

# Recruitment of Specially Appointed Researchers

Cell Simulation Research Group, Center for Frontier Biosciences

## 【Details】

(Immediately after hiring)The Cell Simulation Research Group of the Center for Frontier Biosciences is engaged in research and development of cellular modeling and simulation, and research on the principles and theories of life system operation by utilizing them. This position is open to anyone who is interested in working with our group members to elucidate the fundamental principles and mathematical mechanisms of living systems.

(Scope of change)Services provided by the National Institutes of Natural Sciences.

Theoretical studies in the life sciences have revealed mathematical insights, such as the generation of Turing patterns in reaction-diffusion systems. Fundamental mechanisms and structures that interconnect between bioinformatic functional networks (e.g., transcription, metabolism and signal transduction) and physical properties (e.g., viscosity, temperature, and refractive index) of living systems, however, still remain unclear. The living system synchronizes microscopic biological phenomena with macroscopic phenomena, and the interaction of these phenomena makes it a single system. By exploring the fundamental principles underlying such cross-correlative interactions, we aim to tackle the fundamental question, "What is life?".

Conventional cell modeling based on systems biology approaches has built a foundation for understanding complex cellular systems by mathematically modeling life functions such as transcription, metabolism, and signal transduction. In past studies of systems biology, such as whole-cell modeling of *Escherichia coli* and *Mycoplasma*, modeling focused on the functionality of connecting various biomolecular networks has been mainly conducted [Ahn-Horst, T. et al *NPJ Syst. Biol. Appl.* (2022); Karr, J. et al. *Cell* (2012); Tomita, M. et al *Bioinform.* (1999)]. However, cells are not just aggregates of biomolecular networks; they also contain governing equations and various physical quantities derived from thermology, optics, fluid dynamics, statistical mechanics, and quantum biology. Cells exist as a single life system by simultaneously having correlation between biomolecular networks and various physical properties of cellular interiors. In this laboratory, we are developing not only cell modeling and simulation platforms based on systems biology approaches but also new cell modeling methods that can simultaneously handle biological information as well as physical information based on physical laws and governing equations (e.g., heat conduction equations and wave equations) that should be established inside cells.

Below are examples of research themes, but proposals based on your own intellectual curiosity are also welcome:

- Modeling of intercellular transport processes of Dendra2 in *Physcomitrella patens* protonemata
- Implementation of phase retrieval algorithms in phase-contrast/differential interference contrast microscope images

- Numerical simulation of the phase transport equation and its application

The Center for Frontier Biosciences is an Inter-University Research Institute located in Okazaki, Aichi Prefecture. The Institute for Physiological Sciences, the Institute for Basic Biology, and the Institute for Molecular Science are also located on the same campus and conduct research in collaboration with each other. The research center and the three research institutes are equipped with a full range of advanced equipment and shared instruments, and are in an ideal environment to promote collaborative research with other research groups, especially with experimentalists in the biological/medical sciences, so that they can concentrate on their research. We encourage our researchers to advance not only their research projects but also their careers.

Cell Simulation Research Group:

<https://www.excells.orion.ac.jp/en/research-group/cell-modeling-and-simulation>

**【Eligibility】**

Doctoral degree or expected to obtain by the date of employment.

**【Number of applicants】**

Specially Appointed Researchers/Postdoctoral Fellows: 1

**【Place of employment】**

(Immediately after hiring) Cell Simulation Research Group, Center for the Exploration of Life Science

(Scope of change) Location determined by the National Institutes of Natural Sciences

**【Work type】**

Full-time (with term of office)

**【Term of office】**

1 year (extension possible until 2027)

(Workload at the end of the contract period - Worker's work performance and attitude - Worker's ability and engagement

The renewal will be determined based on the progress of the work (project) in progress).

**【Treatment】**

Salary: Salary will be based on an annual salary scale. (Determined based on work history and education)

Insurance, etc.: Mutual aid association of the Ministry of Education, Culture, Sports, Science and Technology, unemployment insurance, workers' accident compensation insurance

Other matters shall be in accordance with the employment regulations of the Organization.

**【Application period】**

Applications will be closed as soon as a suitable candidate is found. Please contact us first by e-mail (see below).

**【How to apply】**

Please send the following documents as email attachments

- (1) Curriculum vitae (any format, photo attached, e-mail address provided)
- (2) Research and Achievement List
- (3) pdf of major papers
- (4) Summary of research to date and future aspirations
- (5) Contact information for at least one person whose opinion can be sought about the person

**【Selection Details】**

After screening of documents, interviews will be conducted in person or via web conference. The results will be notified by e-mail.

**【Inquiries and documents should be sent to】**

〒444-8787

5-1 Aza Higashiyama, Myodaiji-cho, Okazaki-shi, Aichi, Japan  
Inter-University Research Institute for Natural Sciences  
Cell Simulation Research Group, Center for Frontier Biosciences  
Masaki Watanabe  
m-watabe@nibb.ac.jp

If you have any questions regarding this application, please do not hesitate to contact us by e-mail.