

Session : “Future-oriented Intelligence”
- Diversity and Transdisciplinary Approach -

Today's Presenters

Prof. NAKAJIMA Miki
Nano Life Science Institute (NanoLSI)



Prof. KIKUCHI Michiru
Research Center for Child Mental Development



Assistant Prof. MILOTSKYI Romain
Frontier Science and Social Co-creation Initiative



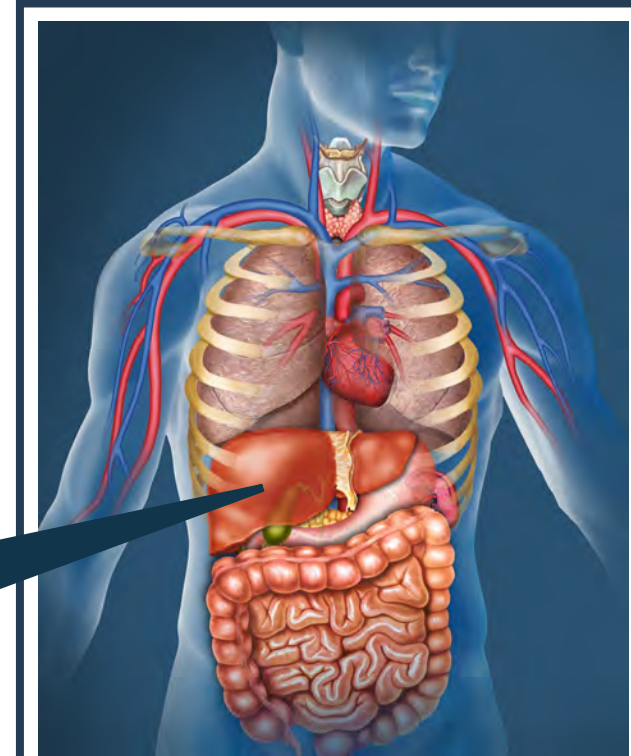
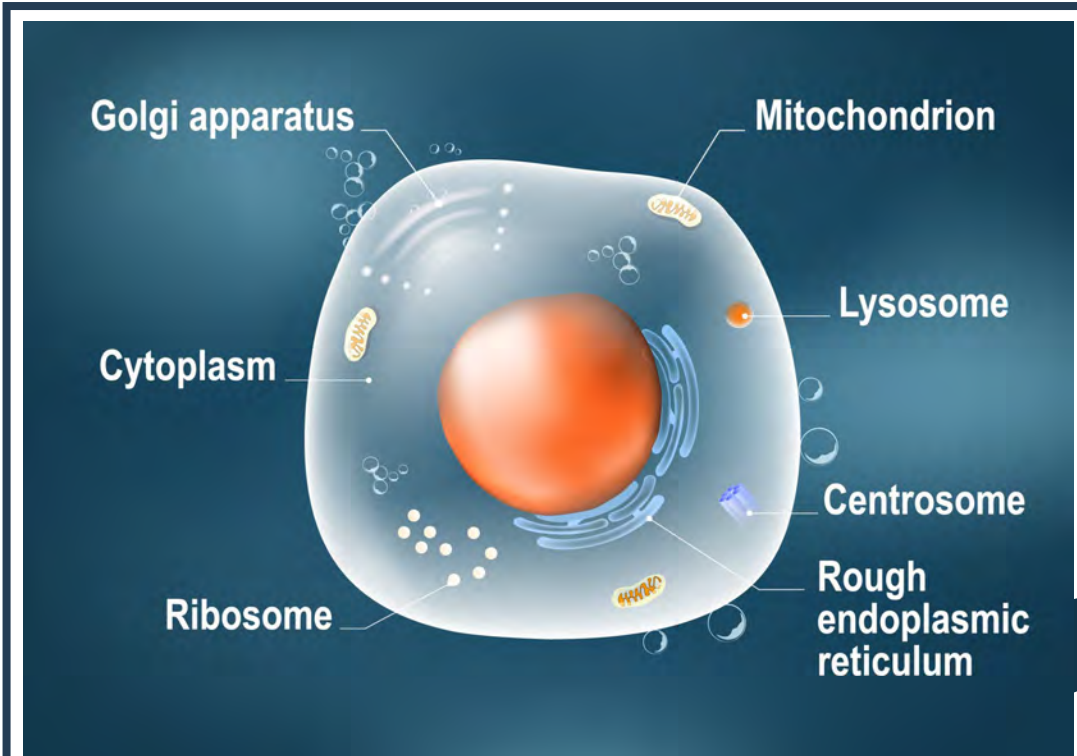


Visualizing Small Things Leads to Big Discoveries

Prof. NAKAJIMA Miki

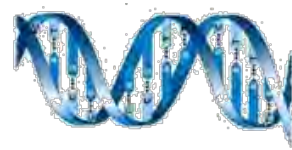
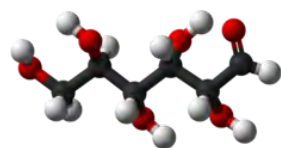
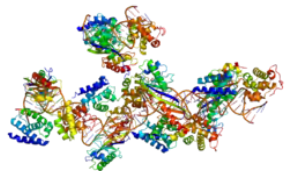


Visualizing Small Things Leads to Big Discoveries



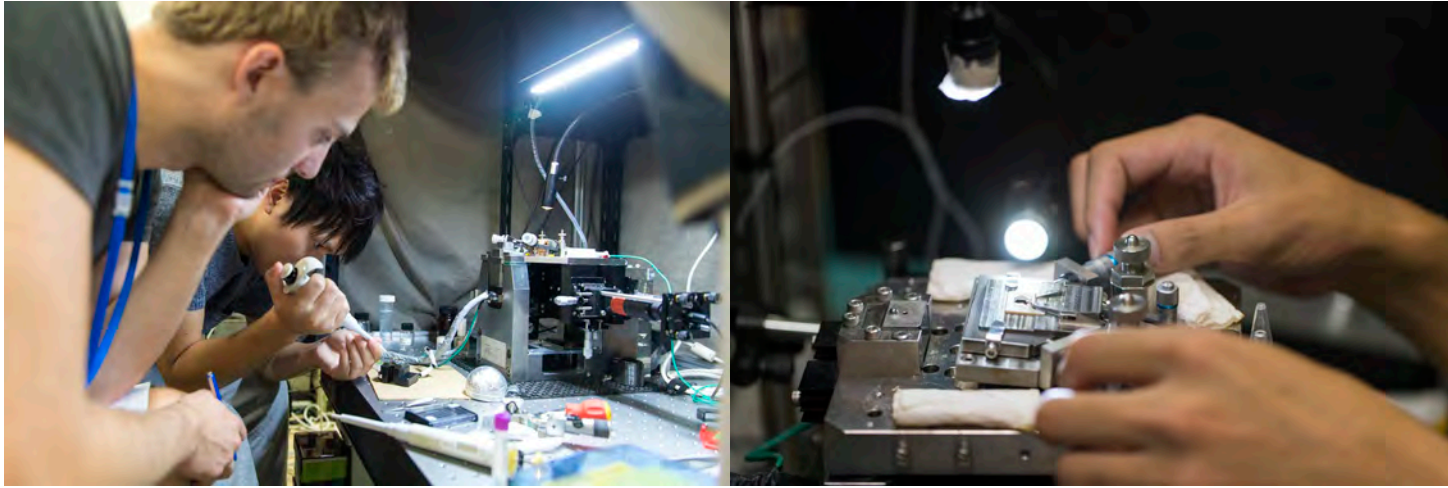
Nanodynamics in Cells

Proteins **Metabolites** **Nucleic acids**



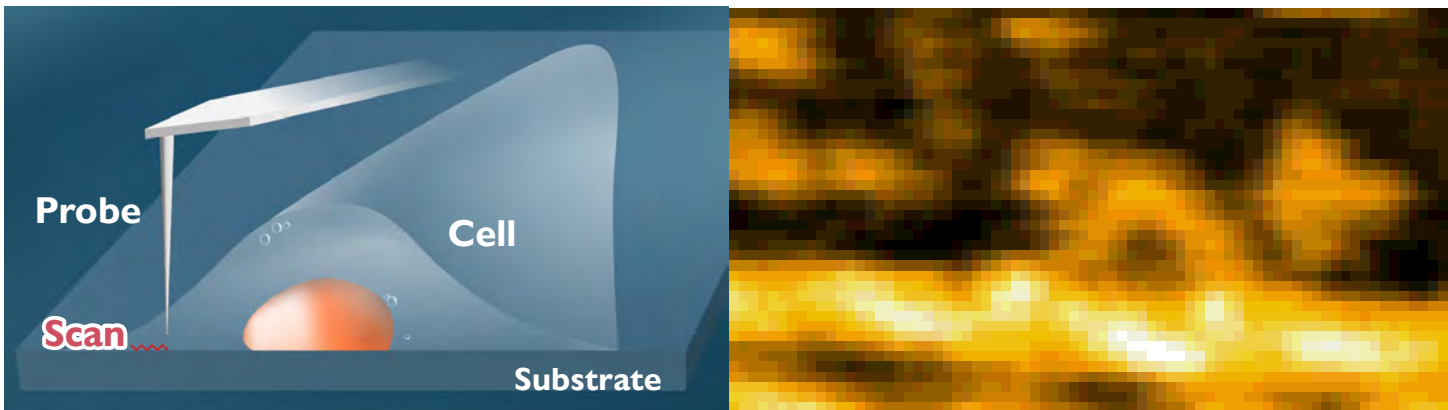
Life Phenomena

- **Disease**
- **Development**
- **Aging**



Bio-Scanning Probe Microscopy

Aim to elucidate the mechanisms of biological phenomena



Scan inside a cell to visualize nanoscale dynamics → **Myosin V on actin** *Nature* (2010)

24 Researchers Form the Core of NanoLSI

Life Sciences



Atsushi Hirao
(PI)



Masanobu Oshima
(PI)



Seiji Yano
(PI)



Kunio Matsumoto
(PI)



Rikinari Hanayama
(PI)



Richard Wong
(PI)



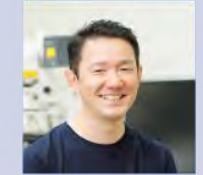
Miki Nakajima
(PI)



Hanae Sato
(Assoc. PI)



Satoshi Toda
(Jr. PI)



Yusuke Miyanari
(Jr. PI)

Computational Science



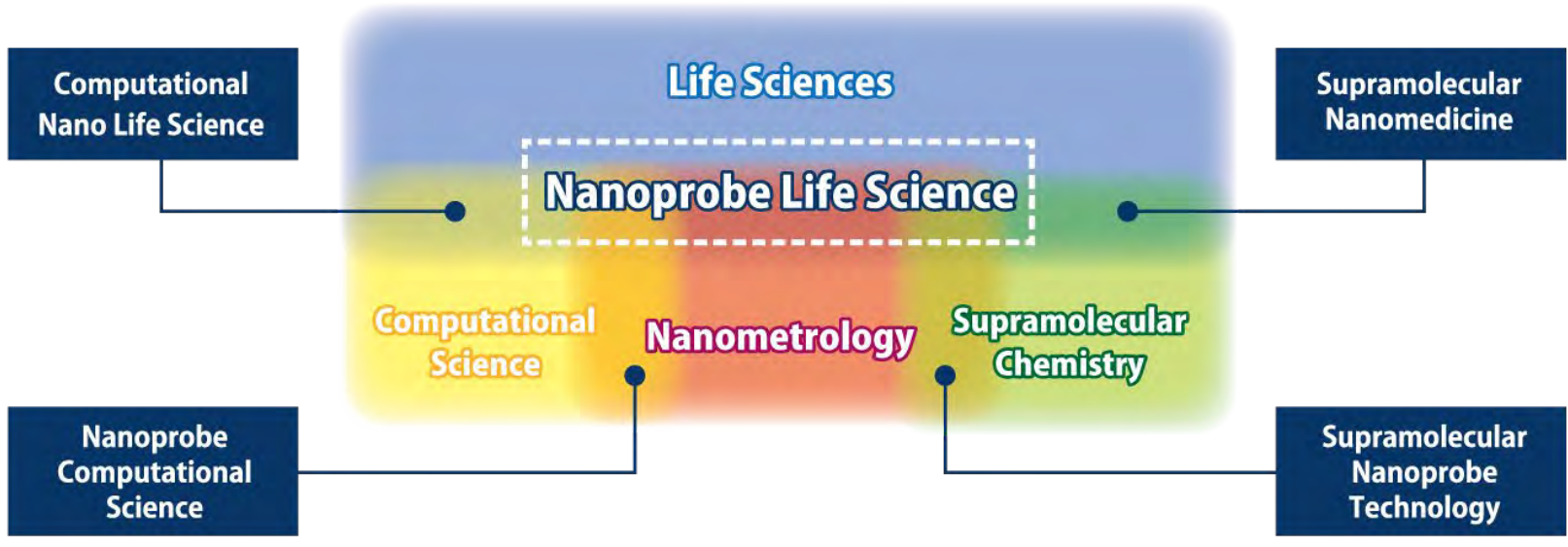
Adam S. Foster
Aalto University
(Overseas PI)



Carsten Beta
University of Potsdam
(Overseas PI)



Satoru Okuda
(Jr. PI)



Supramolecular Chemistry



Shigehisa Akine
(PI)

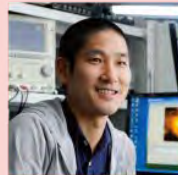


Tomoki Ogoshi
(PI)

Nanometrology



Takeshi Fukuma
(PI)



Noriyuki Kodera
(PI)



Yuri E. Korchev
Imperial College London
(Overseas PI)



Kazuki Miyata
(Jr. PI)



Clemens Franz
(Jr. PI)



Toshio Ando
Distinguished Professor of
Kanazawa University



Satoshi Arai
(Jr. PI)

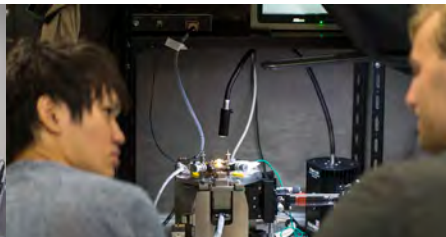


Mark J. MacLachlan
The University of British Columbia
(Overseas PI)



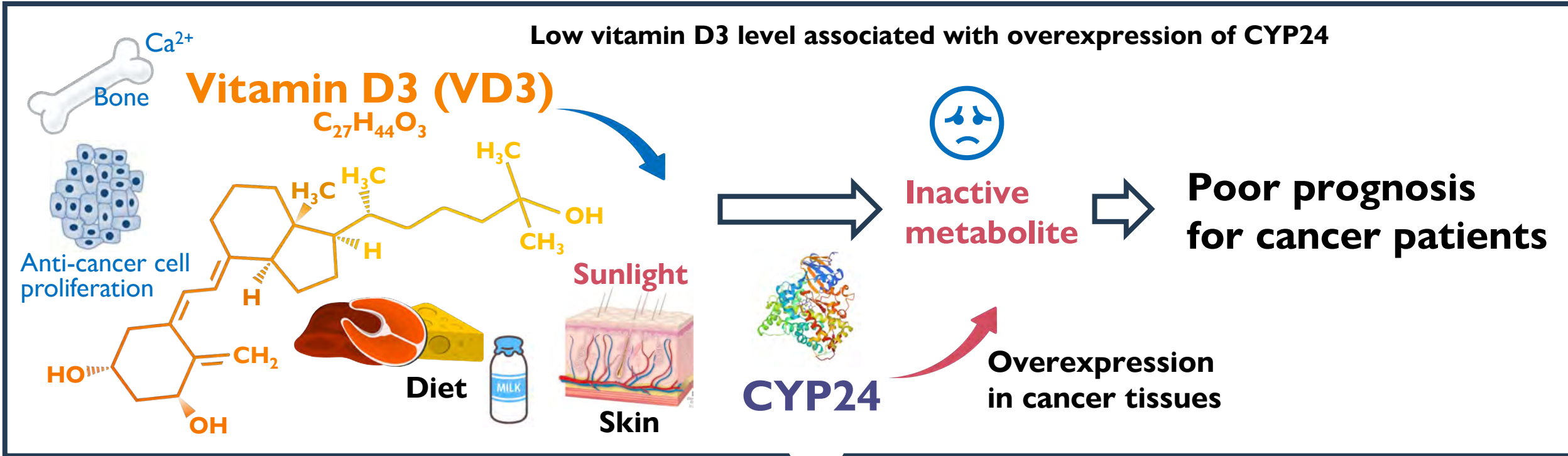
Katsuhiro Maeda
(PI)

Home to 130 Researchers and Staff



Expected Well-being through Research

— Promising **anti-cancer** molecule identified —



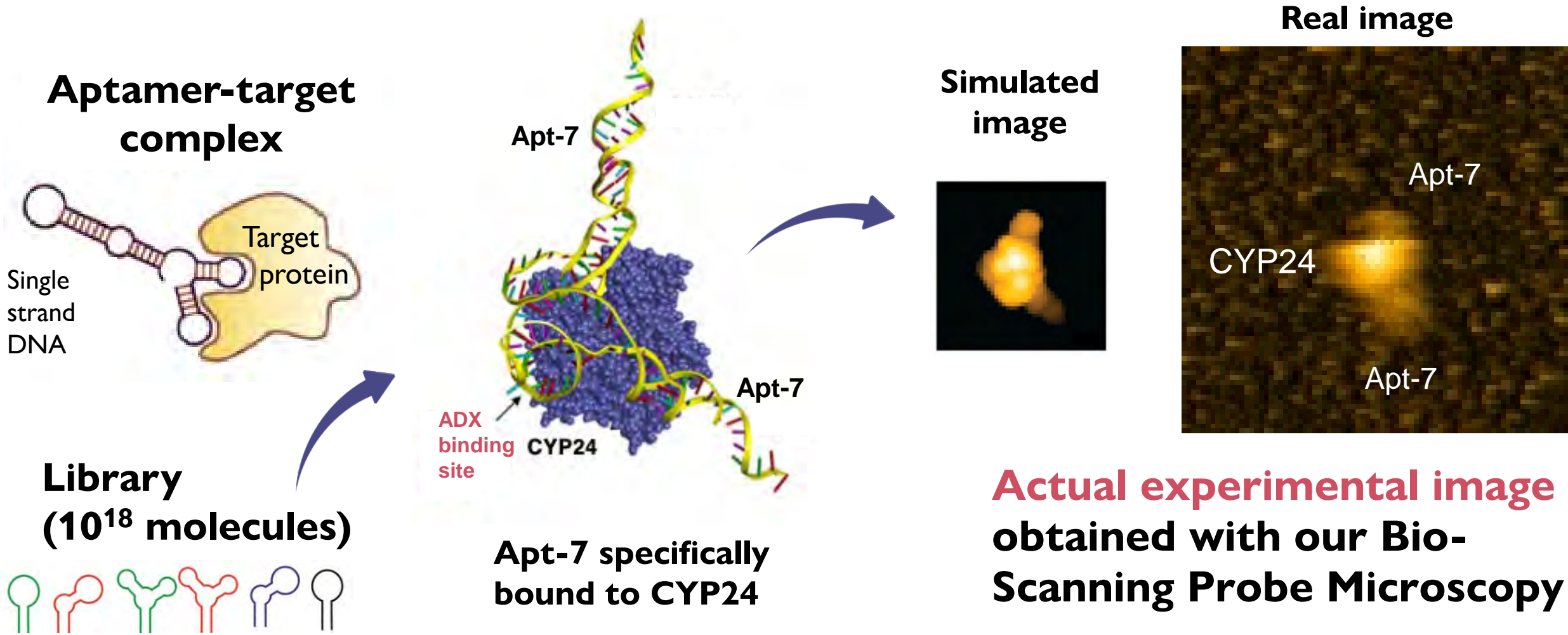
Molecules



- Inhibit the CYP24 activity

Expected Well-being through Research

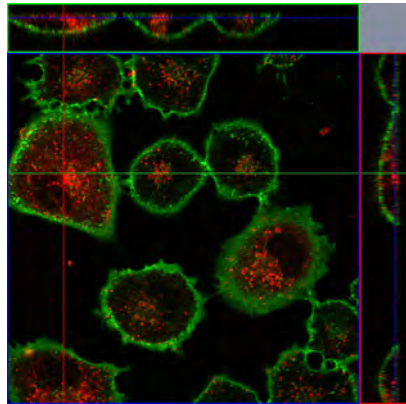
— Promising **anti-cancer** molecule identified —



Biyani M, Nakajima M, et al., ACS Appl Mater Interfaces, 14: 18064, 2022.

Expected Well-being through Research

— Promising **anti-cancer** molecule identified —



Green: Cell membrane
Red: Apt-7

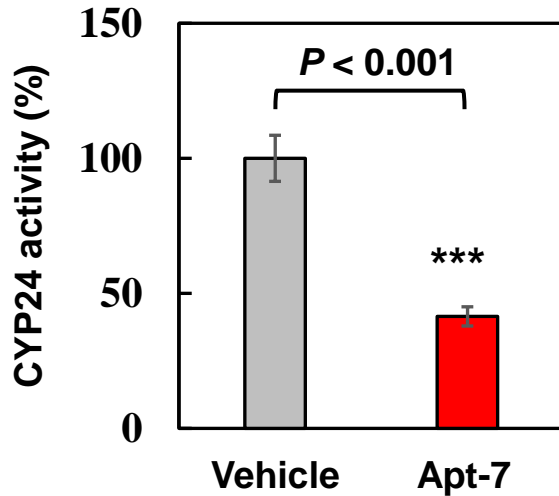
Apt-7 introduced in cancer cells



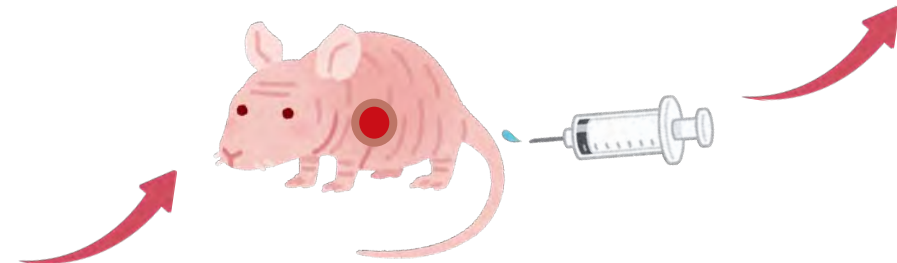
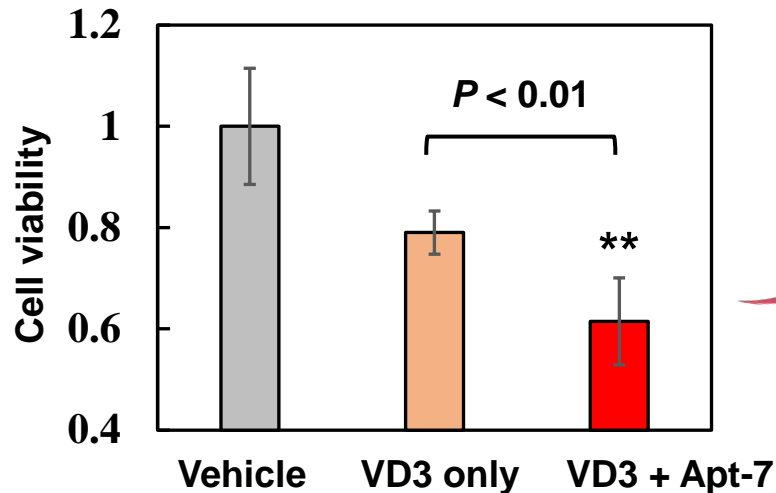
Apt-7 enhanced anti-proliferative activity of VD3



Clinical study



Significant **CYP24 inhibition** in cancer cells



Pre-clinical study using tumor-bearing mouse

Biyani M, Nakajima M, et al., ACS Appl Mater Interfaces, 14: 18064, 2022.

Social Brain Science for Children

National Project "Moonshot Goal 9"



Kanazawa University Hospital

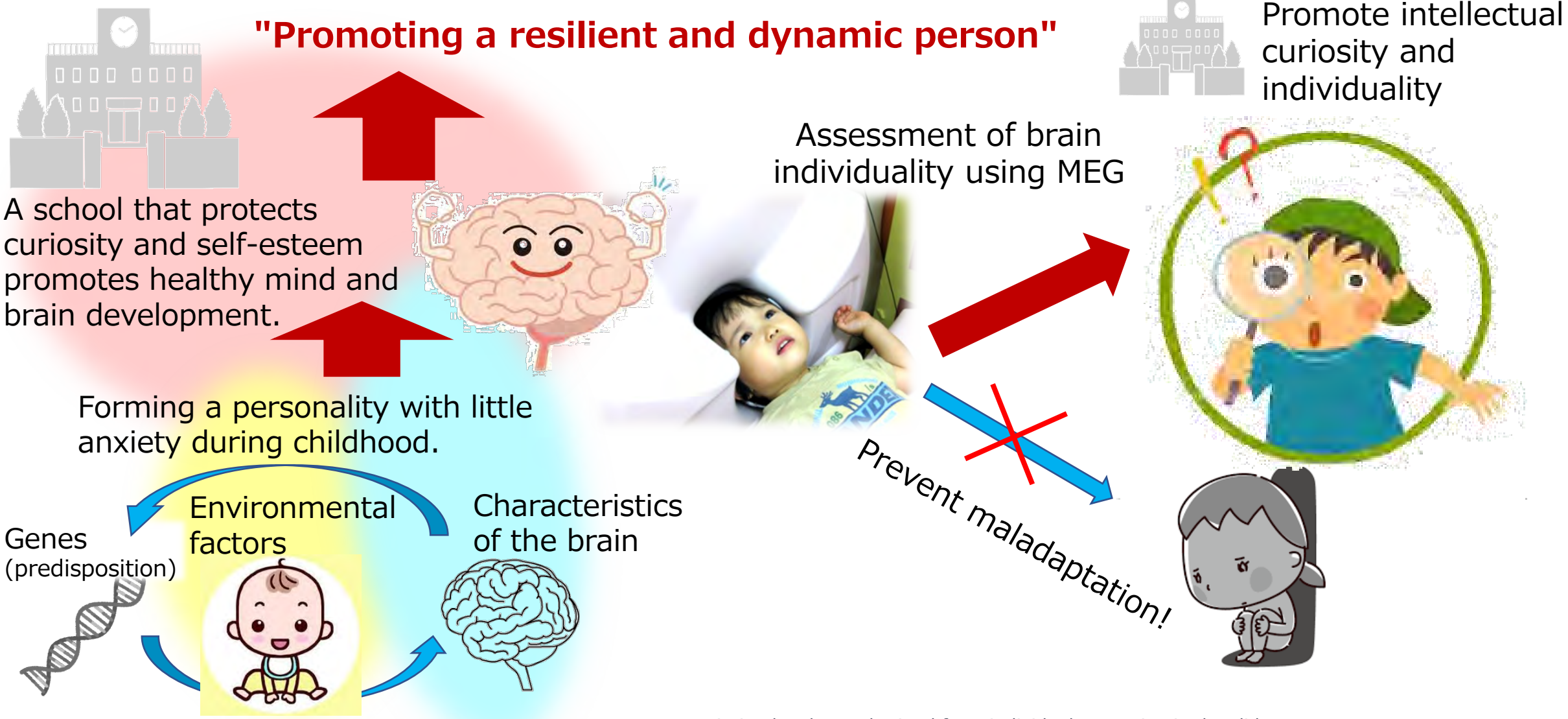
Research Center for Child Mental Development

Prof. KIKUCHI Mitsuru

MEG Center

Protecting children's intellectual curiosity and individuality to realize a dynamic society

Puberty
↑
Schoolchild
↑
Early Childhood



Permission has been obtained from individual appearing in the slide

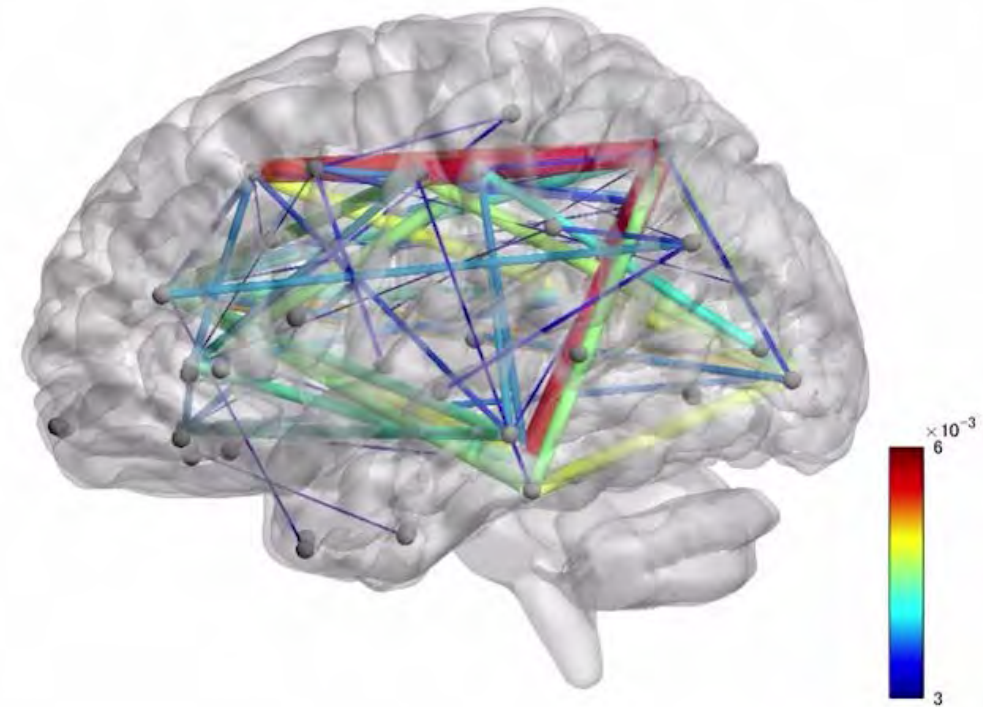
Social activity and brain network

Parent and child gaze into each other's in real time.

"The only device in the world"



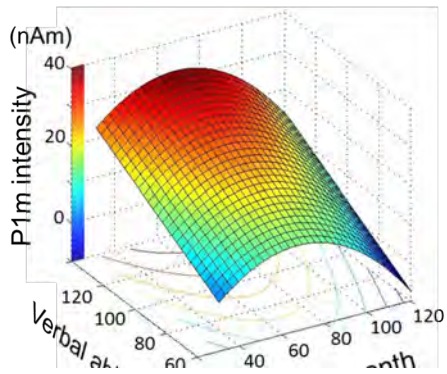
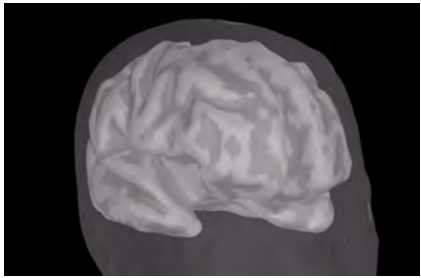
Dynamics of brain networks



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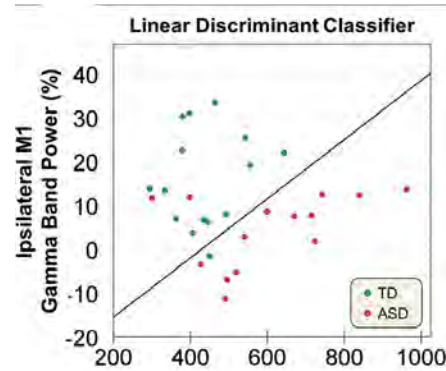
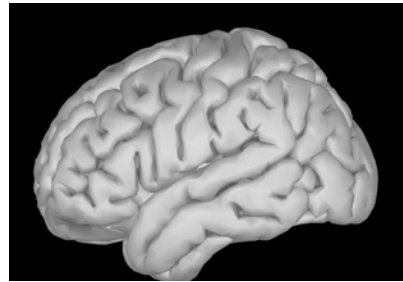
Characteristics of the brain and individuality of children

Auditory system



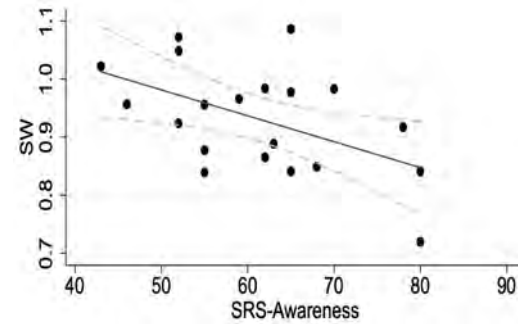
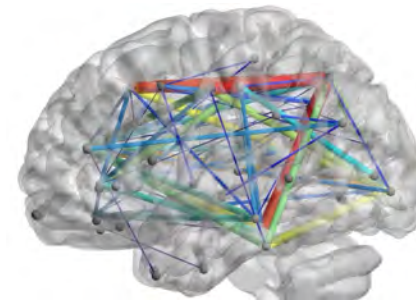
Language Development

Motor system



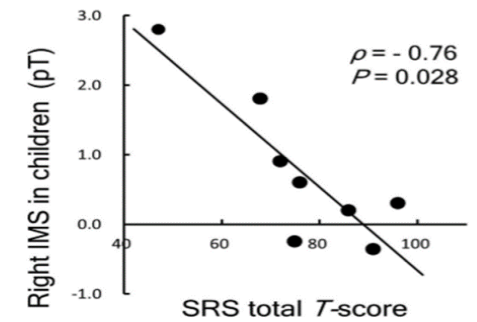
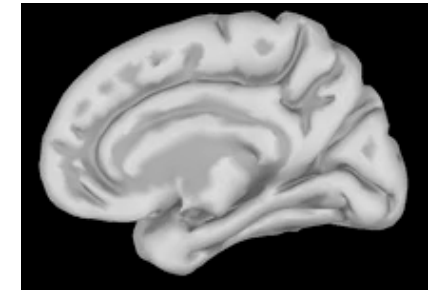
Diagnosis for Autism

Brain connectivity



Severity of Autism

Communication

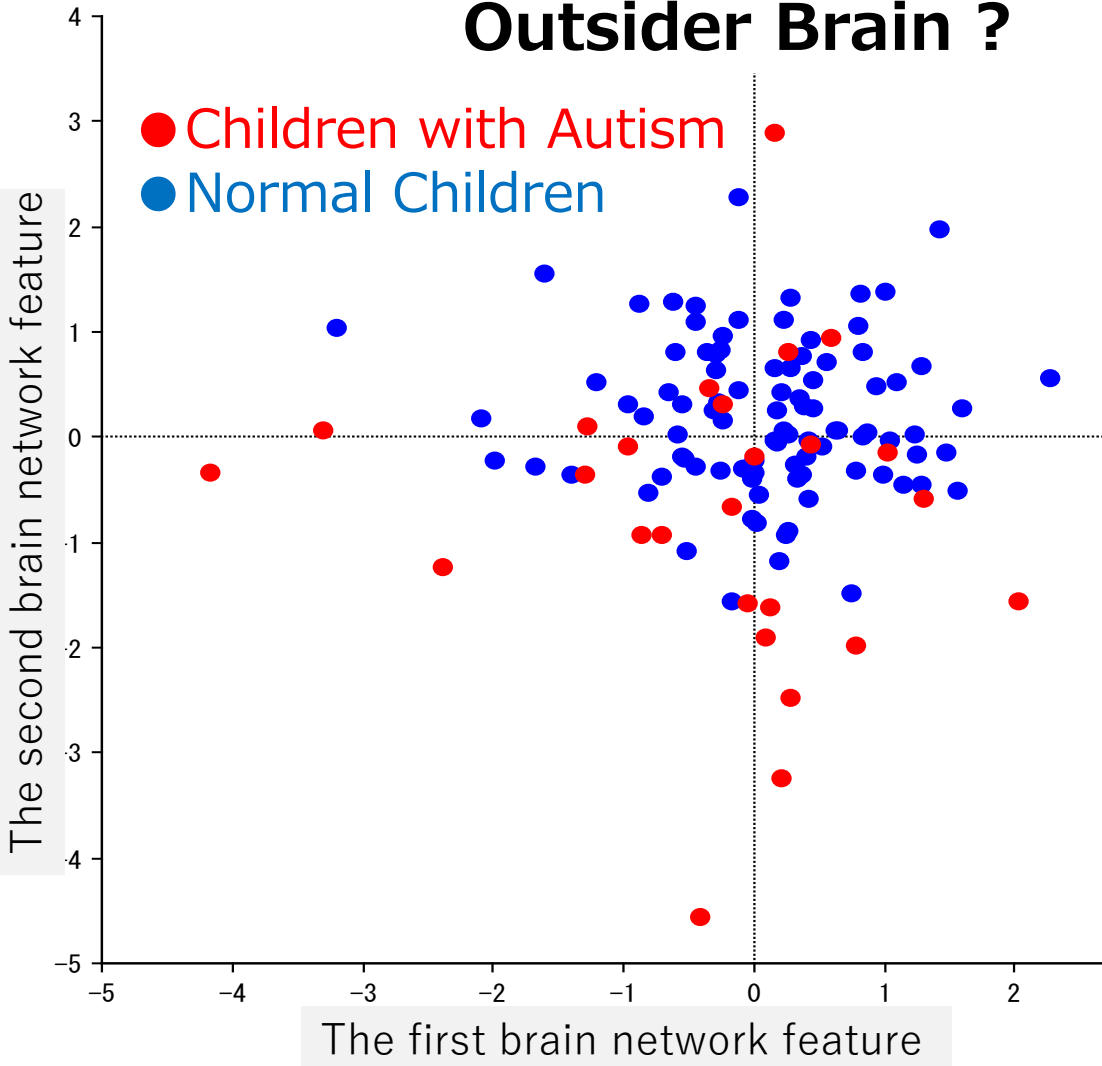


Severity of Autism

Diverse brain function in autism spectrum disorder

Outsider Brain ?

Outsider Arts



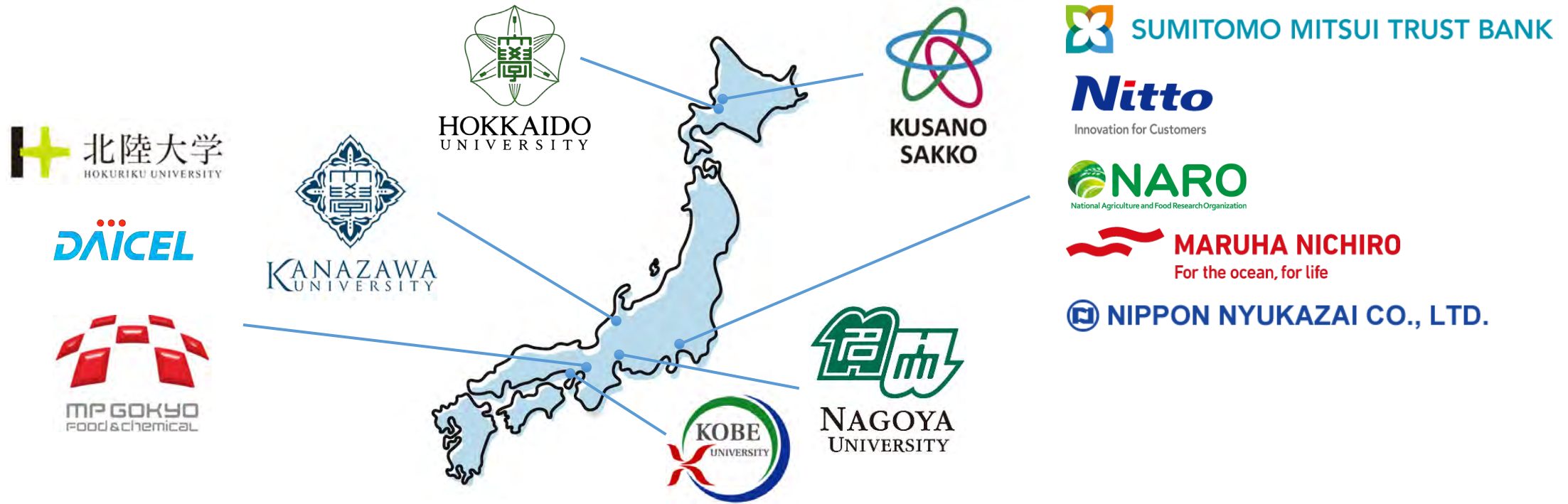
Open innovation platform for industry-academia co-creation

COI-NEXT: Towards sustainable society through circular design

2023/05/15

MILOTSKYI Romain

Project Assistant Professor



Another G7 : 7 Gods of Fortune in Japan

Fukurokuju: **Happiness**

Bishamonten: **Success**

Jyurojin: **Longevity**

Daikokuten: **Wealth**

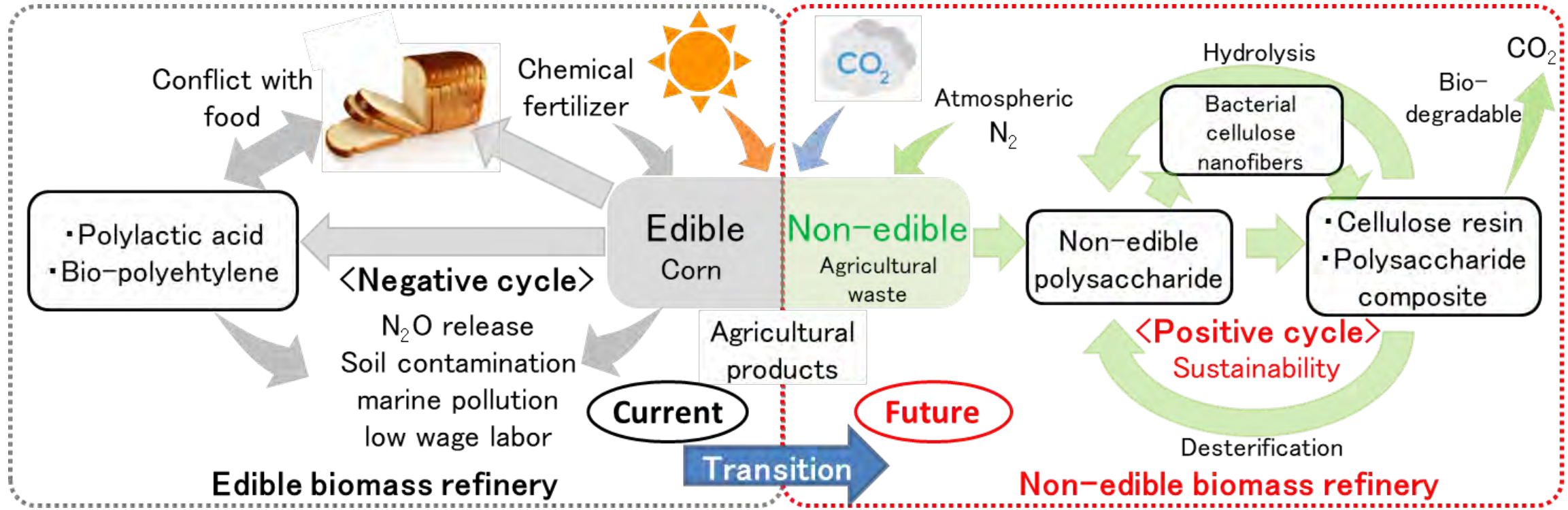
Ebisu: **Development**



Benzaiten: **Beauty**

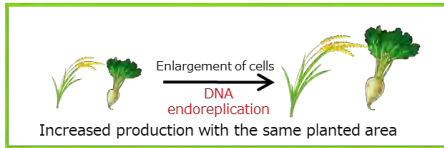
Hotei: **Cleverness**

Our Future Vision : A Next-Generation Biorefinery with Complete Recycling

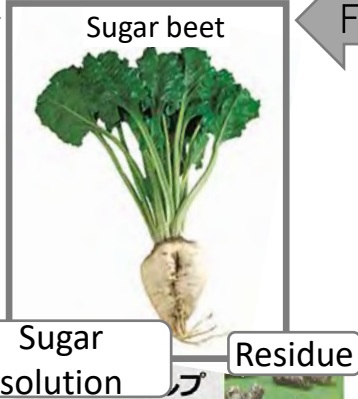


The Circular Economy Creates the Future

Plant functionalization
makes cells bigger
Increased yield



DNA replication

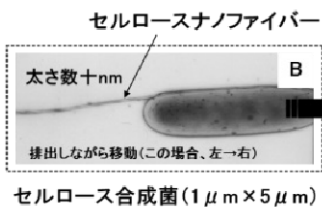


Fertilizer from air !



Modern version
Haber-Bosch
The air becomes
fertilizer

White sugar
200 yen/kg
Million tons/year



Using microbial



Customizable design

- Biodegradable**
- Agricultural materials
 - Fertilizer capsule
 - Aquaculture materials

- Recyclable**
- Paper container
 - Microbeads
 - Food packaging



Environmental regeneration

Global Agricultural Waste + SDGs

Beet Pulp

Production:
15 million tons



Banana Waste

Production:
1 billion tons



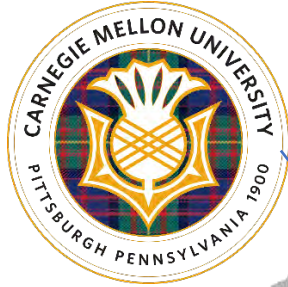
Global sugar beet production

Country	Production Volume (x10,000 tons)	Production Volume/area (kg/ha)
France	3,300	84,000
United States	3,200	63,000
Germany	2,500	62,000
Ukraine	1,700	29,000
Japan	430	64,000
Canada	91	29,900
Total globally	24,700	47,000



Creating Future Together

Research collaboration
with Carnegie Mellon University



British cosmetic retailer

LUSH

All-Ukrainian Innovation Ecosystem



Banana paper maker



One Planet Café®

COI-NEXT Project's home university



KANAZAWA UNIVERSITY

jbei

Joint BioEnergy Institute



Blake Simons,
Division Director,
Lawrence Berkeley
National Laboratory,
Joint BioEnergy Institute

French luxury group

KERING



Banana paper



Redouane Borsali,
CNRS Research Director,
Exceptional class