## Biosynthetic pathways for pigments absorbing visible and near-infrared light in phototrophs

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Planets around red dwarfs are important targets to discover habitable zone and to observe extrasolar biomarker/biosignature. One of biomarker candidates is reflection spectrum called "red edge" which is caused by photosynthetic light absorption around the surface of planets. Light wavelength dominant around red dwarfs has been thought to be in the near-infrared region, and therefore the red edge seen there has been considered to be influenced by photosynthetic activities utilizing near-infrared light. However, a recent study hypothesized that near-infrared light is absorbed by the water column and that primitive phototrophs emerging in deep water use visible light wavelength dominated in the water. By deeply considering the hypothesis, the photosynthetic organisms using visible light would then evolve to use near-infrared light concomitantly with adaptation to surface water/terrestrial life. The course of evolution on light wavelength utilization would be first visible light then near-infrared light. Our research group has studied on the pigment biosynthesis enzyme called COR which works at the committed step for the final pigment product absorbing visible or near-infrared light. I will introduce various characteristics and evolution of COR in the presentation. Study on pigment biosynthesis and evolution on photosynthetic light utilization woule herejon for detecting red edge.

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