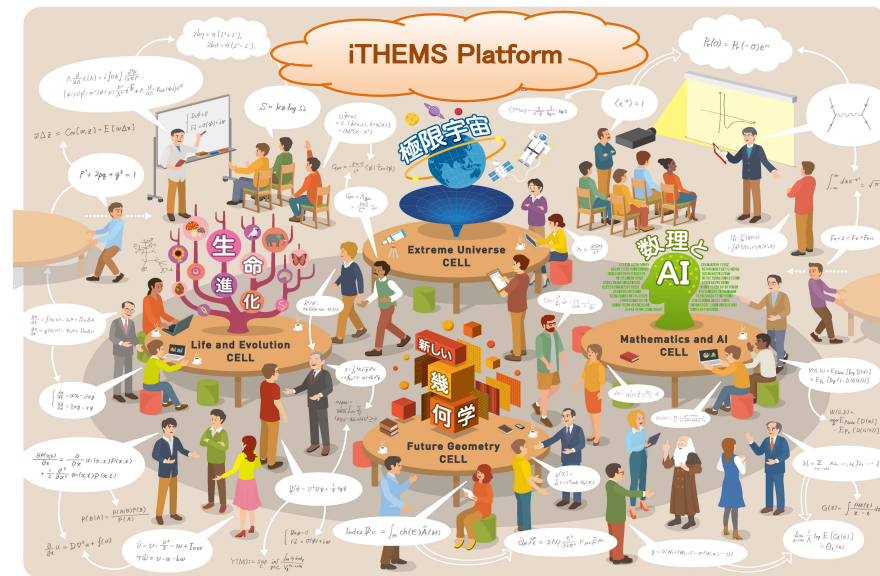


ISCO 2023

Closing Remark

Tetsuo Hatsuda (RIKEN iTHEMS)



IPMU OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY OIST iTHEM 科研費

Interdisciplinary Science Conference in Okinawa

ISCO 2023

Physics and Mathematics meet Medical Science

2023 Feb. 27th ▶ Mar. 3rd

OIST Okinawa Institute of Science and Technology

Deadline of Abstract Submission: 30. Nov. 2022

Deadline of Registration: 31. Jan. 2023

<https://indico.ipmu.jp/e/ISCO2023>

Scan this QR code for more information





Welcome Address Luscombe (OIST)



Opening Remark Takahashi (IPMU)

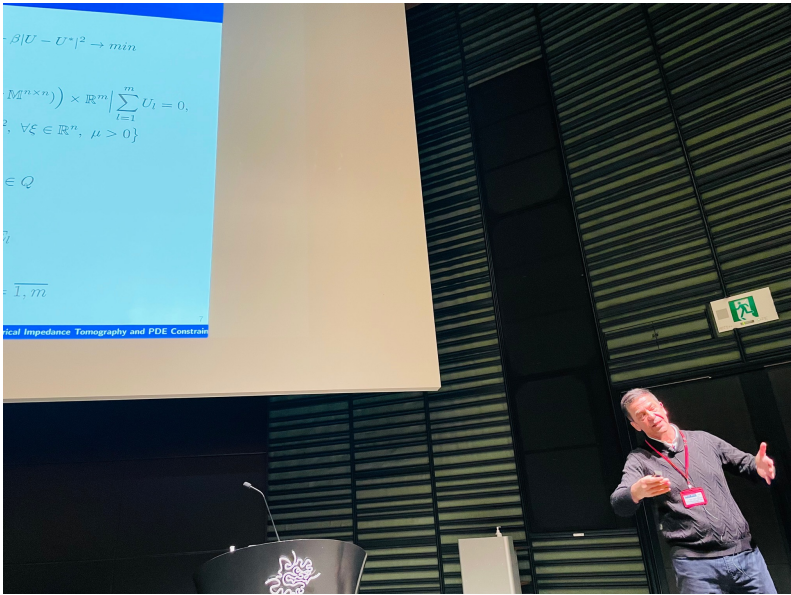


Welcome Talk Wagner (OIST)

Day 1

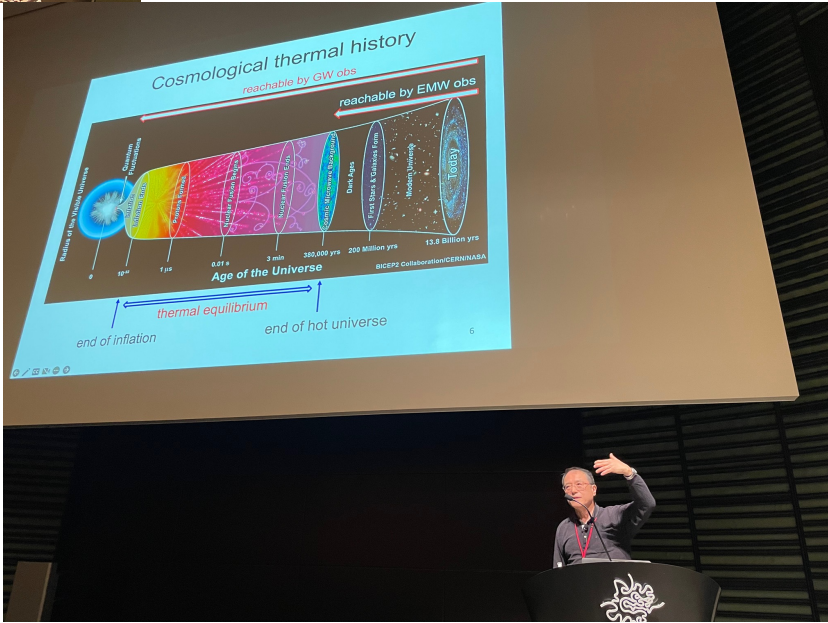


Inflation Universe
Sasaki(IPMU)

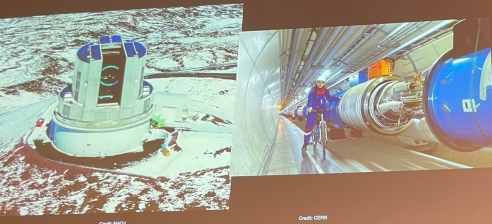


Optimal control
Abdulla (OIST)

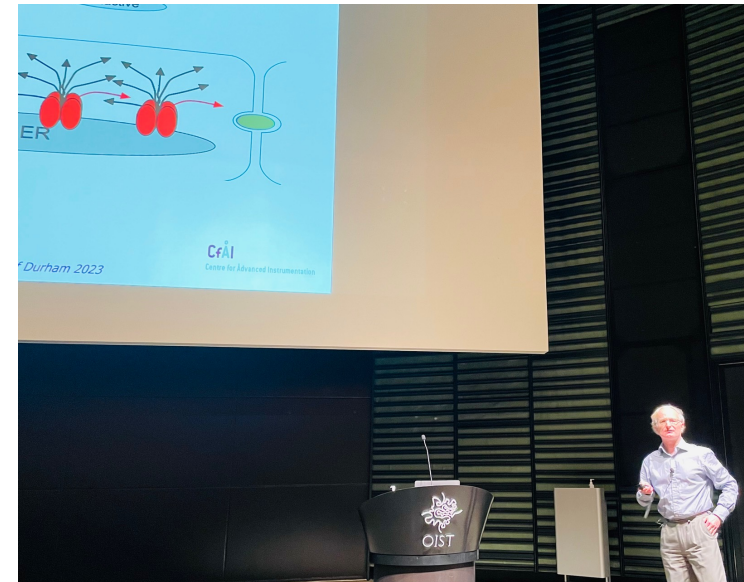
Island Earth
Davies (UC Berkeley)



Time machines



Quantum Computing Nishimori (Tokyo Tech.)




Origin of the Universe Murayama(IPMU)

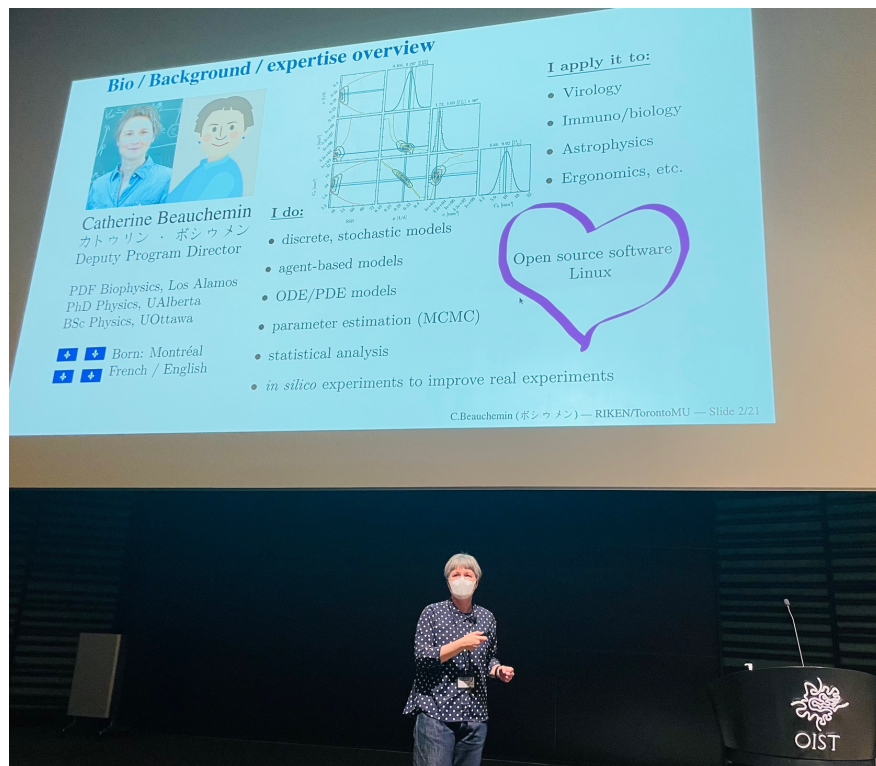
Quantum simulation

Richard Feynman (1981)
"I want to talk about the possibility that there is to be an *exact* simulation, that the computer will do *exactly* the same as nature."

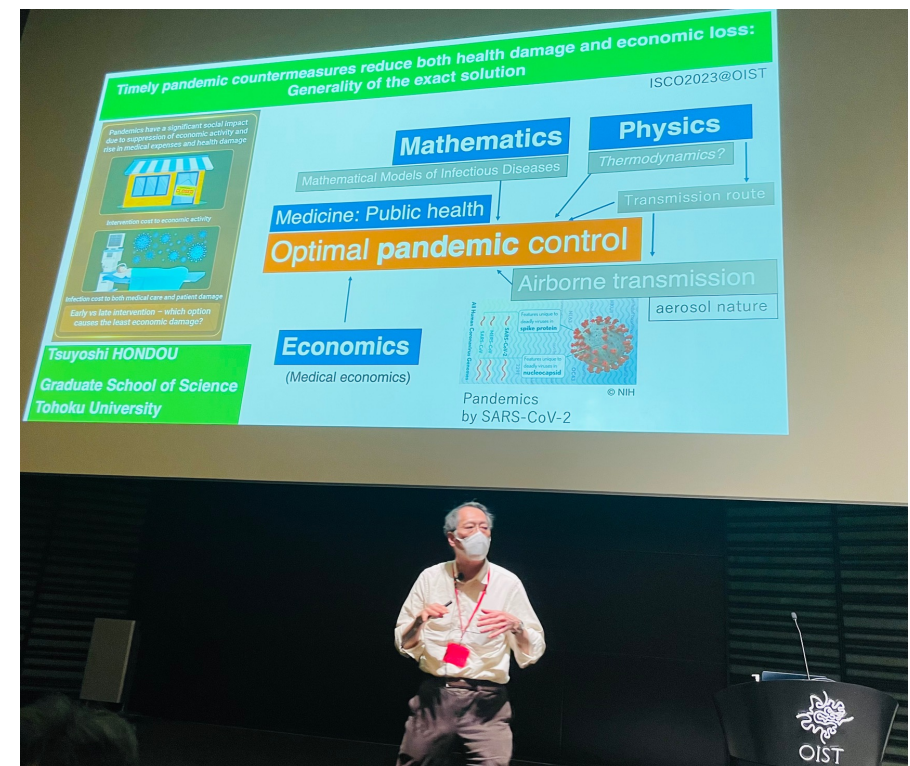
- **(my) Definition of quantum simulation**
To reproduce the behavior of a quantum-mechanical system on an artificial quantum device.
- **Advantage over real experiment**
Precise control microscopic parameters. E.g. interactions between spins
- **Disadvantage**
Difficult to build large systems without noise.
- **Today's topic**
Successfully mitigated the difficulty in a (relatively) large system with up to several thousand qubits.



Endothelium Girkin(Durham)



Optimal Pademic Control Hondou (Tohoku)



Physics Reasoning in Biology Beauchemin (RIKEN/TMU)



Posters



Cell Aging
Kono (OIST)

Day 2

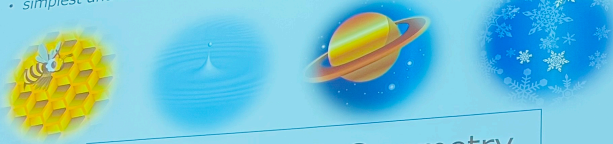
Neutron Stars
Baym (UIUC/RIKEN)



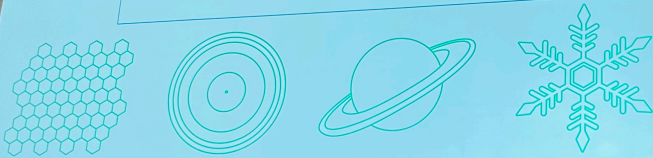
Geometric Analysis

nature chooses symmetric figures: WHY?

- Principle of Least Action (energy)
- simplest and most economic figure: Minimal surfaces, Harmonic maps



Least Energy → Symmetry



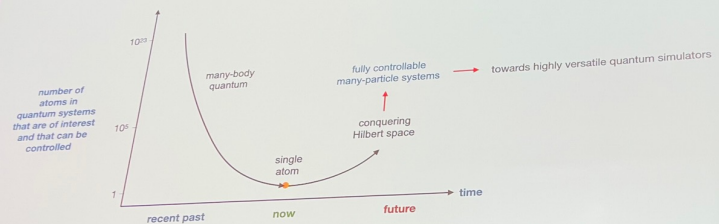
Discrete Geometry

Kotani (Tohoku)

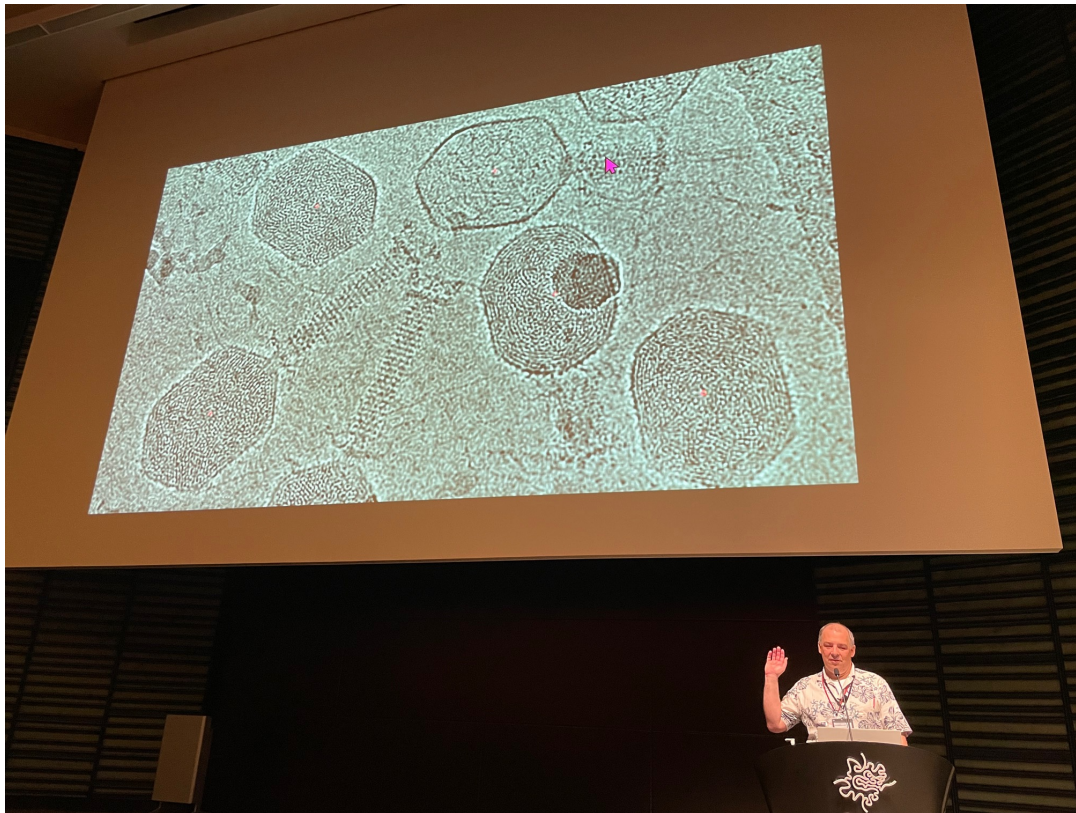
Quantum Simulation

Busch (OIST)

Brief Review of Progress



- the problem is that quantum systems are very fragile and the important coherences decay quickly
- need to find a good system

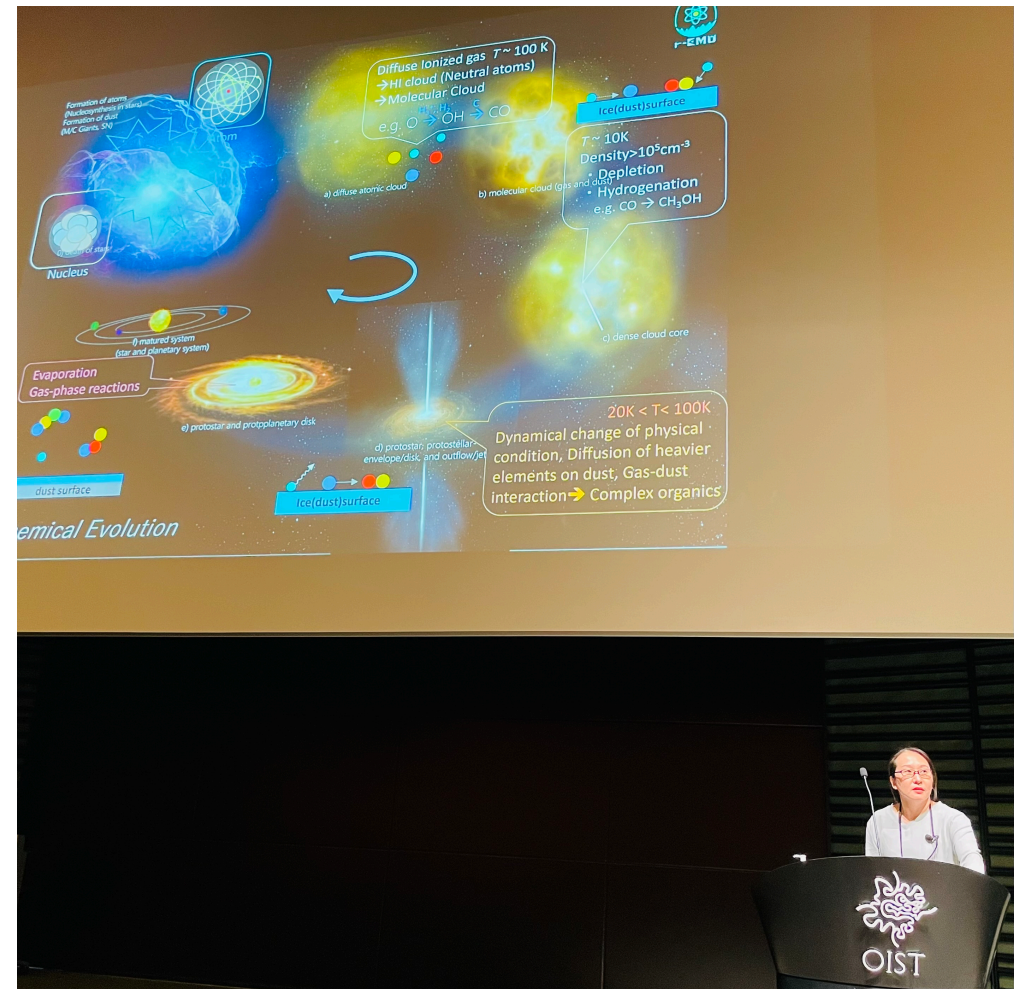


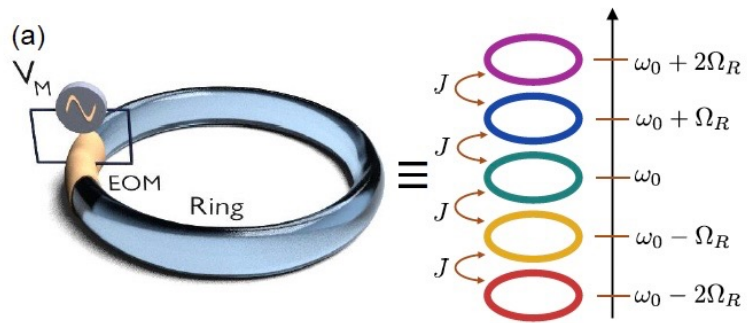
Phage Therapy

Wolf (OIST)

Origin of Solar System

Sakai (RIKEN)



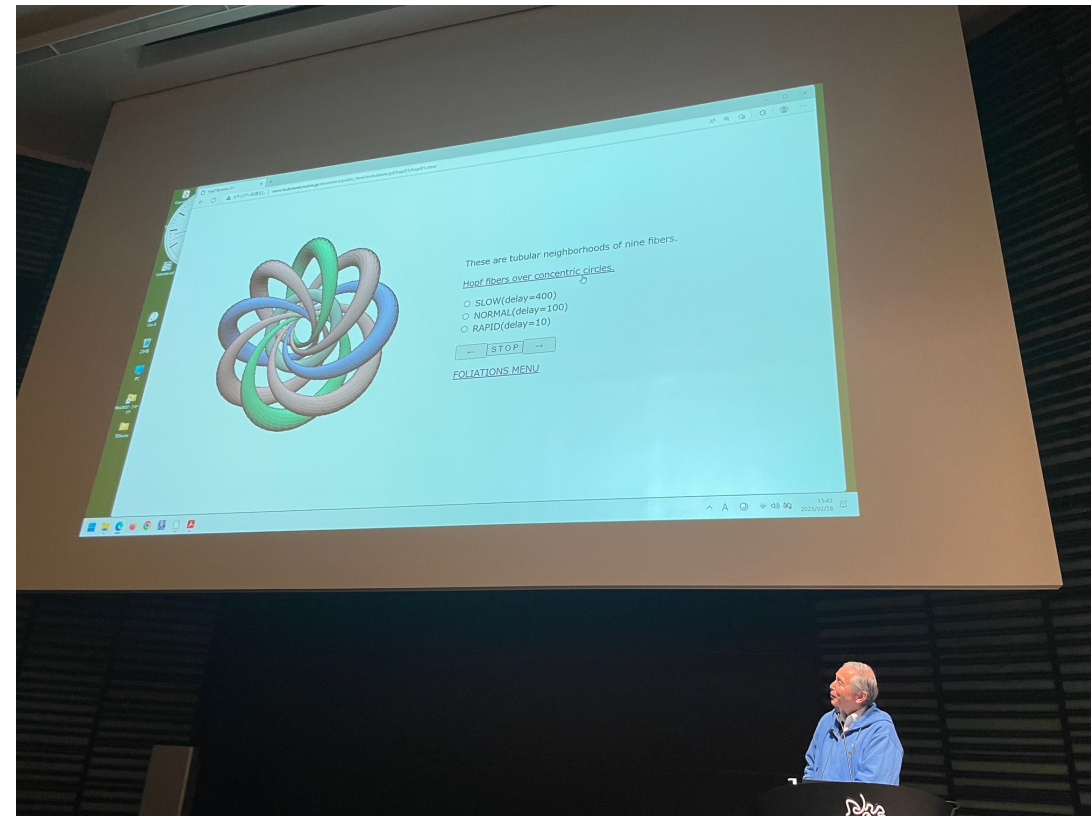


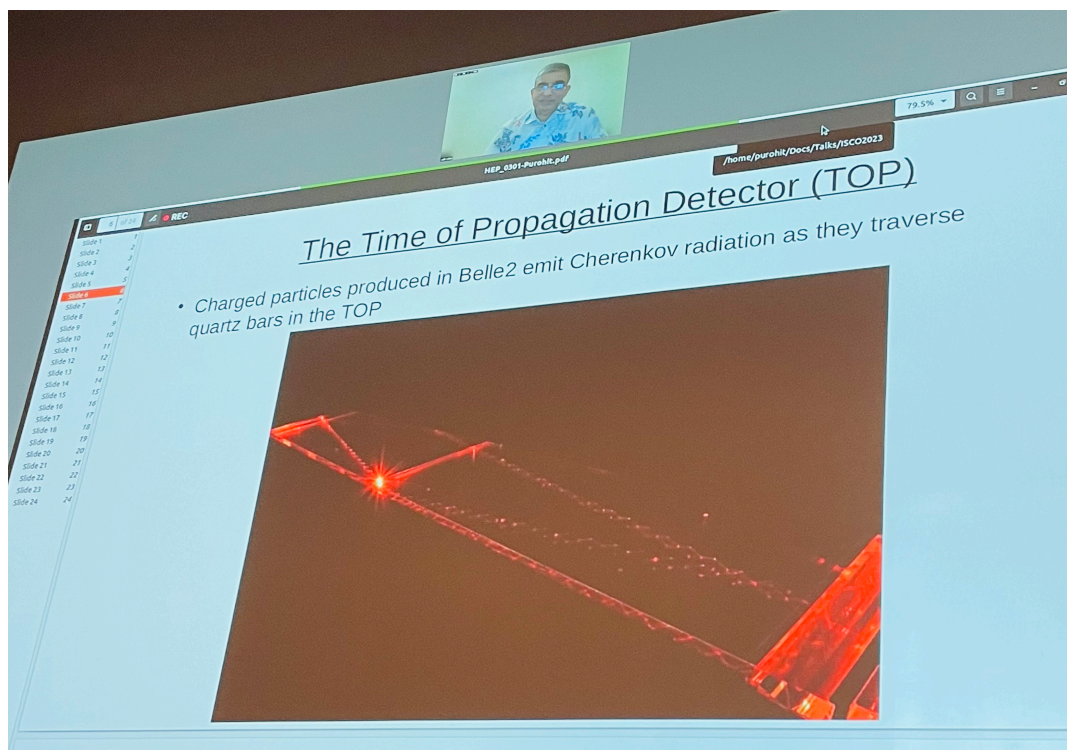
Birkhoff Sections

Tsuboi (Musashino/RIKEN)

Topological Physics

Ozawa (Tohoku AIMR)





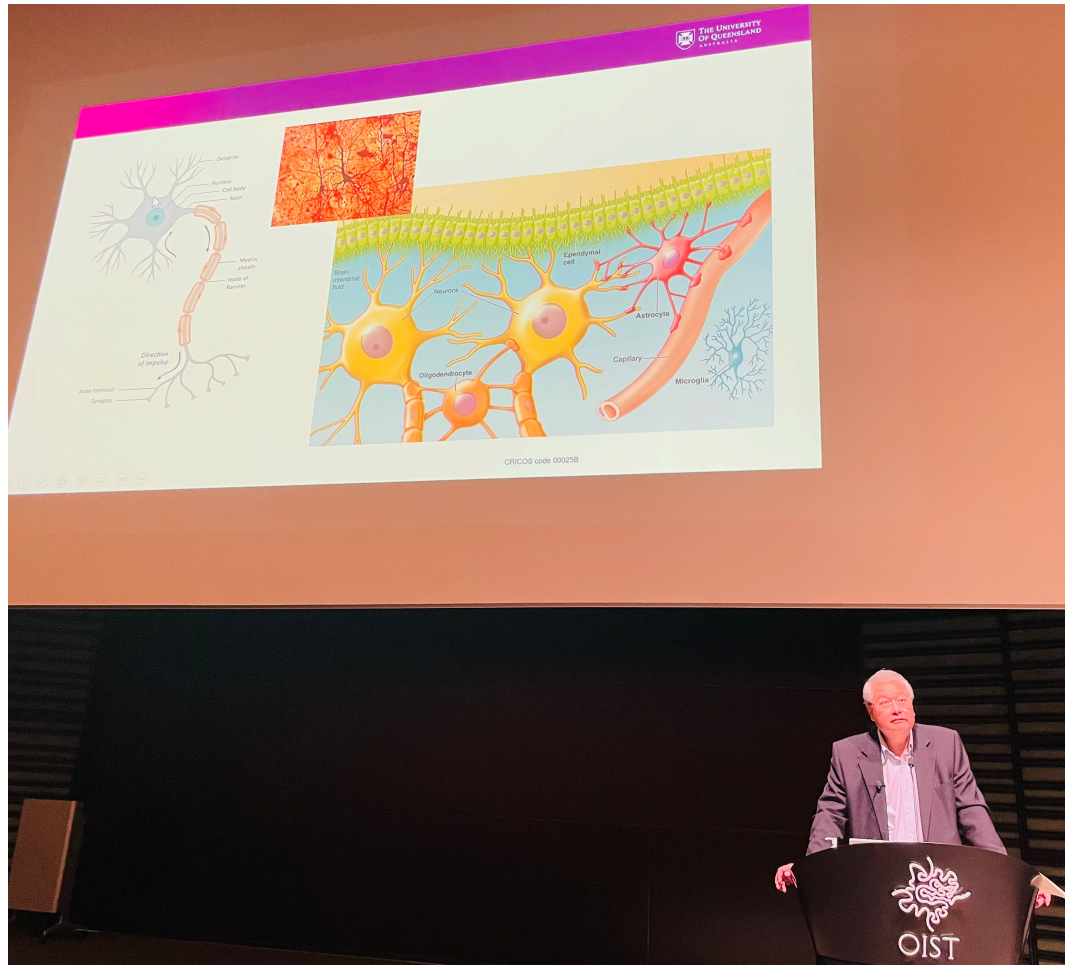
HEP and Medicine
Purohit (OIST)

Day 3

Machine Learning in HEP

Nojiri (KEK)

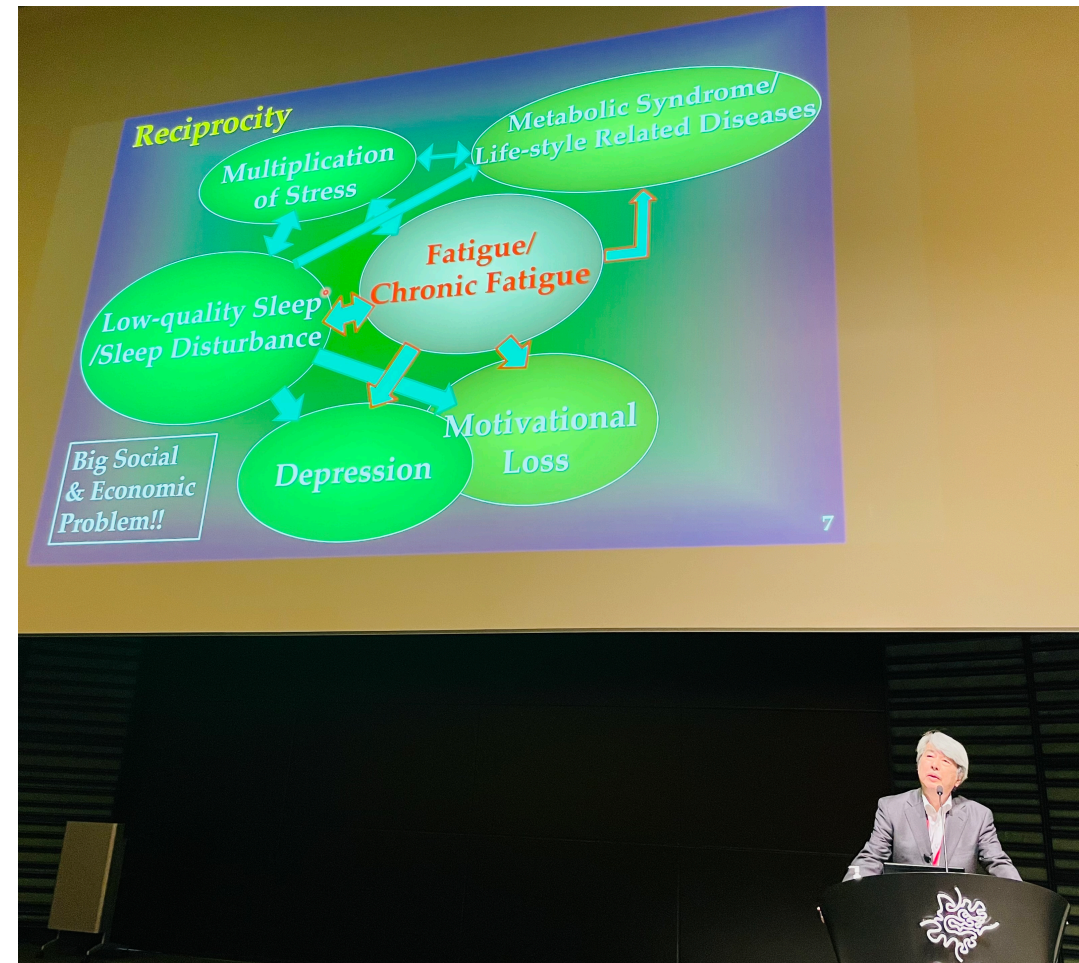




Biomedical Imaging
Reutens (Queensland)

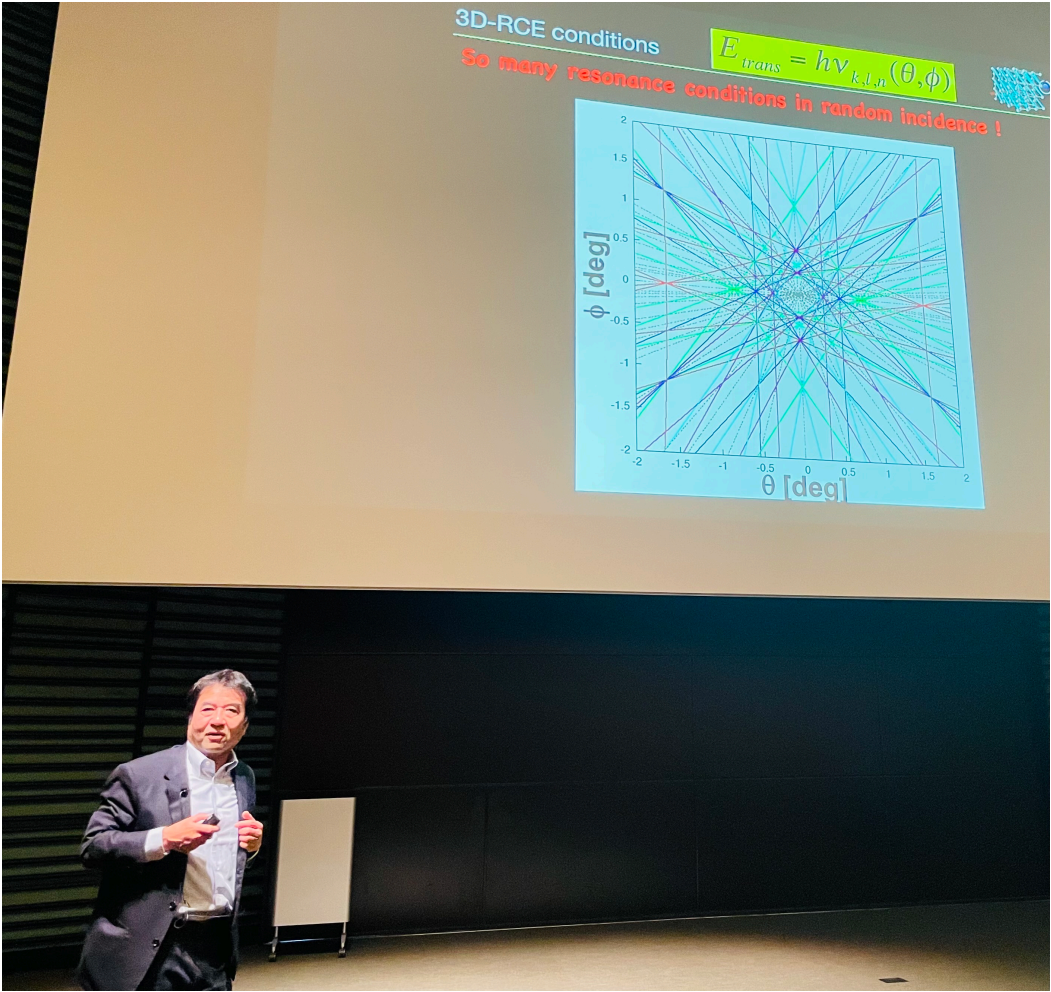
Science of Fatigue

Watanabe (RIKEN)



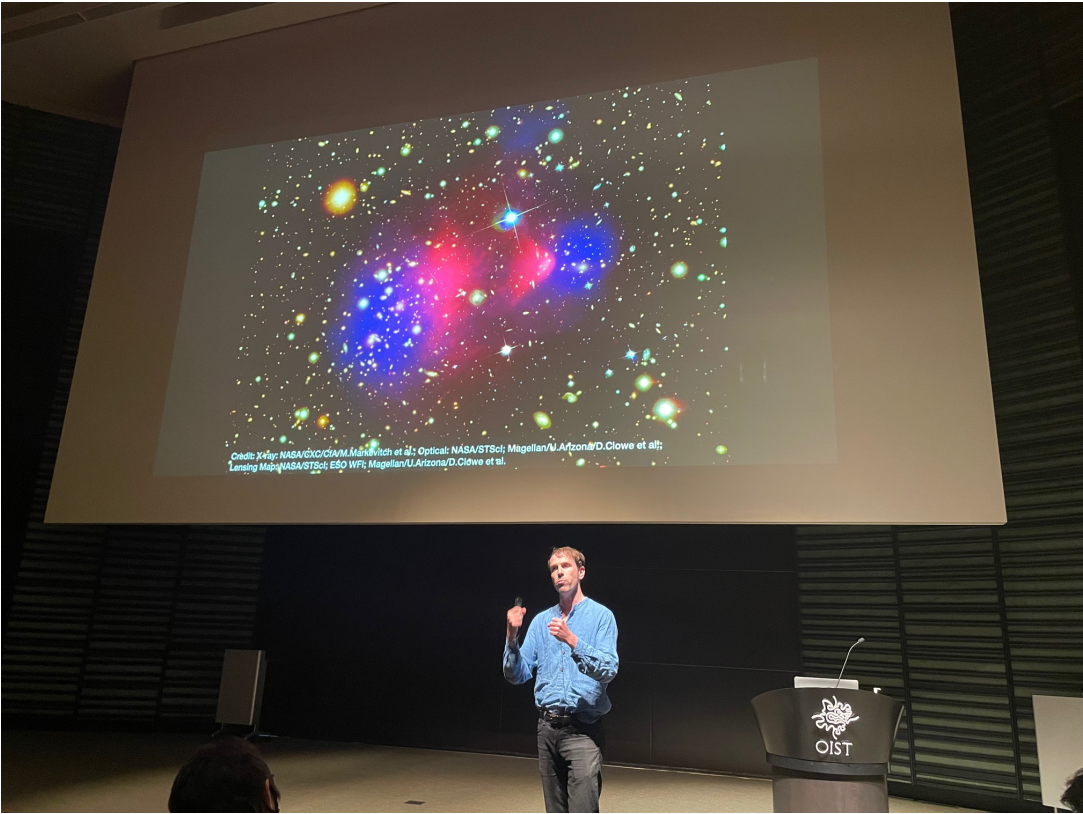
Lunch

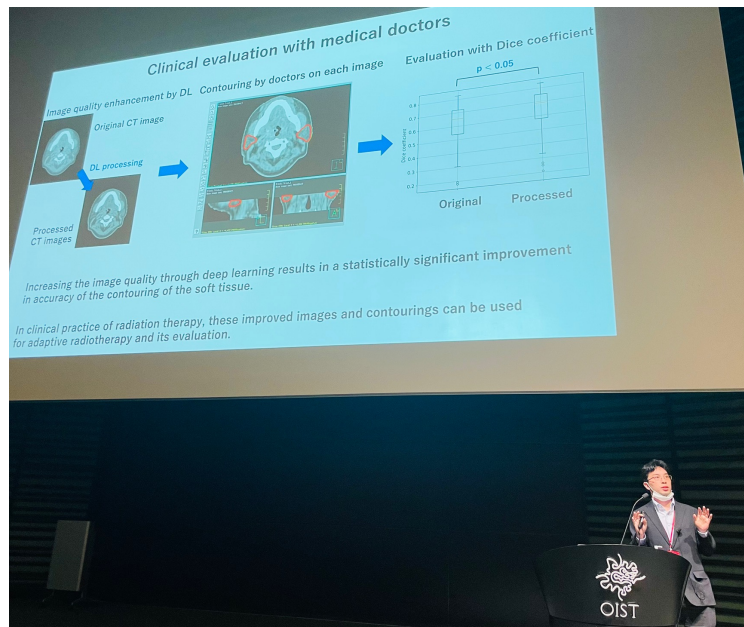




AMO Physics
Azuma (RIKEN)

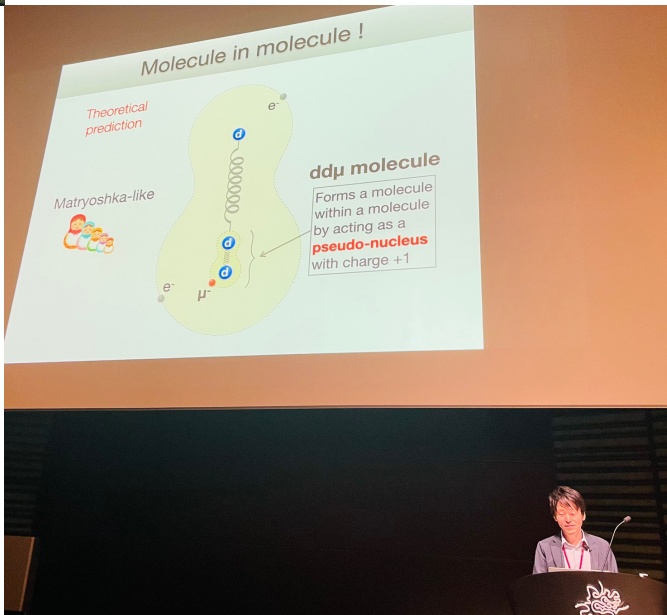
Dark Matter
Melia (OIST)



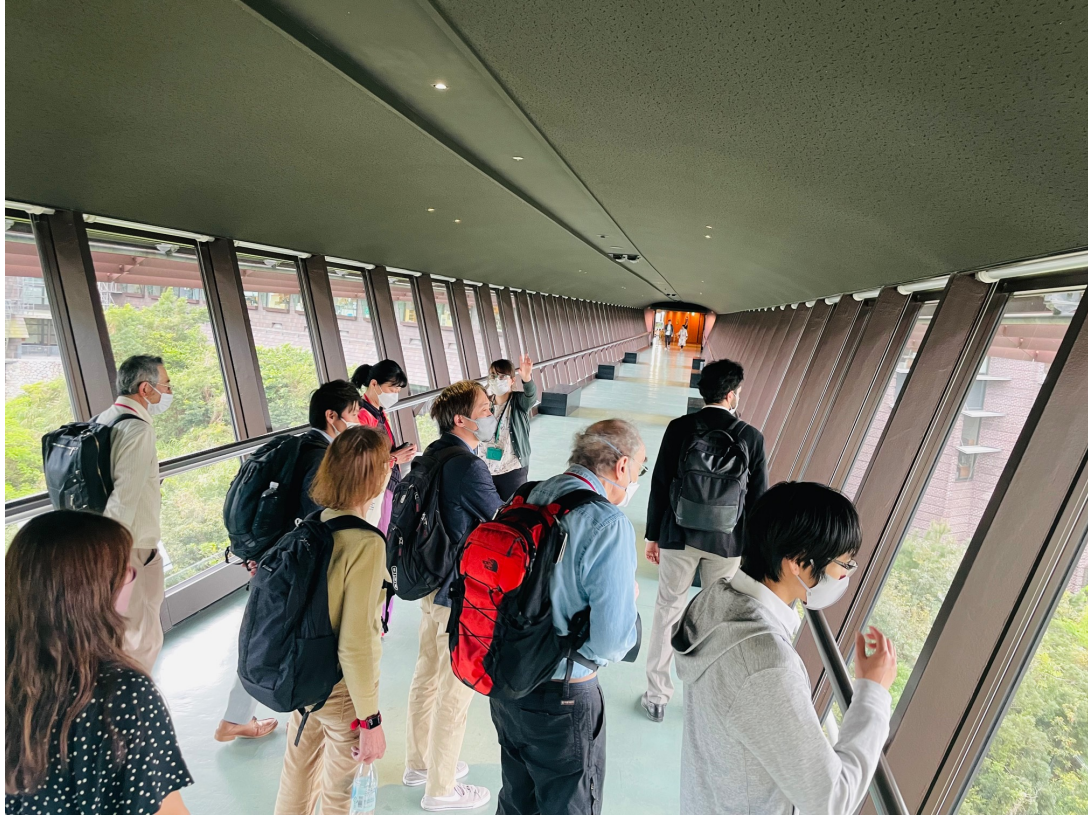


Deep Learning in Medicine Ozaki (Hirosaki)

Muon-catalyzed Fusion Okada (Chubu)



Red Hydrodynamics Monnai (OIT)



OIST Tour



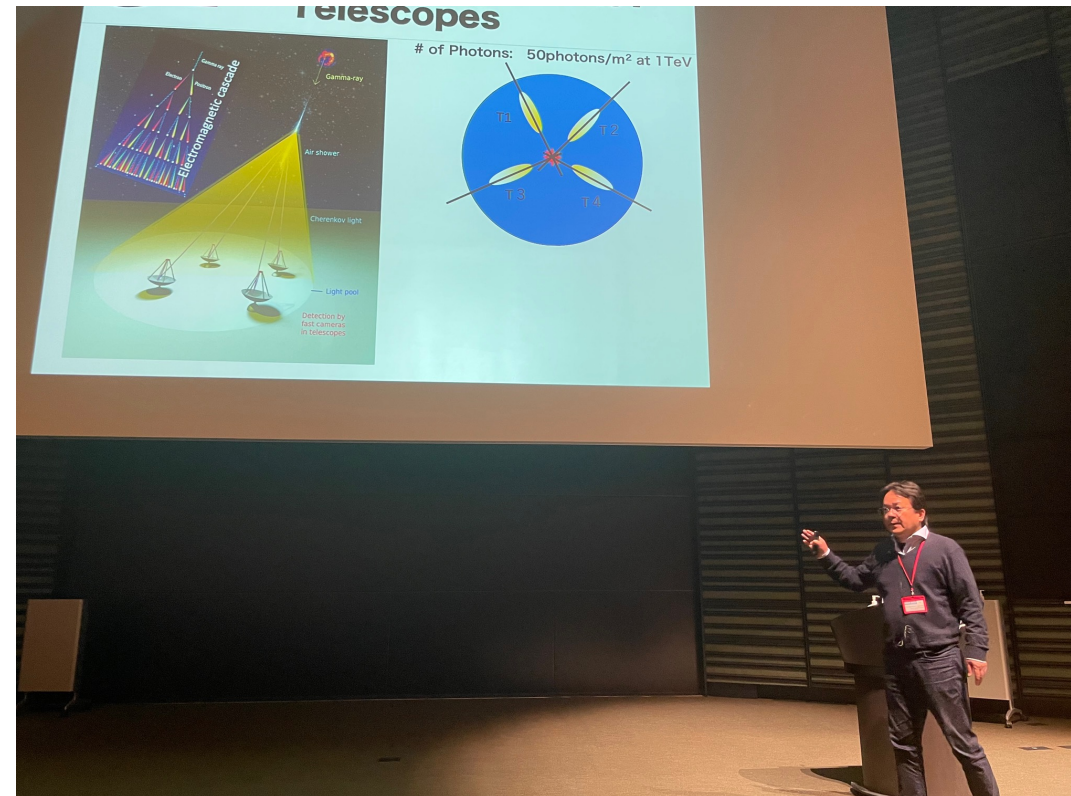
Neutrino telescope: IceCube

Ishihara (Chiba)

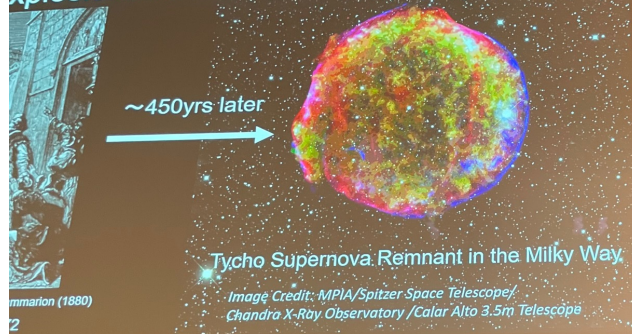
Day 4

Gamma-ray telescope: CTA

Teshima (MPI/ICRR)



Strategy: Finding Legacies of Supernova Explosions in Supernova Remnants



Supernovae Nagataki (RIKEN/OIST)

Virtual Reality Uchiyama (Rikkyo)

Avatars of Hatsuda-san & Nagataki-san

Photogrammetry:
Combining images from ~50 cameras surrounding a person, 3D photorealistic model can be generated.
→ "classical" computer vision technique

AI (Deep Learning) can improve the 3D model:

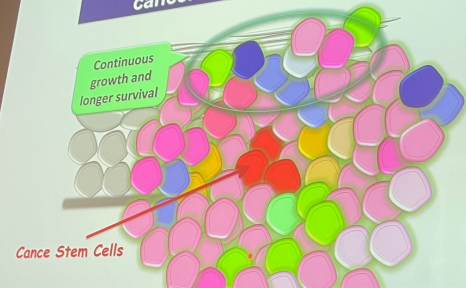
- image inpainting
- mesh optimization
- etc.

In the near future, deep learning may take over from current photogrammetry algorithm.

GALAXIES

RIKKYO UNIVERSITY
Graduate School of Science and Technology

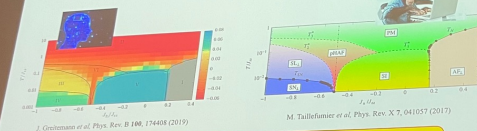
Cancer cells are derived from stem-like cancer cells (cancer stem cells)



Cancer Cells
Saya (FHU/Keio)

Spin Ice
Shannon (OIST)

how did the machine do overall ?



SVM accomplished **complete** classification of all phases (including spin liquids) found in classical Monte Carlo simulation of a model derived from spin ice

The machine was able to do everything the monkeys did, and much faster.



Cerebral Organoids
Pflug (OIST)

Daily Rhythms
Kurosawa (RIKEN)



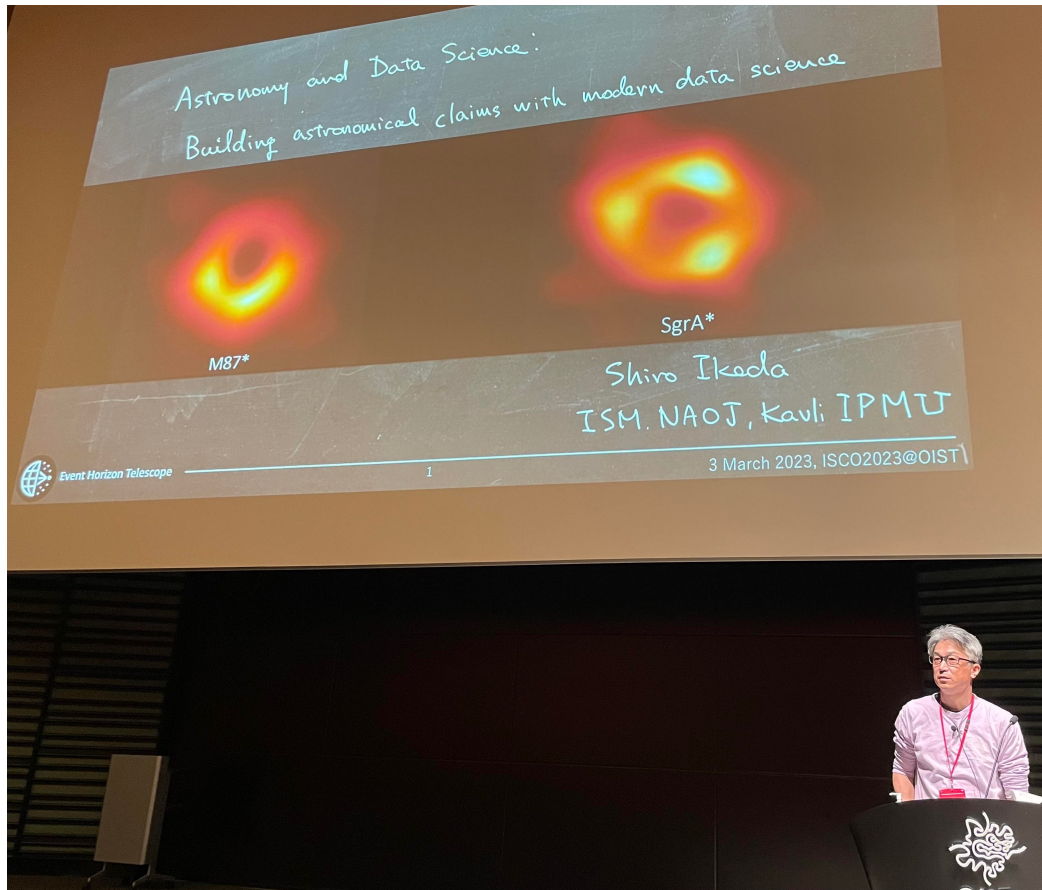
Special Lecture



“About Sharks”

K. Sato
(Churaumi Aquarium)





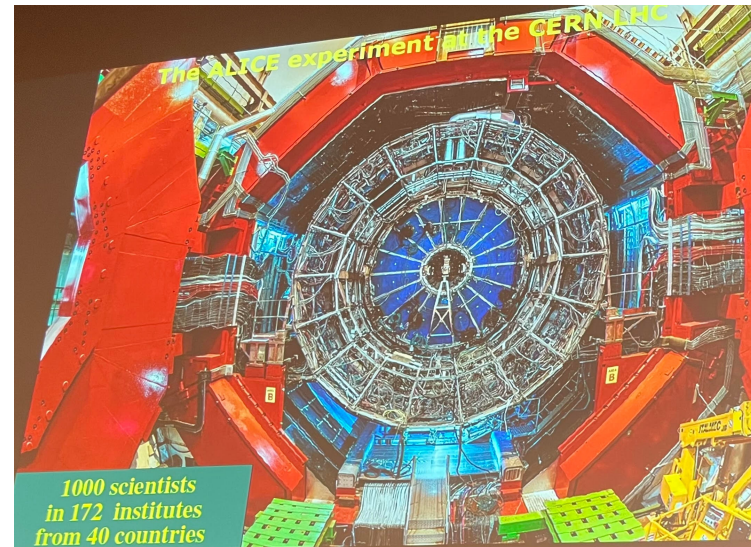
Data Science in Astronomy

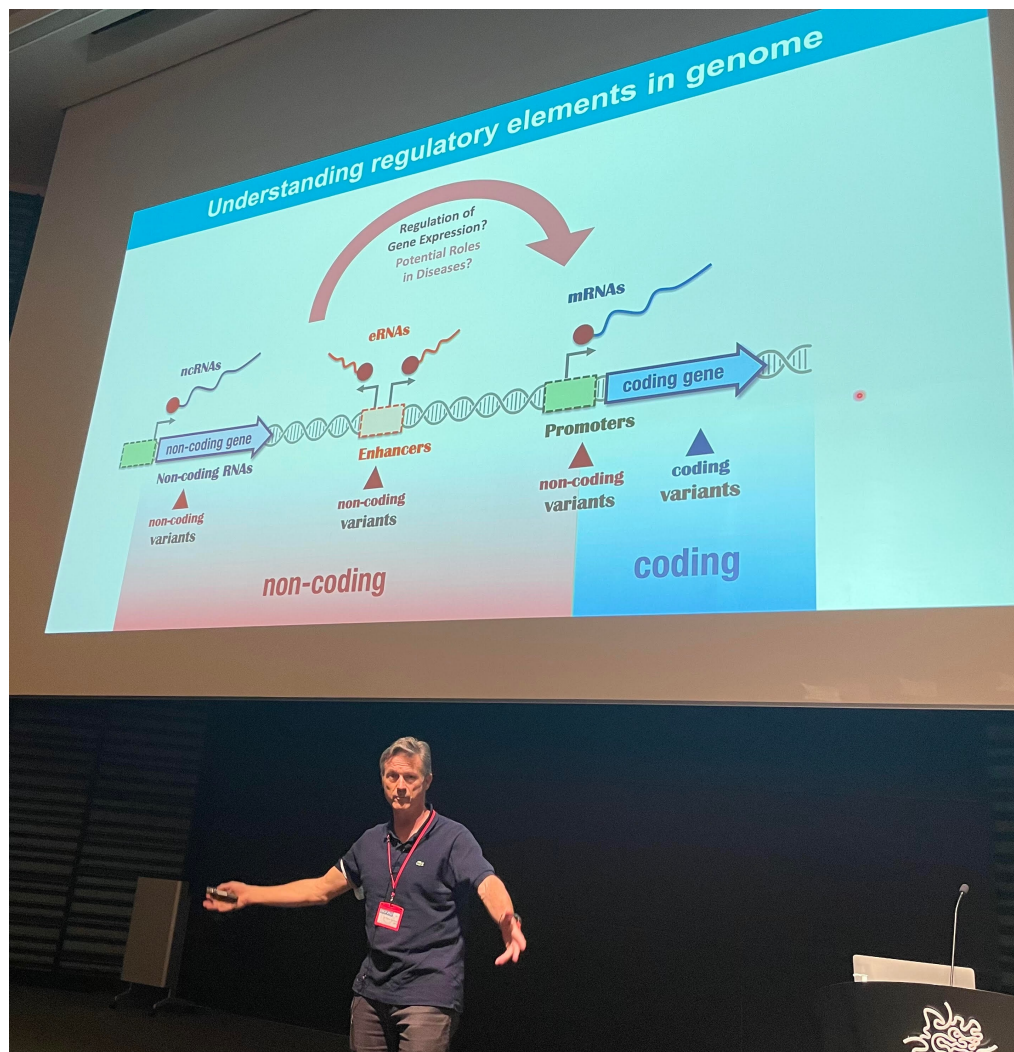
Ikeda (ISM)

Day 5

Quark-Gluon Plasma

Jacak (UC Berkeley/LBNL)

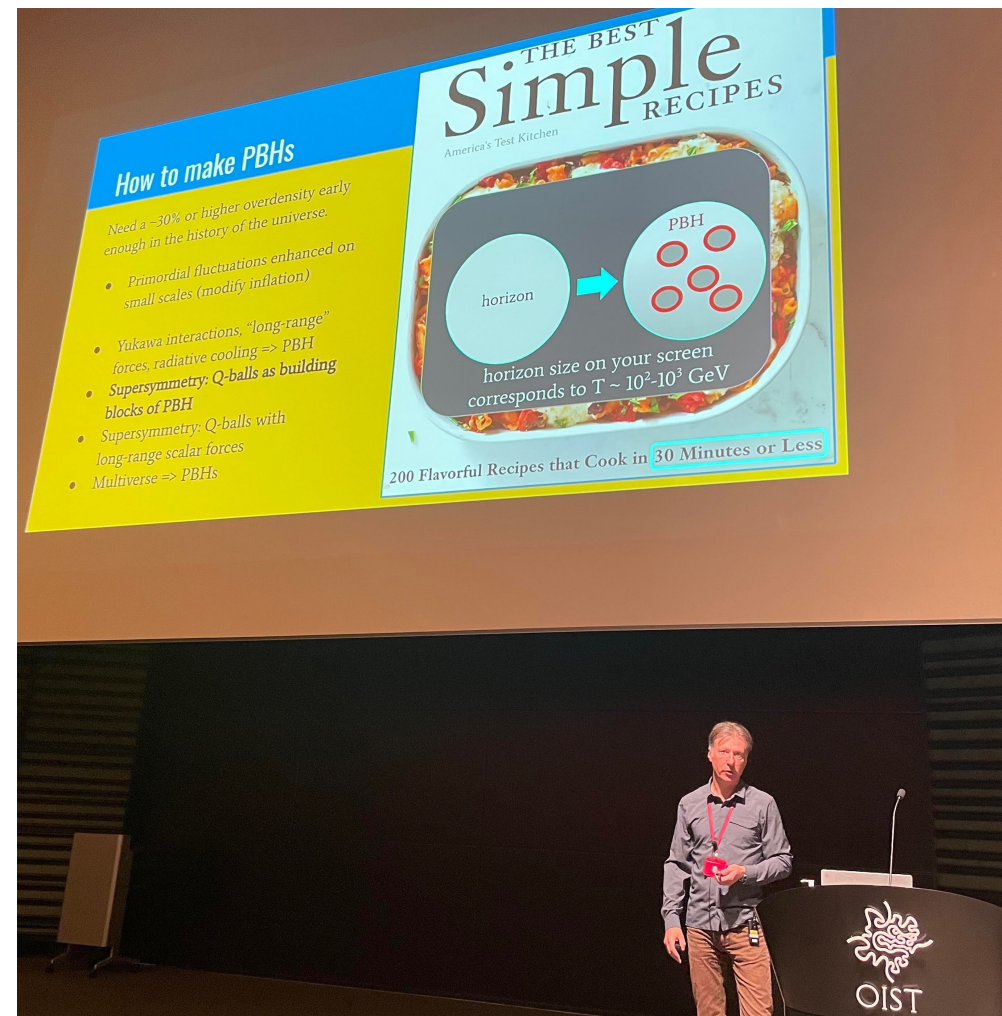




Genome Regulation
Carninci (RIKEN/HT)

Black Holes

Kusenko (UCLA/IPMU)



Concluding Remarks (written by ChatGPT)

"Ladies and gentlemen, as we end this inspiring conference on the interdisciplinary interplay between mathematics, physics, astrophysics, and medical sciences, I would like to express my heartfelt thanks to all of you for your participation, enthusiasm, and contributions. Over the past few days, we have witnessed the power and potential of interdisciplinary collaboration in advancing our understanding of the universe and improving the health and well-being of our society.

Throughout the conference, we have heard from distinguished speakers who have shared their innovative research and groundbreaking discoveries in a variety of fields, from the mathematical modeling of physical systems to the astrophysical exploration of the cosmos, from the development of medical imaging techniques to the discovery of new treatments for diseases. We have also had the opportunity to engage in fruitful discussions and debates on topics such as data-driven research challenges and the ethical implications of new technologies.

As we reflect on the rich and diverse perspectives presented at this conference, I believe we can all agree that the interplay between mathematics, physics, astrophysics, and medical sciences holds great promise for addressing some of the most pressing challenges facing our society today. By combining our knowledge and expertise, we can make significant strides in understanding the underlying principles governing our universe and developing new solutions to improve human health and well-being.

In conclusion, I want to encourage all of us to continue to work together across disciplines and boundaries, to break down silos and foster collaboration, and to embrace the challenges and opportunities of interdisciplinary research. Let us take the lessons and insights gained from this conference and use them to push the boundaries of our knowledge and positively impact the world.

Thank you again for your participation, and I look forward to seeing the exciting new discoveries and collaborations that will emerge from this conference."

But, of course, our mission as scientists is to pioneer what ChatGTP cannot write.

Thanks to

OIST to host the conference,

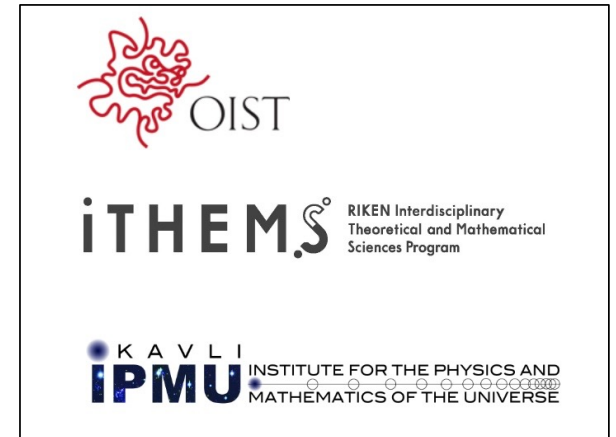
OIST staff,

**Clemente san, Shimizu san, Tsuji san,
Morita san, Maneva san, Miyazato san & OIST workshop section**

IPMU, **Katsuragawa san, Nagasawa san, Minami san,**

RIKEN, **Oota san and Wada san,**

to make this conference successful.





Hope to see you again in OIST in the near future!

