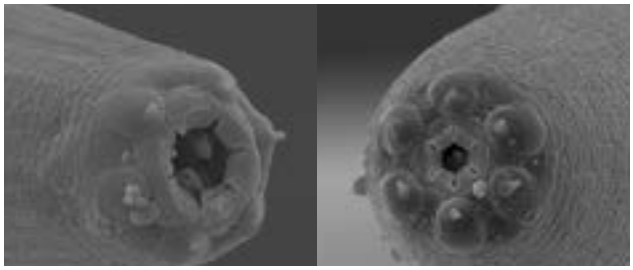


Electron microscope images of the mouth of *Pristionchus pacificus* (photographed at HU's joint-use experiment facility); the shape of the mouth becomes either wide (left) or narrow (right), depending on the environment.

Associate Professor,
Graduate School of
Integrated Sciences for Life
School of Science

OKUMURA Misako

Research interests

Developmental biology, neuroscience, genetics

How is the development of animals regulated by the interaction of the environment and genome?

Why does a fertilized egg divide not into two fertilized eggs, but instead into all kinds of cells in succession and develop into an adult? I first became interested in animal development (the process of an egg growing into an adult individual) when I was in high school. I had forgotten about this question for a while until it resurfaced during a developmental biology class at university. I ended up joining a developmental biology laboratory in graduate school. Using *Drosophila melanogaster* (fruit fly), a common model animal in high school biology textbooks, I set out to find which genes were involved in the process whereby nerve cells took shape. I dissected thousands of fruit fly brains and observed the morphology of nerve cells every day. Finally, I obtained the results indicating that an unexpected gene is involved in the morphological development, which I put together in a paper, and then published.

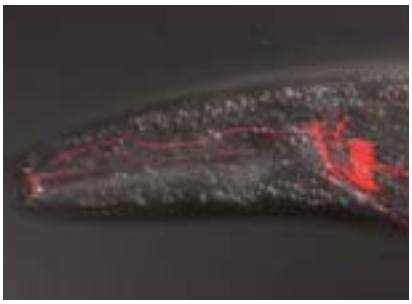
Since finishing graduate school, I have been continuing my research, expanding its scope to include environmental factors, in addition to genes. Animal development is determined not only by the genetic information but also the environment in which they grow. Among your friends and acquaintances, there are perhaps identical twins. They carry exactly the same genetic information, but I am sure they are not totally identical as persons. This is because the environment where they grew up has also influenced their morphology, disposition, and so on.

To elucidate how the environment influences animal development, I am currently conducting research using *Pristionchus pacificus* (roundworms) as a model organism. Roundworms are about 1 mm in length and, interestingly, their mouth can take one of two shapes, depending on the environment it grows in. The focus of my research is the light environment during the developmental process. In addition to microscopic observation, I actively apply new technologies in my research, such as genome editing and bioinformatics.

It is known that the environment in which animals grow influences not only their development but also their susceptibility to disease in adulthood. How this is related to the environment during the fetal period and infancy is still largely unknown. I am hoping that my research with roundworms will eventually lead to such basic findings.

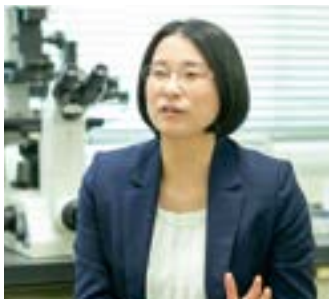
Hiroshima University is an excellent environment in which you can learn to your heart's content. I hope that students will learn and grow as persons while cherishing the questions and interests that arise in them as they encounter various people and acquire new knowledge at university.

Like roundworms, fruit flies make excellent lab animals for genetic experiments because of their short generation time. In the photo, flies are exposed to carbon dioxide for anesthesia.



A confocal microscope image of *Pristionchus pacificus* (roundworm) expressing flurescent protein (red) in the sensory neurons; it shows that the nerve cells that perceive environmental stimuli extend to the tip of the mouth.

"English is essential for us to access the latest research findings, write papers, and communicate with other researchers. To use bioinformatics, which combines biology with data processing, we must also have programming skills. So I'm currently learning them with students," says Prof. Okumura.



Distinctive research facilities

Attached Research Institute

Research Institute for Radiation Biology and Medicine

The Institute conducts comprehensive research projects on the effects of radiation on the human body, ranging from cutting-edge basic research in genomics to advanced clinical deployment of regenerative medicine, etc. While being involved in research and development of medical treatments for A-bomb survivors for over half a century, the Institute is actively engaged, as a research hub in the field of radiation disaster medical science, in joint research projects with researchers and doctors across the country.

Joint Education and Research Facilities on Campus

- Research Institute for Nanodevices
- Research Institute for Higher Education
- Information Media Center
- Natural Science Center for Basic Research and Development
- Morito Institute of Global Higher Education
- Health Service Center
- The Center for Peace
- Environmental Research and Management Center
- Hiroshima University Museum
- Beijing Research Center
- Hiroshima Astrophysical Science Center
- Institute for Foreign Language Research and Education
- Hiroshima University Archives
- Institute of Sport
- HiSIM* Research Center
- Research Center for Diversity and Inclusion