



# Tomoya NAGAI

R&D Administrator

Science Communicator



Mar.1999 Ph.D. (Astronomy, University of Tokyo)

1999-2001 Researcher @National Astronomical Observatory of Japan (NAOJ)

2001-2003 **Miraikan (The National Museum of Emerging Science and Innovation), Japan Science and Technpology Agency (JST)**

2003-2006 **Center for Research and Development Strategy (CRDS), JST**

2007-2011 **Public Relation Center, NAOJ**

2011-2020 **Center for Computational Sciences, University of Tsukuba**

2020-2023 **Theory Center, KEK / Center for Planetary Science, Kobe University**

2023-Now **iTHEMS, RIKEN**

**WEB Director**  
(Planning and development of new contents)



Proposal of R&D Strategy to the Government

Training of Science Communicator / Image Creator

Research management using supercomputers K and Fugaku

Research management and Outreach



# RIKEN (1917-)

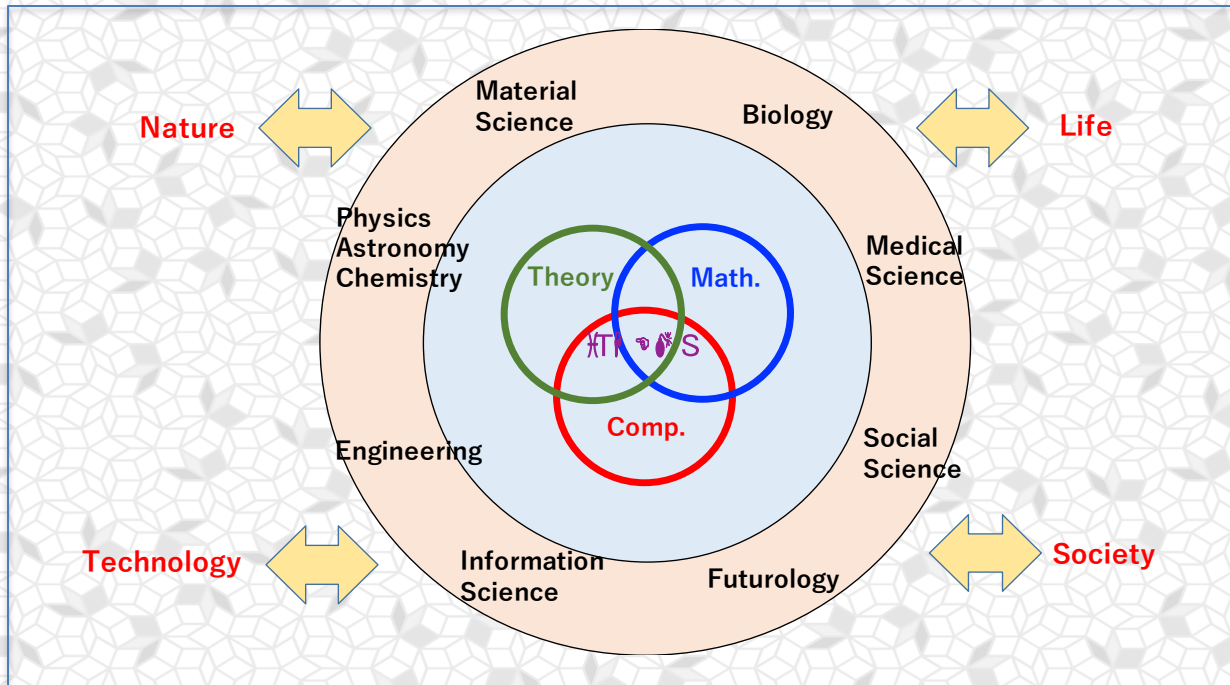
- **First and Largest national research Institute in Japan**  
Number of researchers (~3000, ~27% non-Japanese), Total budget (~800M USD)
- **All fields in natural sciences**  
Physics, Chemistry, Life, Mathematics, Engineering, Information, Computation, ...
- **Big facilities**  
Light source (SPring-8), Supercomputer (FUGAKU), Heavy-Ion Accelerator (RIBF)



**Pillars:** Theoretical, Mathematical and Computational Sciences

**Goal:** Unraveling the mystery of the Universe, Matter, Life as well as to solve key problems in modern society

**Method:** Establishing a synergistic relationship among researchers from different disciplines



iTHEMS strives to foster collaboration among young theorists across different fields and establish an **optimal environment** for generating novel ideas, both within Japan and on a global scale.

**“Interdisciplinarity”** := { **A+B** → **A\***, **A+B** → **B\***, **A+B** → **C** }

## ➤ Interdisciplinary environment:

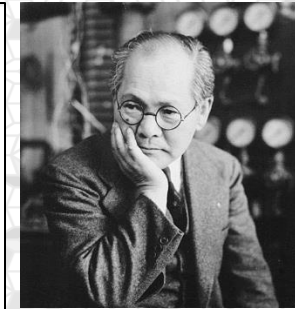
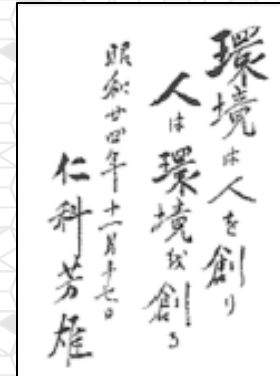
Bringing researchers from different fields together **under one roof**.

## ➤ Flexible environment:

Providing outstanding young researchers with 5-7 years of research positions.

## ➤ Inspiring environment:

Establishing mechanisms for domestic and international brain circulation.



Y. Nishina (1890-1951)

“The growth of researchers relies on their environment, and conversely, a conducive environment depends on the researchers.”

New Frontier Proposal System  
1st Adopted Proposals



RIKEN  
Strategy Center



RIKEN  
Cross-Disciplinary Center

## iTHES

Interdisciplinary Theoretical  
Science Research Group

Interdisciplinary  
Theoretical Science  
Research Group  
(2013.4-2018.3)

## iTHEMS

RIKEN interdisciplinary  
Theoretical & Mathematical  
Sciences

Interdisciplinary  
Theoretical and  
Mathematical  
Sciences Program  
(2016.11-2025.3)

## iTHEMS

RIKEN interdisciplinary  
Theoretical & Mathematical  
Sciences

Interdisciplinary  
Theoretical and  
Mathematical  
Sciences Center  
(2025.4-)

[https://www.mext.go.jp/b\\_menu/shingi/gijyutu/gijyutu23/002/shiryo/\\_icsFiles/afie1dfile/2016/01/05/1365795\\_002.pdf](https://www.mext.go.jp/b_menu/shingi/gijyutu/gijyutu23/002/shiryo/_icsFiles/afie1dfile/2016/01/05/1365795_002.pdf)

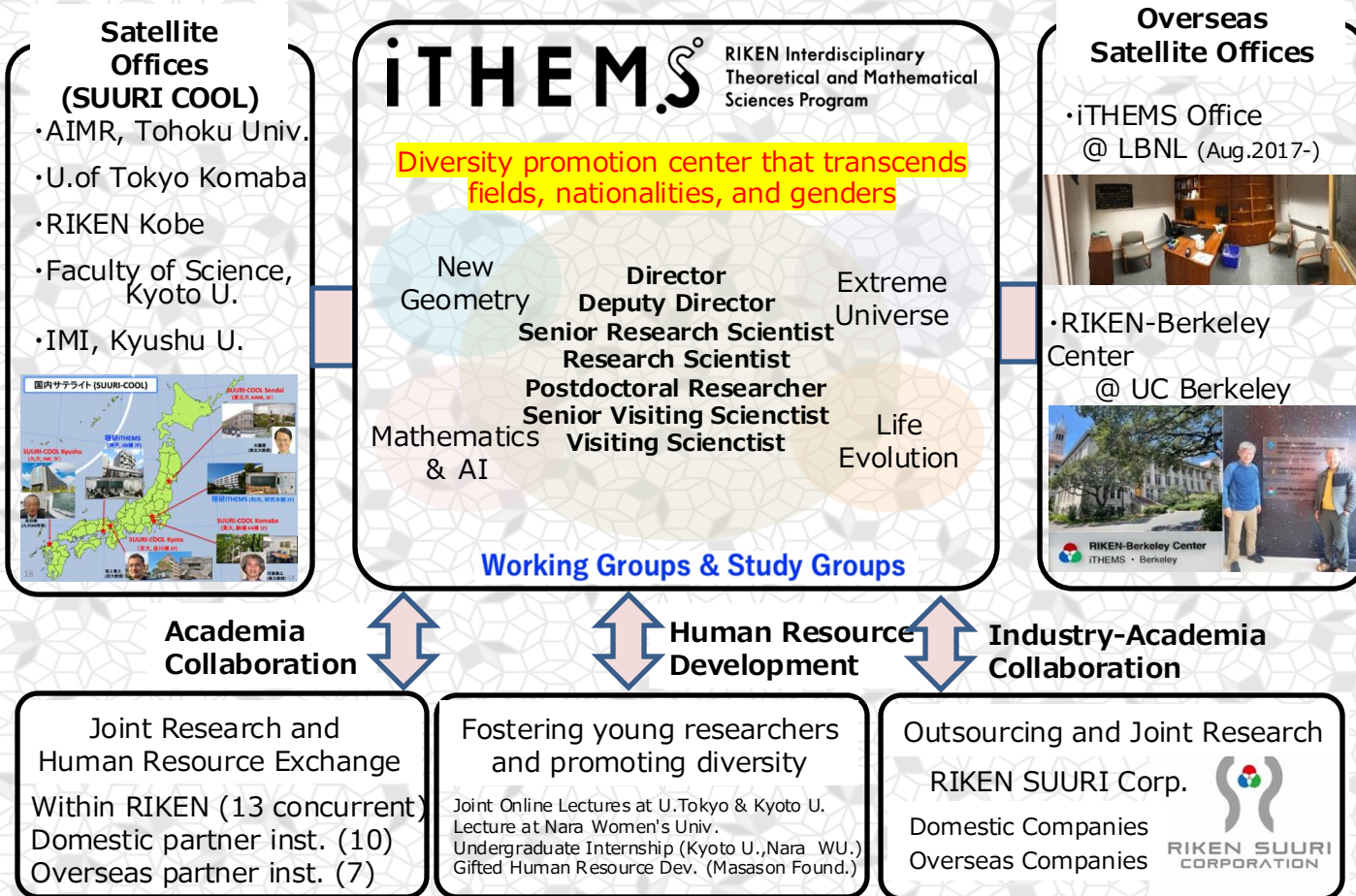
<https://ithems.riken.jp/>

Mathematician, Physicist, Biologist,  
Computational Scientist, Information Scientist  
under one roof



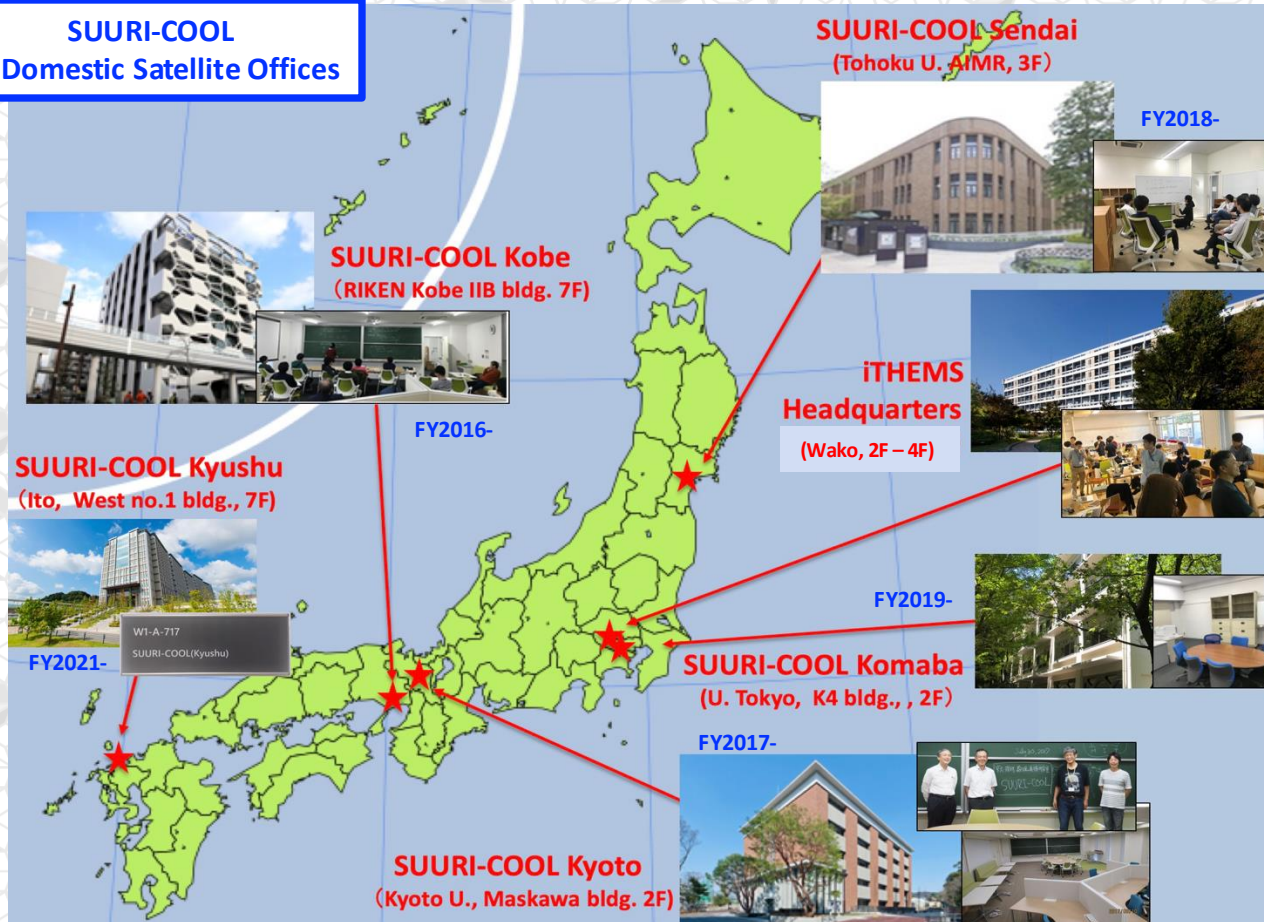
Director	Deputy Directors				Coordinator	
T. Hatsuda (phys.)	T. Tsuboi (Math.)	C. Beauchemin (Biology)	T. Tada (Phys.)	S. Nagataki (Astro.)	T. Miyoshi (Comp.)	T. Nagai

Position	
Director	1
Deputy Director	3
Coordinator	1
Scientific Advisor	4
Senior Research Scientist	11
Research Scientist	6
Special Postdoc Researcher	15
Postdoc Researcher	13
Concurrent Researcher	21
Students	10
Research consultant	3
Senior Visiting Scientist	10
Visiting Scientist	72
Technical Staff	1
Admin. Assistant	6
<b>Total</b>	<b>67</b> <b>(177)</b>





## SUURI-COOL Domestic Satellite Offices



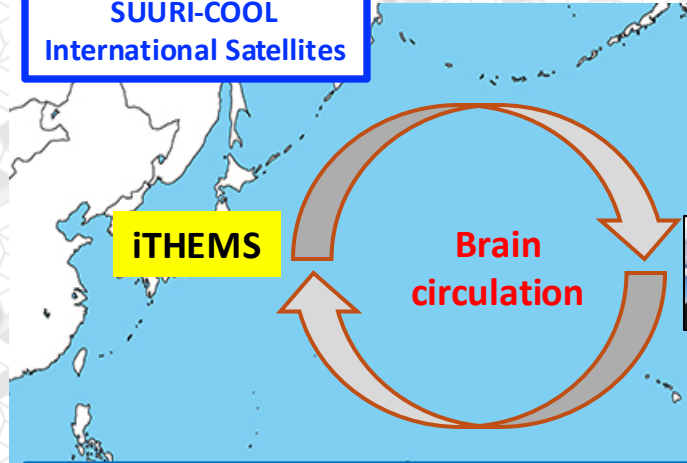
Establish satellite offices at universities in Japan  
and have a system to conduct joint research with researchers at each university.



# SUURI-COOL (outside)

iTHEM.S

SUURI-COOL  
International Satellites



Jason Chang  
iTHEMS RS  
2018.5-2021.11



Yarf Lyu  
RIKEN-Berkeley  
Fellow, 2023.9-

LBNL

Comp.  
Phys.

Takashi Okada  
iTHEMS SRS  
2018.5-2022.3



UCB  
Biology Dept.

Theo.  
Biology

UCB/LBNL

Keita Mikami  
iTHEMS RS  
2019.9-2019.12



UCB  
Math Dept.

Math.

Masahiro Nozaki  
iTHEMS SPDR  
2019.2-2020.3



UCB  
Physics Dept.

## RIKEN-Berkeley Center in UCB, 2022 -

RIKEN-Berkeley "Mathematical Quantum Science  
initiative" JST ASPIRE Program (2024.2.1-2029.3.31)

Wick Haxton  
iTHEMS VSRS  
2018.4-



Quantum Info.  
Cond.Matt.

Yantao Wu  
iTHEMS PDR, 2021.6-



RIKEN-Berkeley Center  
iTHEMS • Berkeley

### RIKEN-Berkeley Fellow



Ermal  
Rrapaj  
2022.11  
-2023.4



Manuela  
Saez  
2022.11-



Jan  
Shutte-Engel  
2023.7-



Yuuka  
Kanakubo



Yuki  
Fujimoto  
2024.10-

Nucl.  
Part.  
Astro  
phys

Researchers can stay in Berkeley for long periods of time to enable collaborative research.

## Educational Activities

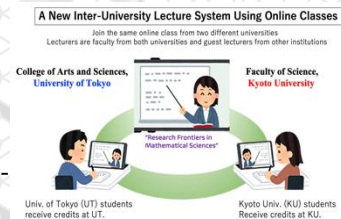
- ✓ Joint educational program with Kyoto Univ.

"Pipeline Connecting RIKEN and MACS program" (2020-)  
Study group + RIKEN visit



- ✓ Inter-University online undergrad. lectures with U. of Tokyo + Kyoto U.

"Research Frontiers in Mathematical Sciences" (2022-13 online lectures



- ✓ Joint educational program with Nara Women's Univ.

"Frontiers of Modern Science - Mathematics, Universe, Matter, Life, and Information -" (2020-) 15 online lectures + RIKEN visit



- ✓ Hosting graduate students as JRA/IPA/ST  
23 students during FY2018-FY2023

## Outreach

- ✓ Press releases: 56 since 2017
- ✓ Feature articles

- ✓ iTHEMS online Public Lectures

"The World of Mathematical Sciences" (2020-)



- ✓ Journalist in residence (2018-)

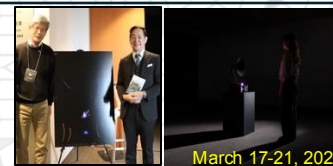


- ✓ Books for the general public



- ✓ Public exhibitions

e.g., "Black Hole Recorder" at Miraikan with more than 2,000 visitors



# Distributed the S&T poster for everyone titled “One S&T poster for Every Household” during Science and Technology Week

For the past 19 years, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) has published a study material, the S&T poster for everyone titled “One S&T poster for Every Household”, every year to increase the public's exposure to science and technology, and to encourage the appropriate understanding and flexible use of knowledge related to science and technology.

- 2023: Virus
- 2022: Glass
- 2021: Ocean
- 2020: Antarctica
- 2019: Geo-Evolution Japan
- 2018: Quantum Beam
- 2017: Cell
- 2016: Hydrogen
- 2015: Medicine
- 2014: Protein
- 2013: Mineral
- 2012: Sun
- 2011: Magnetic Field & Superconductivity
- 2010: Plasma
- 2009: Astronomical Telescope
- 2008: Light Map
- 2007: Diagram of our Universe
- 2006: Genome Map
- 2005: Periodic Table of Elements



More than 300,000 have been printed and distributed to all elementary, middle, and high schools, universities, and science museums.

# The 2024 S&T poster for everyone titled "Mathematics Connecting to the World: One S&T poster for Every Household"

S&T Poster Math

**世界とつながる “数理”**

**身近な数学**

**1 やまびこ**  
やまびこが返ってくるの、どうして？

**2 人形をおく**  
変えられるの、どんな工夫を？

**3 多数決**  
みんなの意見、どんなとめて？

**4 湖の魚の数え方**  
湖の魚の数え方、どうして？

**5 ワイルスが広がる条件**  
ワイルスが広がる条件、どうして？

**6 目の色と遺伝**  
目の色と遺伝、どうして？

**7 マンホールのふたの形**  
マンホールのふたの形、どうして？

**8 カブのカタチ**  
カブのカタチ、どうして？

**9 世界とつながる “数理”**

**未来**

**10 人工知能 (AI)**  
AIが賢くなるのは、どうして？

**11 量子コンピュータ**  
量子コンピュータ、どうして？

**12 インターネットの魔法と数学**  
インターネットの魔法と数学、どうして？

**13 数学の世界**  
数学の世界、どうして？

**14 数学の世界と数学**  
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**100 数学の世界と数学**  
数学の世界と数学、どうして？

This year's theme was chosen by MEXT for the mathematics submitted by iTHEMS

# The 2024 S&T poster for everyone titled “Mathematics: One S&T poster for Every Household”

0) Covered with  
“Penrose Tile”  
representing  
Mathematics



3) Introduction to  
Mathematics in  
the Humanities,  
Society and the  
Arts

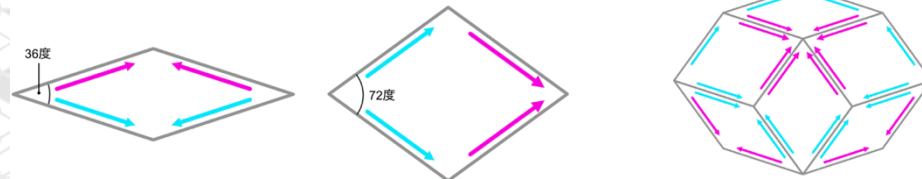
1) Entrance to the  
story of how  
we naturally  
use  
mathematics to  
live with things  
in the world

2) Introduce the use of mathematics in understanding and  
utilizing various aspects of the world through case studies

# Penrose Tile

This pattern is made up of two types of diamond-shaped tiles, with no gaps between them.

Interesting property that no matter how widely they are arranged, the same pattern will never repeat itself.



Penrose Tile

Arrange the edges with matching colors and orientations.

# The 2024 S&T poster for everyone titled “Mathematics: One S&T poster for Every Household”

Special WEB site: <https://poster-suuri.riken.jp/>

## Youtube MEXT Channel Explanatory Video

The screenshot shows the MEXT YouTube channel interface. The search bar contains the text '世界とつながる“数理”'. Below the search bar, there are four video thumbnails. The first thumbnail is titled '学習資料「一家に1枚、20枚目のテーマは 世界とつながる“数理”」' and has a duration of 0:59. The second thumbnail is titled '令和6年度学習資料「一家に1枚 世界とつながる“数理”」PR動画' and has a duration of 5:01. The third thumbnail is titled '令和6年度学習資料「一家に1枚 世界とつながる“数理”」解説動画「数理について」' and has a duration of 7:40. The fourth thumbnail is titled '令和6年度学習資料「一家に1枚 世界とつながる“数理”」' and has a duration of 8:51. On the right side of the page, there is a large video player showing a man in a suit, identified as the Cabinet Minister, pointing to a large poster titled '世界とつながる 数理'. The poster features a circular graphic with various mathematical symbols and the text '科学技術週間' (Science and Technology Week).

The screenshot shows the website poster-suuri.riken.jp. The main heading is '世界とつながる“数理”'. Below the heading, there is a large circular graphic with the text '世界とつながる “数理”' and an image of hands holding wooden blocks. To the right of this graphic, there is a section titled '広い世界へとつながる数理へ、ようこそ！' (Welcome to Mathematics, connecting to a wide world!). Below this, there is a paragraph of text explaining the purpose of the poster and a button labeled '画像を拡大' (Enlarge image). Further down, there are two numbered sections: '1 やまびこ' (Echo) and '2 人形をおく' (Put the figures). Each section includes a small diagram and a paragraph of text. At the bottom of the page, there is a navigation menu with buttons for 'イメージから数理を探す' (Search for mathematics from images), '動画から数理を探す' (Search for mathematics from videos), '一覧から数理を探す' (Search for mathematics from a list), 'レベルから数理を探す' (Search for mathematics from levels), '分野から数理を探す' (Search for mathematics from fields), and 'コラムから数理を探す' (Search for mathematics from columns).

English version in the future



# My Outreach and other Activities to date

## 1. Science Communication Human Resource Development

- Science Producer, Science Image Creator

## 2. Creation and Organization of Scientific Events

- International Science Festival
- Mitaka Solar System Walk (Stamp collecting event with the solar system scaled down to a city)

## 3. Scientific Content Development & Implementation

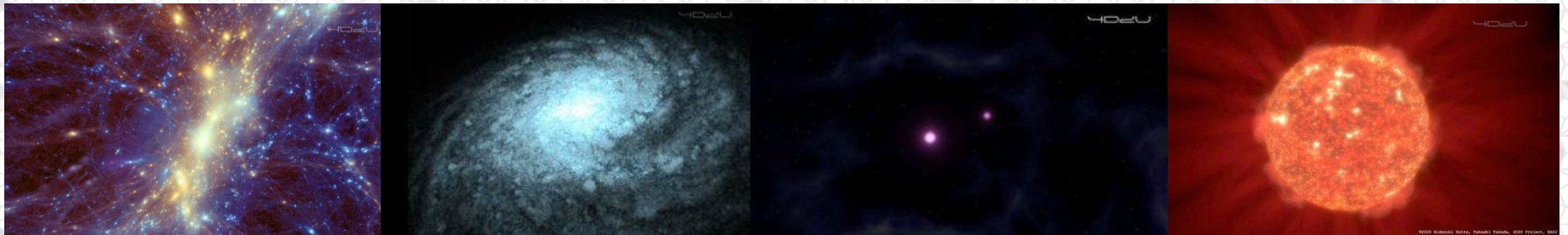
- Printed Materials (Book Publishing) , Game, and Goods
- Exhibits, Website, Web Streaming and Video, 3D contents

Science Visualization based on supercomputer simulations in collaboration with 4D2U project of NAOJ

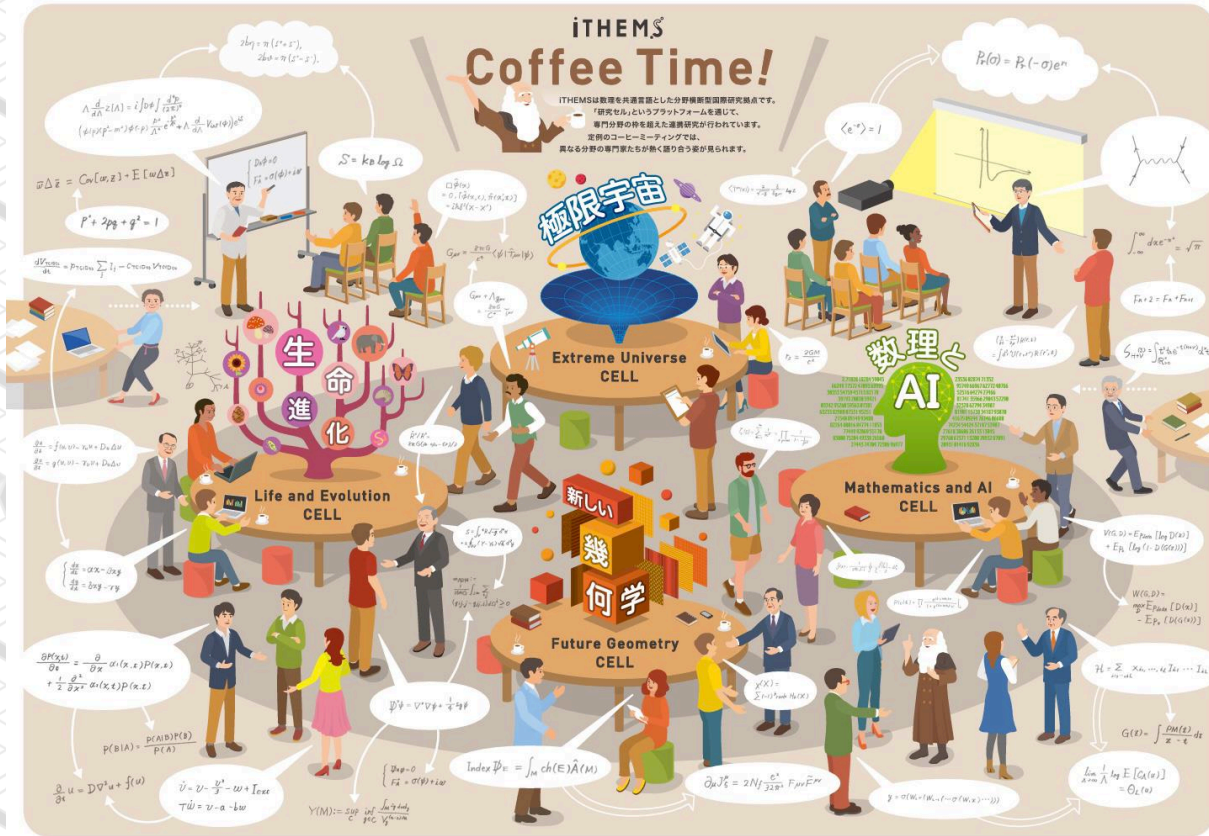
Goods to improve understanding of “QCD (Quantum ChromoDynamics)” Focusing on the “color load” among the properties of QCD.



Planning: JICFuS Public Relations Office  
Production: Uruno Creative Office



# Thank you for your attention



<https://ithems.riken.jp/en>



**iTHEMS**

