

SUIGEN Vol.7

Issued on June 14, 2023



§ Opening Interview

World's Leading Researcher on Organoids Tackling the Challenge of Elucidating the Symbiotic Relationship Between Humans and Intestinal Bacteria

Department of Mucosal Ecosystem Design, Institute
for Molecular and Cellular Regulation

Professor Nobuo Sasaki

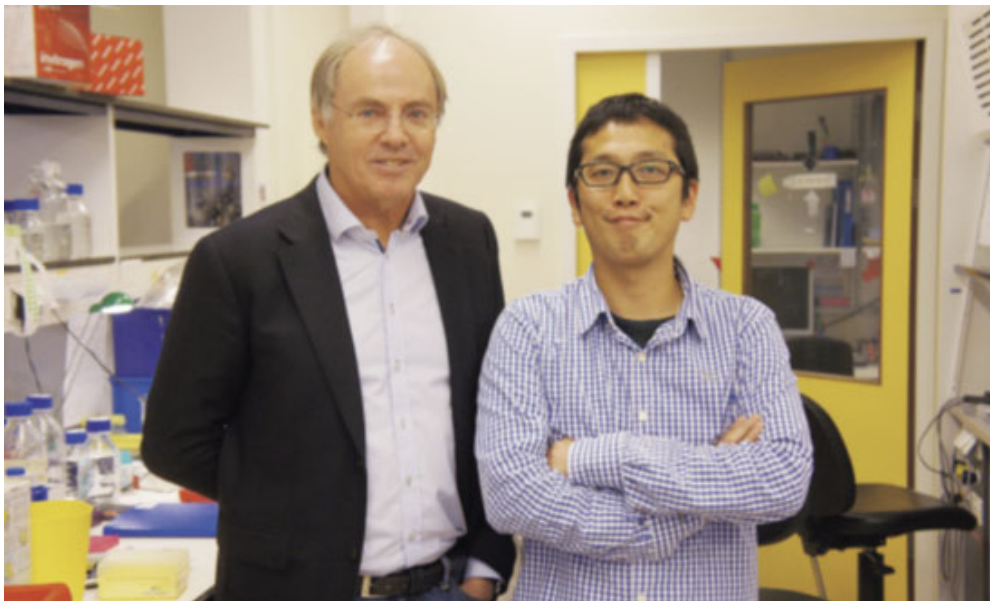
Professor Nobuo Sasaki of the Institute for Molecular and Cellular Regulation is one of the world's leading researchers on organoids. Organoids are a technology for culturing animal and human organs and cells in vitro. The advantages of organoids are the ability to culture normal human cells, which was impossible with conventional culture methods, and the ability to handle human organs. Professor Sasaki was involved in research on human cancer cell organoids for five years from 2011 under Dr. Hans Clevers in the Netherlands, who was the first in the world to succeed in the organoid culture method. After that, he worked at Keio University School of Medicine before establishing his laboratory at Gunma University in the spring of 2021.



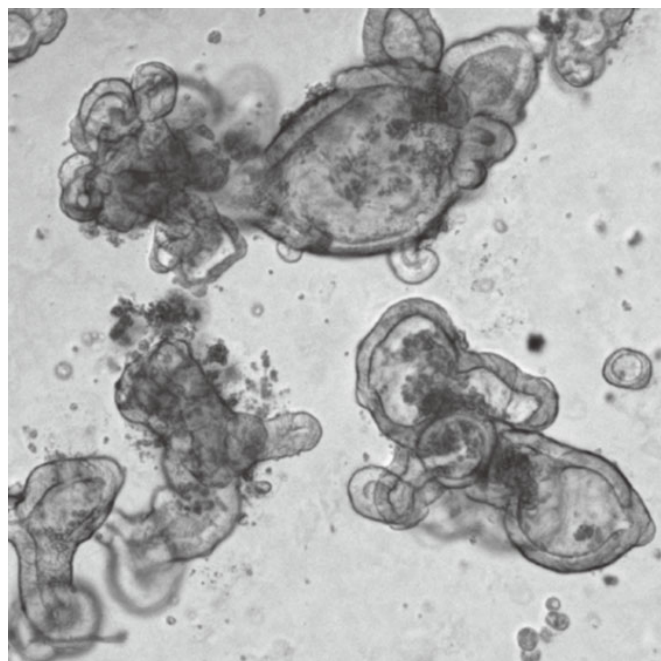
He has published a series of papers in top journals, and last year he was selected as an "H papers author (a researcher who has published several papers in the top 1% of the number of times his/her paper has been cited)".

The master of organoids, who has attracted the attention of molecular biologists worldwide, is now taking on the challenge of elucidating the actual state of intestinal

bacteria-host interactions. He aims to establish "intestinal design," a science that uses the power of intestinal bacteria to freely increase or decrease the number of target cells, to elucidate the mechanisms of disease onset, and to develop new treatment methods.



With Dr. Hans Clevers



Human colorectal organoid

§ Frontline

Consideration of Life and Death Perspectives of Terminal Cancer Patients ~ Enhancing Communication Skills of Nurses ~

Department of Nursing, Graduate School of Health Sciences

Associate Professor Ayumi Kyota

The main focus of my research is to explore better communication between patients and nurses by examining the views of life and death of "terminal cancer patients" who are aware that their death is imminent.

I first became interested in this topic while working as a nurse at an acute care hospital. One terminal cancer patient said to me, "I think this is the last firework. Today is the anniversary of my mother's death." I was so struck by the words "last" and "anniversary of her death" that I could not reply to her. I regretted that if I had tried to listen to her more carefully, I might have been able to provide better nursing care that would have enabled her to live a life that was more like her own until the last moment of her life.

Even when I read articles and books, all I read was "respect the views of life and death of each person." I then went on to graduate school and began this research.



Using AI for Histopathological Image Analysis

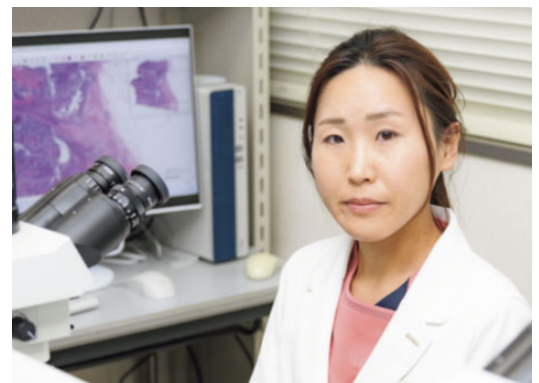
~ Exploring Markers for Predicting Cancer Treatment Effectiveness ~

Department of Diagnostic Pathology, Graduate School of Medicine

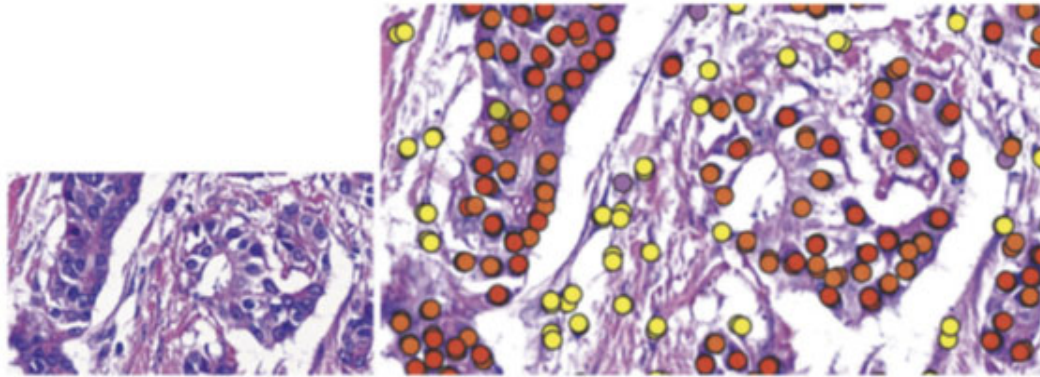
Lecturer Ayaka Katayama

As a doctor, I am involved in pathology diagnostic work, while my research focuses on breast pathology and cancer. One of my research focuses on image analysis technology for pathological tissue using AI (artificial intelligence). I want to quantify the morphological features of colorectal cancer and find indicators (morphological biomarkers) that can predict treatment efficacy and prognosis.

Pathological diagnosis involves determining benign or malignant status and identifying histological types by annotation (labelling; see figure) of lesions (abnormal cells and tissues). In cancerous tissues, it also evaluates the malignancy of the cancer and determines the indications for drugs and the effectiveness of treatment.



Morphology is essential in the pathological diagnosis of cancer. This is because malignancy is determined by morphological features such as the appearance of the nucleus and nucleoli, the frequency of mitosis, the amount of necrosis and the mode of invasion. In recent years, lymphocytes/plasma cells spreading within the cancer tissue have gained attention as markers of drug therapy efficacy and related to prognosis.



Organisational picture before annotation (left) and post-annotation image (right)

Host-Gut Bacterial Interactions at the Genetic Level

Center for Food Science and Wellness
Assistant Professor Yuta Sugiyama

The gut microbiota is considered "another organ" because it affects the overall health of the host. However, many unexplored aspects exist of the host and intestinal bacteria interactions. I aim to elucidate this interaction at the genetic level of intestinal bacteria.



I became interested in intestinal bacteria when I was engaged in research on the mechanism of substance-mediated symbiosis between host and intestinal bacteria at the endowed chair of the Institute of Fermentation Research established at Ishikawa Prefectural University, which is what led me to devote myself to this research.

§ Research Activities Opening Up New Frontiers

Young "Information Theory" Researcher Active Worldwide

~ Developing a Unique Sensibility and Taking on the Challenge of Interdisciplinary Fields ~

Faculty of Informatics

Associate Professor Shyota Saito

Information theory is the study of information and communication mathematically - it is the mathematical modelling of digital data compression and transmission and the mathematical clarification of compression and communication efficiency. Associate Professor Shota Saito of the Faculty of Informatics is one of the researchers in this field currently attracting worldwide attention. He says that the appeal of information theory lies in its simple and beautiful mathematical theory, and his brilliant mathematical formulas reveal "mathematical answers" one after another, which are published in the world's top journals and at international conferences.

He also actively applies his information theory research results to machine learning, information security, and other fields. He is expected to contribute to strengthening Japan's competitiveness in the digital field.

$$\inf_{P_{Y|X}: \mathbb{P}[d(X,Y) > D] \leq \epsilon} H_{\alpha}(Y)$$

Limitations of lossy compression



Developing Treatments for Obesity and Diabetes by Controlling Metal Metabolism

Department of Developmental Biology and
Metabolism, Institute for Molecular and Cellular
Regulation

Assistant Professor Ayako Fukunaka

Ayako Fukunaka, Assistant Professor at Institute for
Molecular and Cellular Regulation, is researching to



clarify the role of zinc transporters in lifestyle-related diseases, particularly diabetes and obesity.

Among the essential nutrients, "minerals" are often deficient, and in Japan, the intake of 13 minerals, including calcium and iron, is encouraged. Zinc, found in pork, egg yolks, and other foods, is one such mineral. A protein called zinc transporter is necessary for zinc to be taken into each cell in the body and function properly.

Assistant Professor Fukunaka has been elucidating the role of zinc transporters in glucose and lipid metabolism. In addition to zinc transporter research, she is currently trying to understand how metal is related to obesity and diabetes. The goal is to develop new treatments for these diseases.

§ Prism

The Importance of Work-Life Balance and a Pleasant Workplace

Center for Diversity and Inclusion

Lecturer Megumi Nagayasu

Gunma University has been actively recruiting and promoting female researchers under a 10-year plan since 2013. The university has established the promotion center "Mayudama Plaza" at Aramaki, Showa, and Kiryu campuses, where consultation services and educational events are planned.

Director Kowase said "The support for the recruitment and promotion of women has changed dramatically over the past 10 years. We have support measures to meet the challenges of various life stages, such as returning to work after childcare or nursing care, continuing research despite a heavy workload, and stepping up to a higher level. I would like you to consult with us before you worry that you have reached your limits."



"Mayudama Plaza", a place for exchange.



"Research skill up seminar", which is popular every time.

[≤go to TOP>](#)