal investigator】

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【Term of project】 FY2008− 2012

【Budget allocation】
159,800,000 yen (direct cost)

【Homepage address】 http://photo1.biophys.kyoto-u.ac.jp/