Curriculum Vitae

Name
Keitaro Tanoi

Current Position
Professor, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan

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Education & Professional Experiences (Times New Roman, 11 point)
Keitaro Tanoi received his B.Agr. and M.Agr. from The University of Tokyo in 1999 and 2001, respectively, and later earned his Ph.D. in Agricultural Sciences. After serving as Assistant Professor and Associate Professor, he was a JST PRESTO researcher from 2015 to 2019 and became Professor in 2018. He has also served as Unit Subleader at the Fukushima Institute for Research, Education and Innovation (F-REI) since 2024.

Research Interests (Times New Roman, 11 point)
Professor Tanoi's research focuses on the application of radiation and radioisotopes to agriculture and plant science. His work includes plant mineral nutrition, particularly the dynamics of magnesium, sodium, phosphorus, and cesium, as well as the development of non-destructive imaging systems to visualize the transport of minerals and photosynthates in living plants. He is broadly interested in integrating radioisotope imaging, plant physiology, and molecular biology to reveal novel transport mechanisms and translate them into agricultural and environmental applications. More recently, his group has also explored interactions between ionizing radiation and biomolecular systems, including radiation-responsive fluorescent proteins.

Selected Publications (**※3-5 major papers**)
Kaiho-Soma, A., Kurita, Y., Kobayashi, N. I., Nakanishi, T. M., and Tanoi, K. (2025). Determination of the phloem transport pathways and destination of photosynthates in soybean using autoradiography and fluorescent tracer imaging. *Plant Signaling & Behavior* 20(1), *in press*
Suetsugu, K., Sugita, R., Yoshihara, A., Okada, H., Akita, K., Nagata, N., Tanoi, K., and Kobayashi, K. (2023). Aerial roots of the leafless epiphytic orchid *Taeniophyllum* are specialized for performing crassulacean acid metabolism photosynthesis. *New Phytologist,* 238, 932–937.
Kobayashi, N. I., Takagi, H., Yang, X., Nishizawa-Yokoi, A., Segawa, T., Hoshina, T., Oonishi, T., Suzuki, H., Iwata, R., Toki, S., Nakanishi, T. M., and Tanoi, K. (2023). Mutations in RZF1, a zinc-finger protein, reduce magnesium uptake in roots and translocation to shoots in rice. *Plant Physiology*, 192, 342–355.

Lecture Title
Radiation-Excitable Fluorescent Proteins: A New Interface Between Ionizing Radiation and Biomolecular Photophysics

Abstract (500 words maximum)

Fluorescent proteins are widely used as optical probes in biology and are generally understood as molecules excited by light. In this lecture, I will present our recent finding that certain fluorescent proteins can also emit light in response to ionizing radiation. This phenomenon suggests a previously unrecognized interface between radiation chemistry and biomolecular photophysics. Using beta-emitting radioisotopes and purified fluorescent proteins, we found that selected blue and cyan fluorescent proteins exhibit measurable luminescence upon radiation exposure, whereas many conventional longer-wavelength fluorescent proteins do not. In particular, short-wavelength-excitable variants showed stronger responses, indicating that excitation wavelength is a key determinant of this property. A single amino acid substitution in mTurquoise2 altered its optical properties but abolished the radiation-responsive signal, suggesting that the phenomenon is highly sensitive to the chromophore environment. We also found that the response varied depending on the beta-emitting isotope used, suggesting that both the properties of the radiation and the chemical changes it induces in aqueous solution are important for this phenomenon. A working hypothesis is that beta irradiation generates energetic electrons or related reactive species in water, which then excite the chromophores of fluorescent proteins, particularly those responsive to short-wavelength excitation. This provides a new framework for understanding how ionizing radiation may interact with biomolecules at the electronic level. This finding may open new possibilities for radiation sensing, radioisotope imaging, and the development of genetically encoded probes responsive to ionizing radiation.