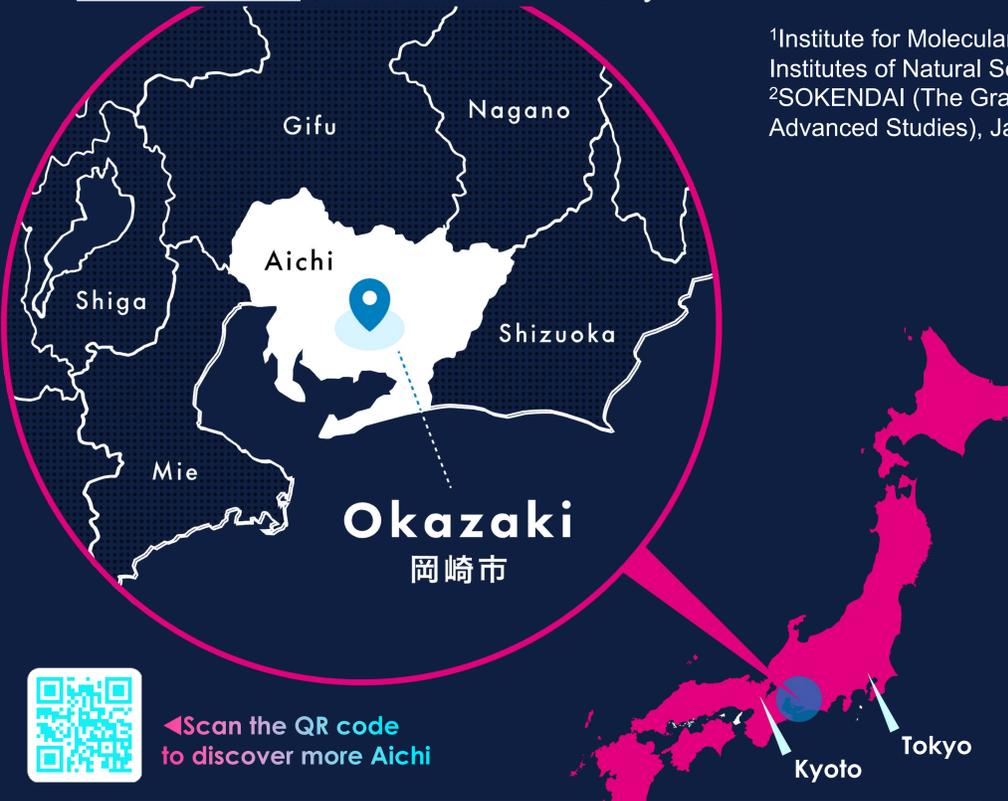


The Moonshot Research and Development Program of Japan

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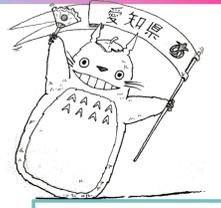


Scan the QR code to discover more Aichi

Introduction

Where are we from?
 What is Aichi? Okazaki?

- Island : HONSHU
- Largest City in Aichi : NAGOYA
- Population of Aichi 7million* / of Okazaki 400,000!
- *>Los Angeles(4million) + Chicago(3million)



The dynamic capital of Japanese industrialization

Located east of Kyoto in central Chubu, Aichi has long flourished as an important center of trade and manufacturing in Japan. It generates more revenue from its industrial shipments than any other prefecture. Aichi is also home to the automobile giant Toyota, which is so powerful they named a town after it

Renowned firms in our region

- TOYOTA
- DENSO
- brother
- Makita
- YAMAHA
- HONDA...

MS Project



The Moonshot Research and Development Program sets ambitious goals to attract people, and promotes challenging R&D projects with the aim of resolving difficult societal issues while bringing together the wisdom of researchers from all over the world.

9 Goals and Challenges

Goal 1 Overcoming limitations of body, brain, space and time	Goal 2 Ultra-early disease prediction and intervention	Goal 3 Coevolution of AI and robots
Goal 4 Cool Earth & Clean Earth	Goal 5 Sustainable food supply and consumption	Goal 6 Fault-tolerant universal quantum computer
Goal 7 To Age 100 without Health Concerns	Goal 8 Controlling and modifying the weather	Goal 9 Increasing peace of mind and vitality

Social problems

- Shrinking and aging societies
- Global climate change
- Extreme natural disasters

Solving with **Nine goals**
 ■ Bold Ideas
 ■ Challenging R&D
 We have set nine goals and aim to achieve them by 2050

Goal 6
 Realization of a fault-tolerant universal quantum computer that will revolutionize economy, industry, and security

Goal 6 / 1PD, 12PMs

Expectations for Quantum Computers	Current Problems
<ul style="list-style-type: none"> Unique quantum mechanical properties High-speed computation (Supercomputer) 	<ul style="list-style-type: none"> Quantum states are easily broken → Hard to perform large scale computation

By 2050

- Increase the number of quantum bits
- Reduce error rate
- Connect quantum bits mechanically
- Find a quantum error correction method with a higher fault tolerance threshold

Program Director (PD)

 KITAGAWA Masahiro
 Graduate School of Engineering Science, Osaka University



Quantum computer hardware							
<table border="1"> <tr> <td>Superconducting qubit YAMAMOTO Tsuyoshi</td> <td>Trapped ion TAKAHASHI Hiroki</td> <td>Photon FURUSAWA Akira</td> <td>Semi conductor MIZUNO Hiroyuki</td> <td>Semi conductor TARUCHA Seigo</td> <td>Neutral atom OHMORI Kenji</td> <td>Neutral atom AOKI Takao</td> </tr> </table>	Superconducting qubit YAMAMOTO Tsuyoshi	Trapped ion TAKAHASHI Hiroki	Photon FURUSAWA Akira	Semi conductor MIZUNO Hiroyuki	Semi conductor TARUCHA Seigo	Neutral atom OHMORI Kenji	Neutral atom AOKI Takao
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Our Team



Ohmori PM Project

- R&D Projects**
Large-scale and high-coherence fault-tolerant quantum computer with dynamical atom arrays
- 4Themes**
PIs research across 4 R&D Themes

Key words

- Dynamical qubit array
- Large number of cold-atom qubits
- Optical tweezers
- Move arbitrarily and at high speed
- Error detections and corrections
- High stability and usability

R&D Theme01 Development of scalable quantum computing platforms	R&D Theme02 Development of long coherence qubit and high-fidelity quantum gate	R&D Theme03 Development of a quantum error detection and correction architecture specialized for the cold-atom platform
R&D Theme04 Stable and powerful integrated laser systems		

7 PIs from 5 labs.

- 7 Principle Investigators (PIs), including the Project Manager (PM) himself, each with their own projects and teams
- PM/ PI**
Kenji Ohmori
Professor/ Chairman of Department of Photo-Molecular Science, IMS
- Sylvain de Léséleuc**
Dep. of Photo-Molecular Science, IMS
Rb atoms, ultrafast & CW lasers excitation
- Takeshi Fukuhara**
Center for Quantum Computing, RIKEN
Sr atoms
- Takafumi Tomita**
Dep. of Photo-Molecular Science, IMS
Rb atoms, ultrafast & CW lasers excitation
- Takunori Taira**
RIKEN SPring-8 Center / Dep. of Photo-Molecular Science, IMS
High power laser for trapping and Rydberg excitation
- Yoshiro Takahashi**
Dep. of Physics
Kyoto University
Yb atoms
- Chihiro Yoshimura**
Research and Development Group
Hitachi, Ltd.
Software integration

60+ researchers, students and others participating in the project!

Community

Moonshot R&D Program aim to achieve the ambitious goals by bringing together wisdom from all over the world under the direction of top researchers.

Our team has already started collaborations with **4 countries**, and it will become more active in the future. We actively welcome students and researchers from Japan and abroad. This year, **12 internship** students are participating in research at the Ohmori Group. **Join us!**



Take the QuantiAttack challenge developed by the Osaka University team of MS Goal 6!