

IRES: Summer 2027 Biology Research Program in Japan Neurobiology of tetrachromatic vision and behavioral responses in Zebrafish and Medaka

Carlos A. Molina & Mika Mukata (PIs)



Please fill out this form in chat as we wait:



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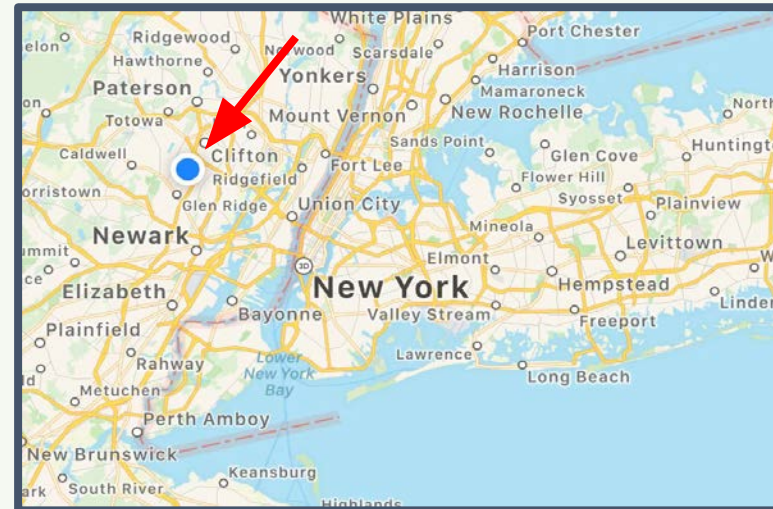
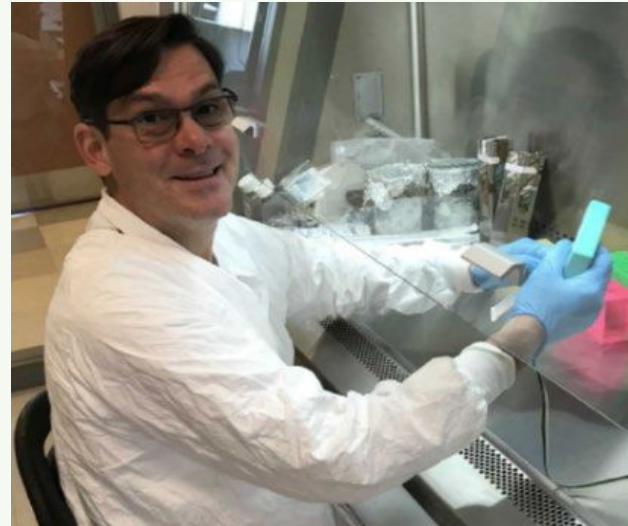
NSF #2505377

May 8 to July 10, 2027

Welcome!

Objectives of our session

- o Overview of program
- o Science research
- o Eligibility
- o Participation
- o Q and A



Japan Map



International Research Experiences for Students (IRES)

[View guidelines](#)

[NSF 24-506](#)

- Supports the development of world-class research skills in international cohort experiences
- Contributes to development of a diverse, globally-engaged workforce with world-class skills
- Focuses on active research participation by undergraduate or graduate students in high quality international research, education and professional development experiences

Overall structure:

- 3-year program, with three cohorts of six students each
- Continuity between cohorts through an overarching research project

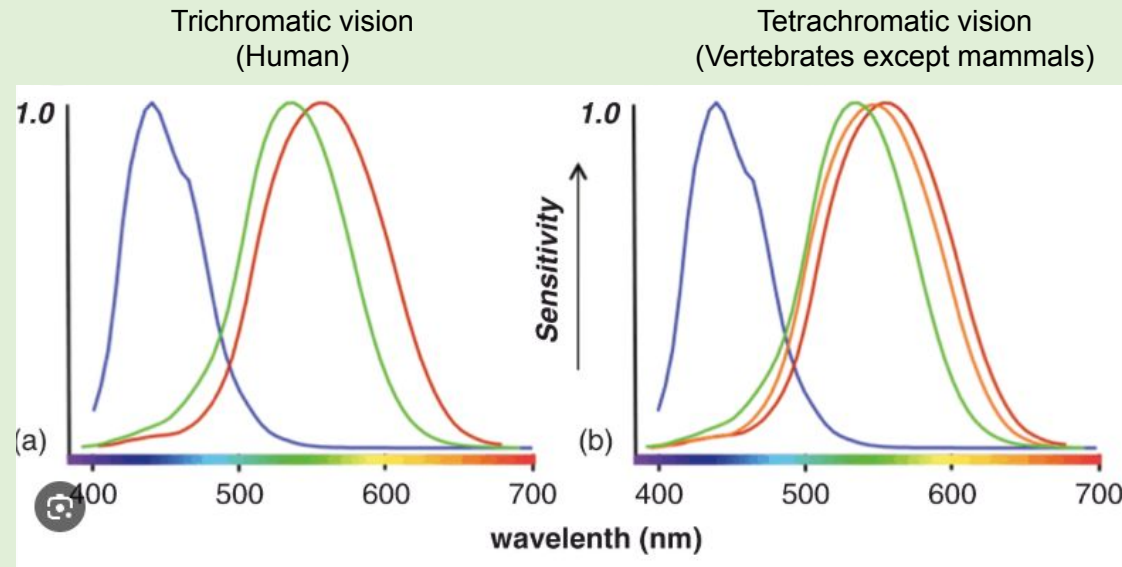
For Summer 2027:

- January– early May: Online cultural and scientific preparation in the US (or wherever you will be). Required readings will be assigned for discussion.
- Sunday, May 9: Travel to Nagoya, Japan
- May 10-14: All participants at NIBB, Okazaki for in-country orientation
- Mid-program symposium mid-June
- May 17-July 9: Pairs of participants at each of three sites. Eight week program in labs

Neurobiology of Tetrachromatic Vision and Behavioral Responses in Zebrafish and Medaka



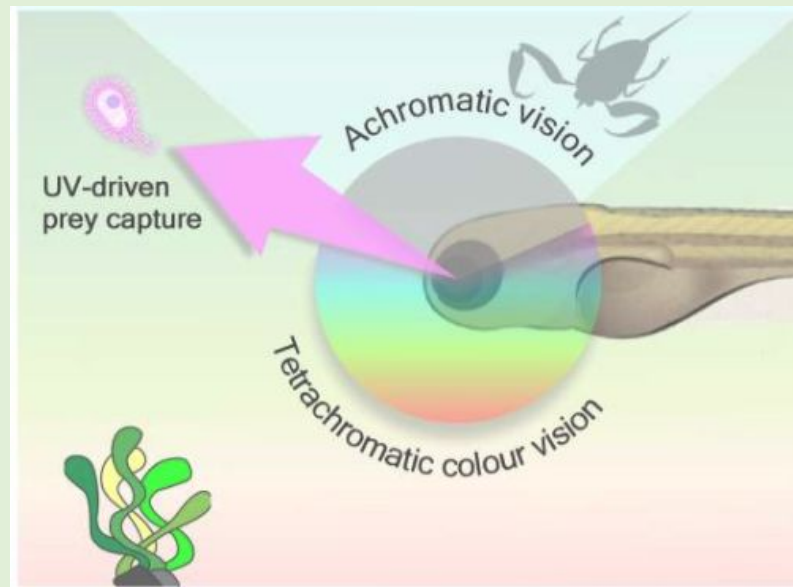
Dr. Hiromi Hirata
Aoyama Gakuin
University



Dr. Fumi Kubo
Center for Brain
Science at Riken
Institute in
Saitama.



Dr. Seiji Wada
Aoyama Gakuin
University



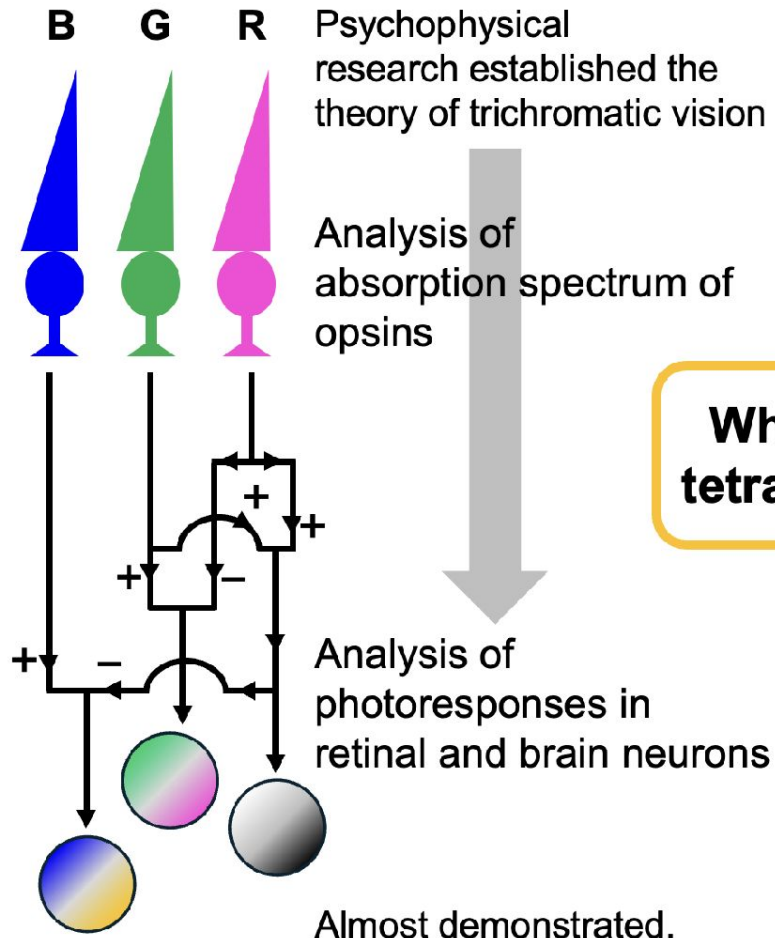
Dr. Yasuhiro Kamei
National Institute of
Basic Biology,
Okazaki, Japan



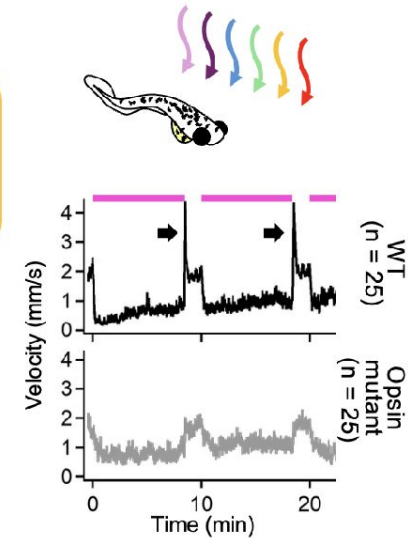
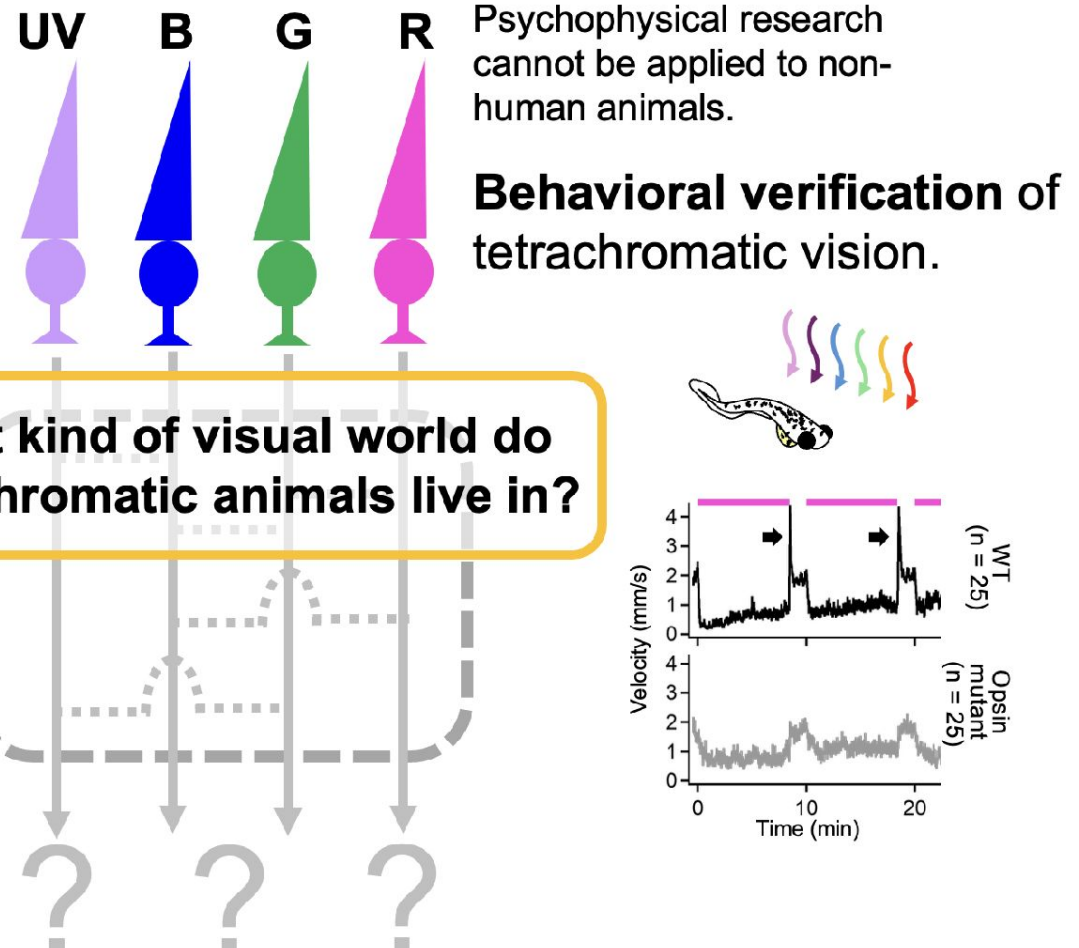
**Dr. Kasumi
Nakagawa**
Gifu University



*Trichromatic vision
(Human)*

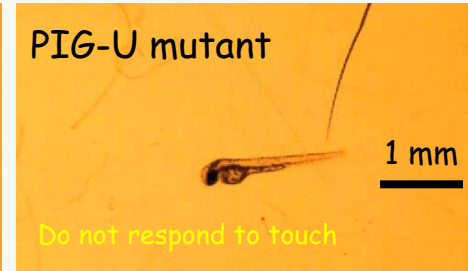


*Tetrachromatic vision
(Vertebrates except mammals)*

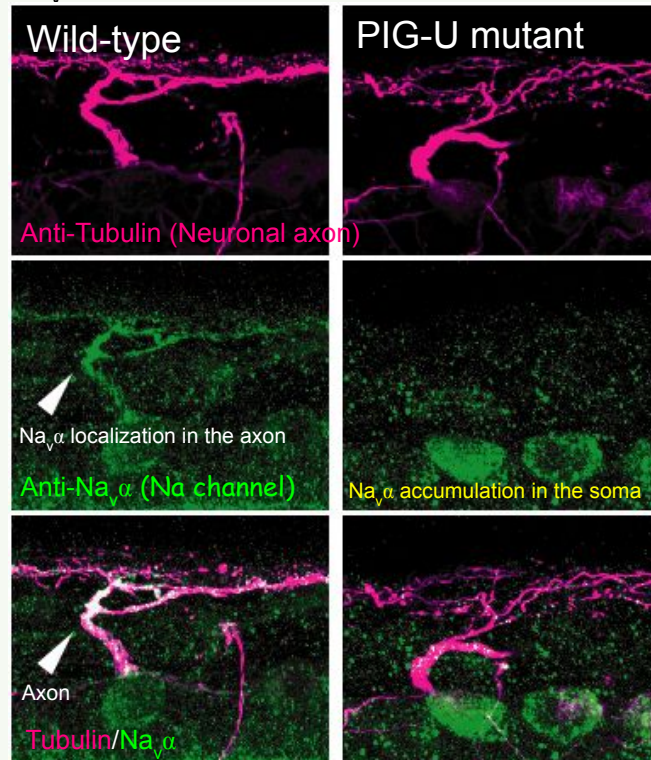




Forward genetics to identify zebrafish mutants with touch response defects.



$\text{Na}_v\alpha$ localization defects in the spinal neurons.



Isolation of motor mutants

↓
Identification of the responsible genes

↓
PIG-U (GPI transamidase subunit) case

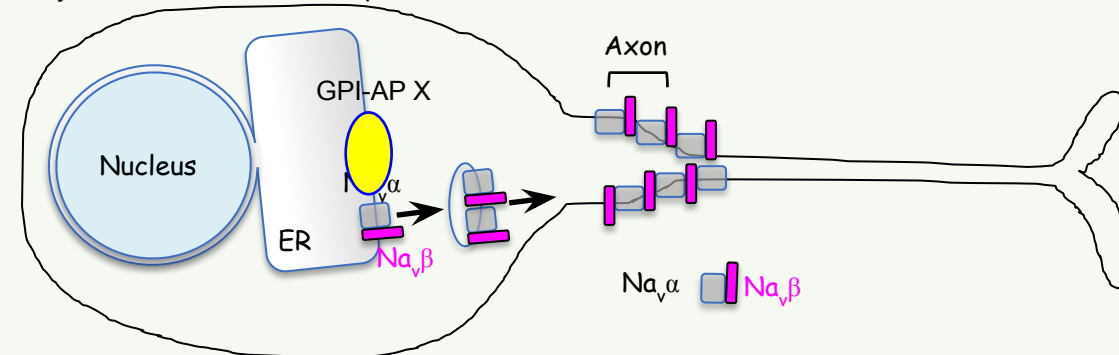
↓
Synthesis of GPI-anchored protein X ?

↓
 $\text{Na}_v\alpha$ localization at the axon

↓
Neuronal excitability

↓
Touch response

PIGU (GPI transamidase subunit)
-> Synthesis of GPI-anchored protein



Identification of genes, which are essential for motor development and/or neuronal function.

...and some other motor mutants to study.

Understanding visual processing and behavior.

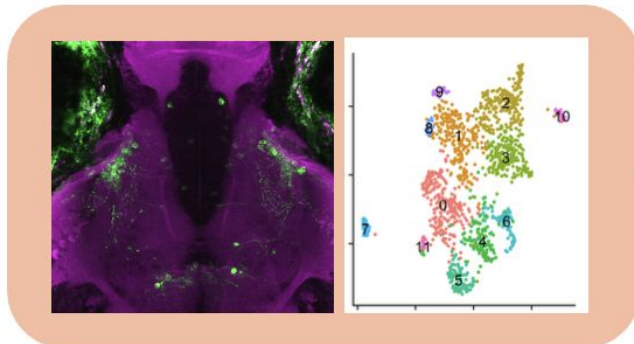
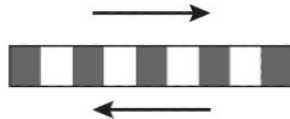
<http://kubolab.jp/wp/en/fumi-kubo/>



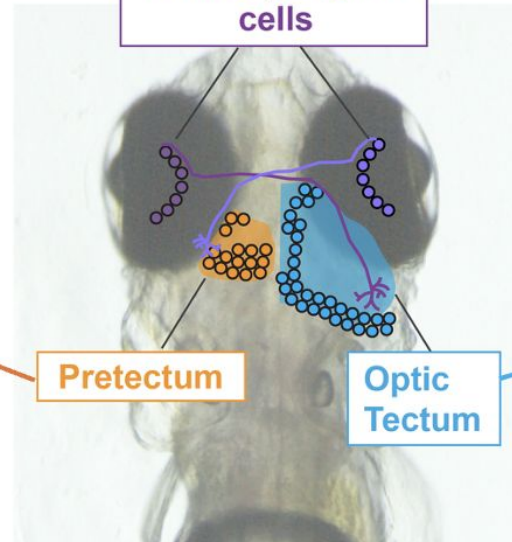
Dr. Fumi Kubo
Center for Brain
Science at
Riken Institute in
Saitama.

Her research specialization is in neural circuit mechanisms involved in zebrafish behavior. Specifically, her lab studies the visual system of larval zebrafish to help determine the roles of neural circuits that lead to behavior at the cellular and circuit levels.

Optic flow (direction)



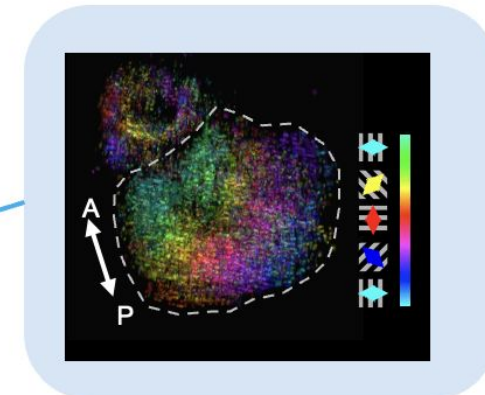
Retinal ganglion cells

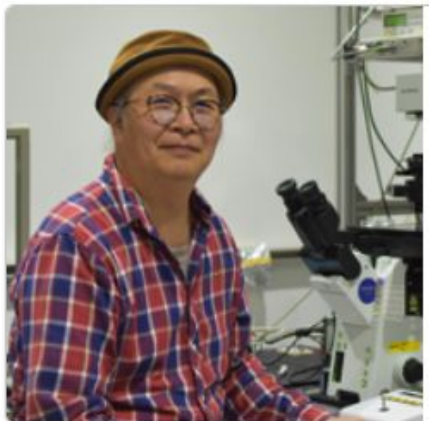


Pretectum

**Optic
Tectum**

Orientation





Dr. Yasuhiro Kamei
National Institute of Basic
Biology, Okazaki, Japan

https://www.nibb.ac.jp/en/sections/members/kamei_yasuhiro_.html

His research group employs various and original biotermological research technologies.

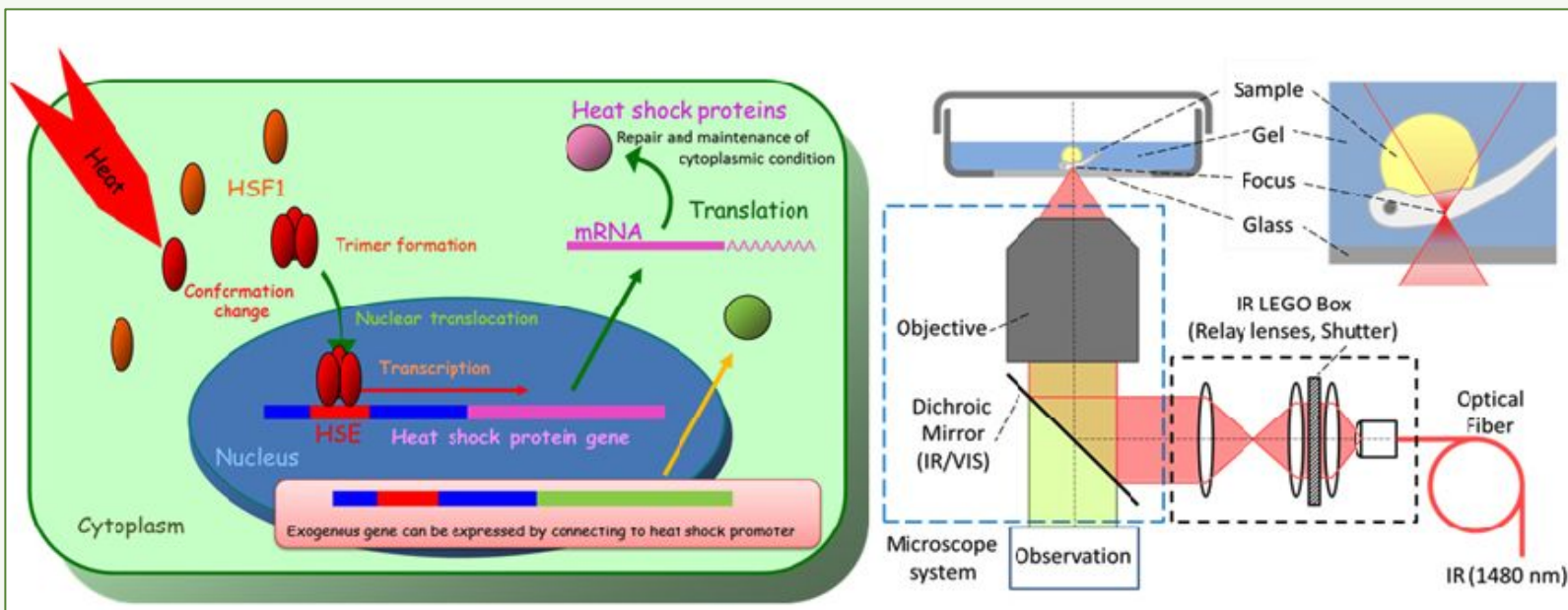
- One of these is the infrared (IR) laser application, which enables single-cell or subcellular local heating by focusing IR through an objective lens on a microscope.
- This technology was originally developed for laser induced gene expression in the targeting of single-cells through the heat shock response (see below).
- This local heating technique can be used to analyze the thermodynamics of a cell via the use of a nano-scale thermometer; the second of his original techniques.

Dr. Kamei laboratory is working to reveal how temperature heterogeneity is generated within a single cell as well as considering its meaning from a biological standpoint.



Dr. Kasumi Nakagawa
Gifu University

https://researchmap.jp/kasumi_n?lang=en



Schematic illustration of heat shock response of cells and an infrared laser-evoked gene operator (IR-LEGO) microscope system.

What is covered?

- Roundtrip airfare between a U.S. airport and Japan
- Ground transportation between Nagoya airport and site
- Housing during the program in Japan
- Transportation and housing for mid-program retreat
- Laboratory supplies
- \$7200 stipend

We are seeking applicants who are enthusiastic about

- Doing laboratory research in biology
- Working within an international research environment
- Learning about different cultures and languages and learning about how to navigate the related complexities
- Pursuing science research in their careers
- Gaining experiences related to international collaborations



Please see flyer for eligibility criteria

Application deadline: November 6, 2026
11:59pm ET



Participant commitments

- All program components, including pre-departure preparations
- Pre and post-program evaluation (conducted online for several years after the program)
- Sharing out of your experiences—conferences, university, etc.
- Continued commitment to research project and communicating with other cohorts



Q & A with Japan IRES Alumni

<https://inside.montclair.edu/colleges-schools-research/math-science/ires-summer-biology-research-program-japan>

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Sebastián Castro



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