

Hearing about the status of the
Designated National University Concept

**Excellence and Innovation
in Synergy Toward a Leading University**

January 11, 2022

Hideo Ohno

President, Tohoku University



Concept as a Designated National University Corporation

2

Toward a Global Top-Thirty University

Leading Synergy of Excellence and Innovation

Creation of Knowledge via
Excellence
in Research & Education

Leading
Innovation
of Society & Economy

Education

Providing unique Degree Programs through advanced global joint programs

Governance Reform

Further Reinforcement of functionality based on advanced academic governance

Research Capabilities

4 World Leading Research Centers

Society Collaboration

Leading innovation through global industry-academia cooperation centers

Issues & Requests

Drastic Improvement of International Presence

Functional reinforcement responding to various societal needs and issues

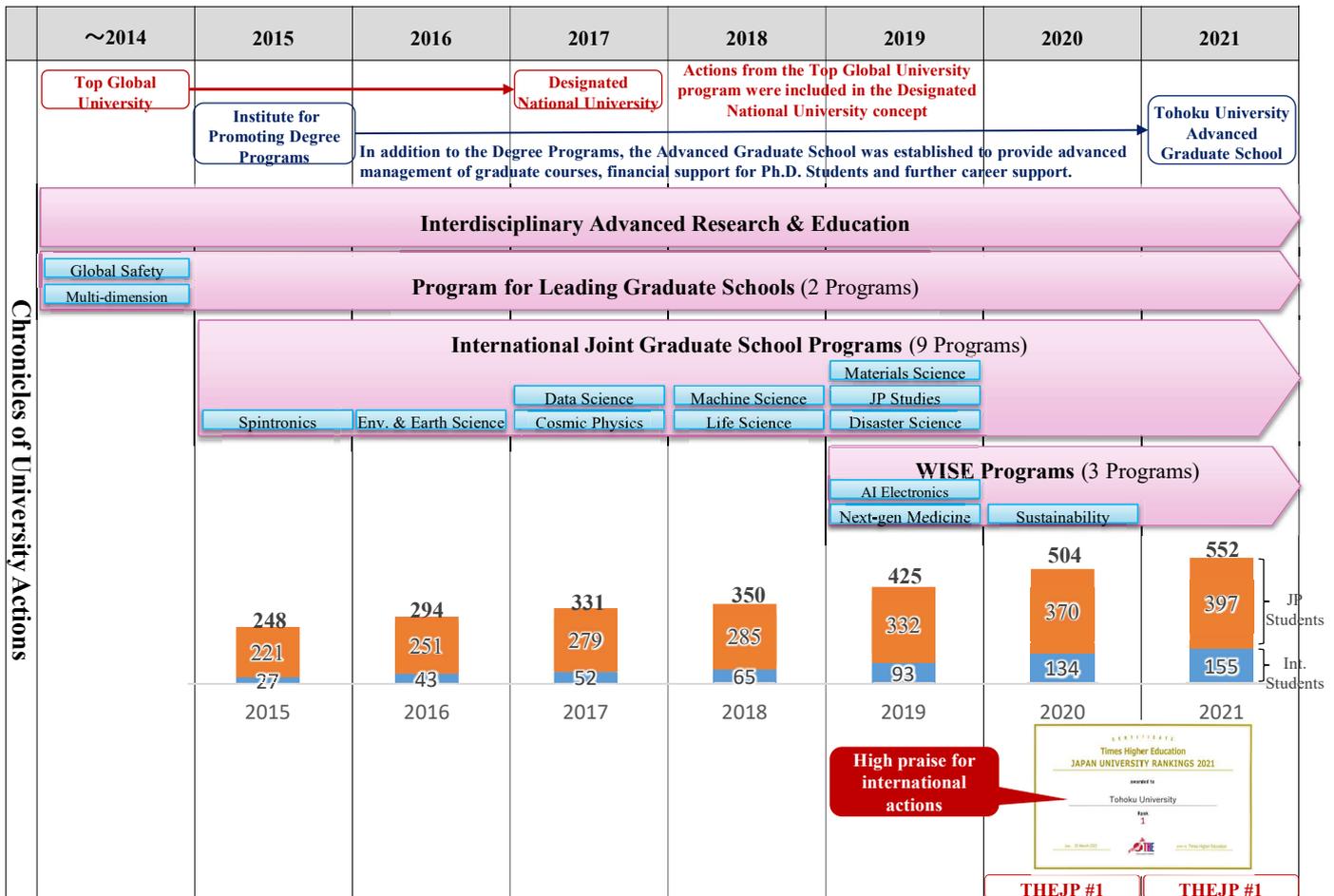


Concept:

Providing unique Degree Programs centered around the International Joint Graduate School

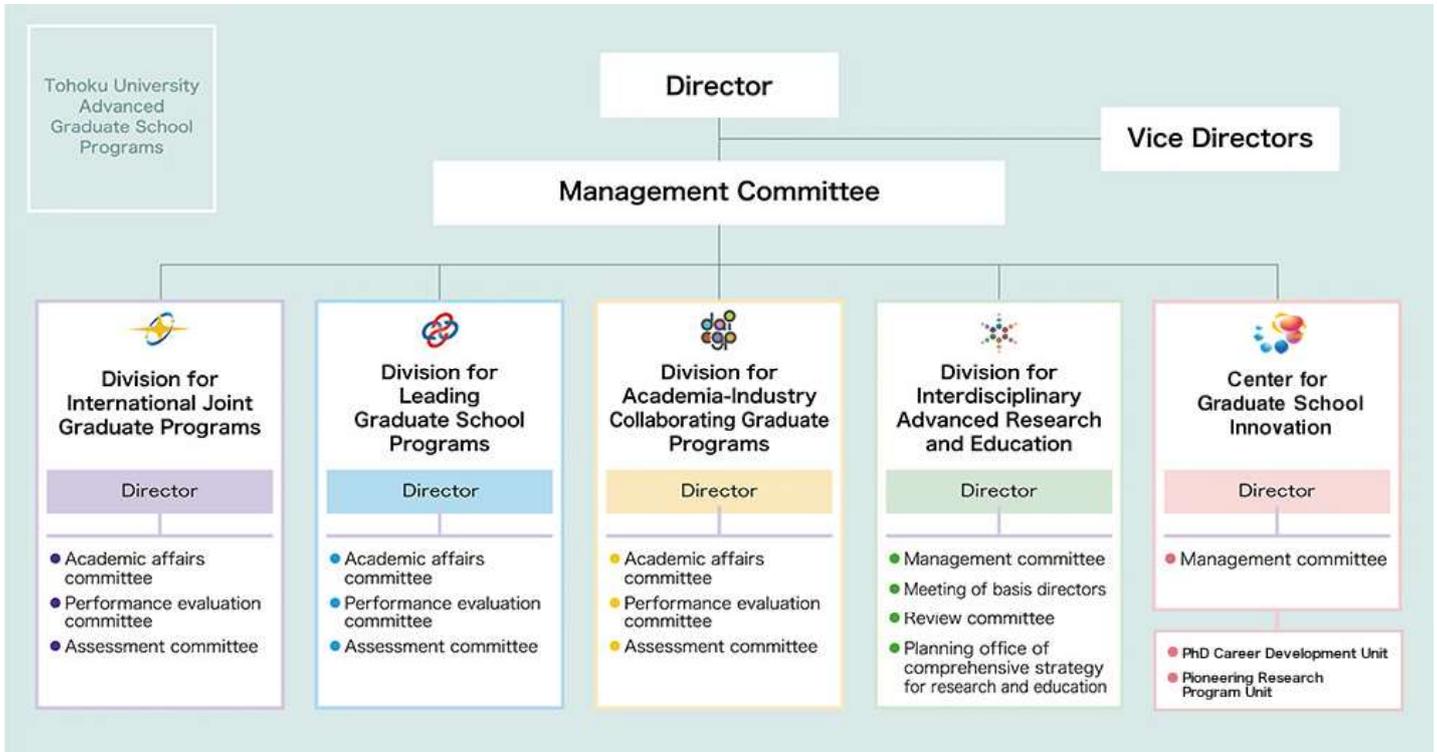
Actions:

- Promote Degree Programs and the Tohoku University Advanced Graduate School
- New financial support actions
- New international education in times of COVID-19





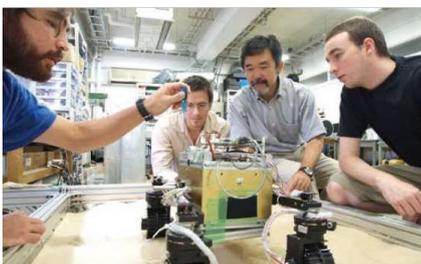
Tohoku University Advanced Graduate School operational as of April 2021. Expanding Degree Programs to 25 by 2030.



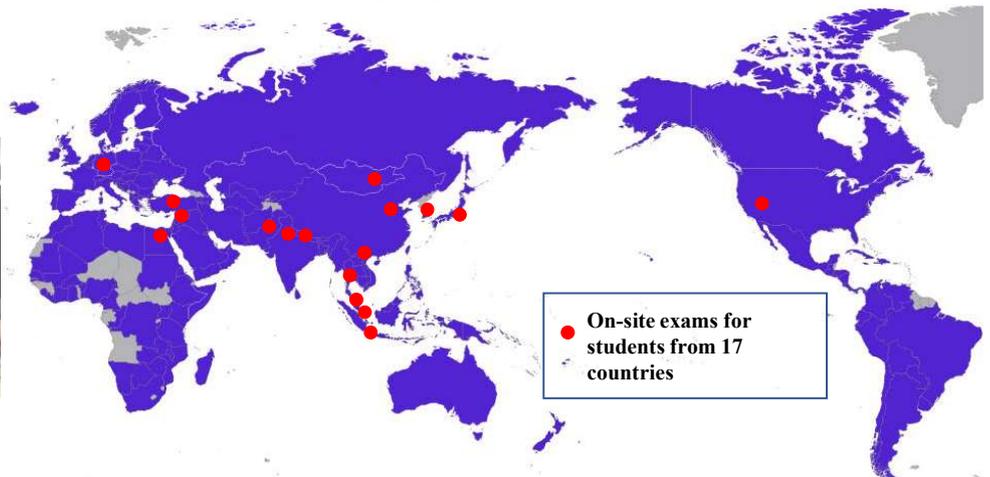
Internationalization of bachelor entrance exams: Attracting brilliant international students (School of Engineering as model)

- Collaboration with high schools to engage students with near perfect SAT score
- University wide deployment after trial period.

International Bachelor Course in Machine Engineering (IMAC-U) Connecting to Master & Ph.D. courses



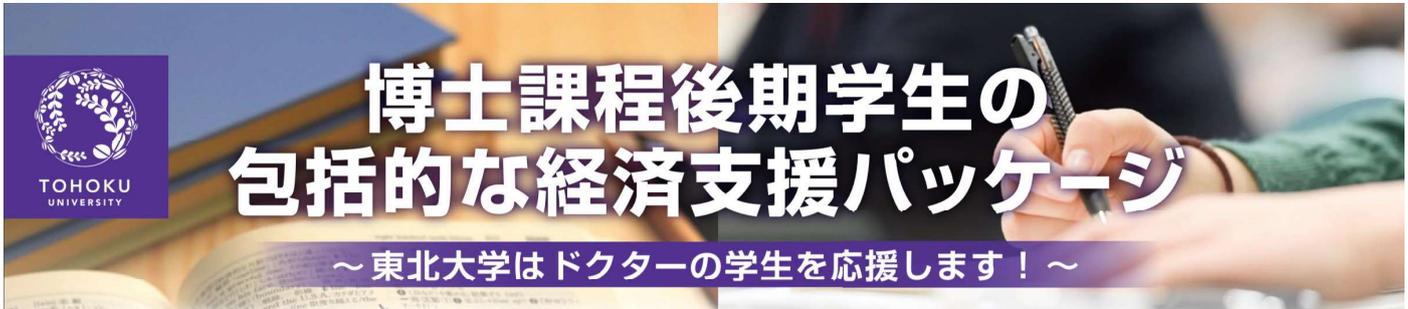
Origin of international students (145 countries, colored purple) & on-site entrance exams



● On-site exams for students from 17 countries



Realizing the goal to “Provide financial support to all Ph.D. students by 2030” ahead of time in 2018.



- Ca. 2700 Ph.D. students at Tohoku University
 ➔ **Financial support to all, effectively no fees**
- Support per student: **1,300,000 JPY per year on average**
- FY2020: Support of living expenses (1.8M JPY)
32% reception rate



- We have been **quick to address the issues highlighted by the COVID-19 crisis** due to the stagnation of international student exchange programs and support the academic life of students through each of the four units.
- We aim to connect the world in a borderless and inclusive manner through the integrated use of virtual and real space by **building a new international education model** at our university.

Online International Exchange

◆ Online Short Exchange Programs

- 2 programs in summer 2020 with 26 participants from US & Asian universities, 90% satisfied
- 5 programs in spring 2021, 3 pre-admission programs to come

◆ Virtual Exchange Program

- Credit programs in collaboration with international consortia (APRU)
- 13 participants as of autumn 2020



Montana University Virtual Exchange Program

Learning with International Students Online

◆ Online International Co-Education (Leading Actions)

- New “International Co-Education Seminars” online with students from North American universities in 2020
- Satisfied students
- Continuation in the second semester with students from Australia
- Interacting with overseas students while staying in Japan



Online International Co-Education Prof. Kazuko Suematsu (Global Learning Center)

Online International Education

◆ International pre-admission online courses

- Pre-admission courses for 29 students of the international Bachelor program
- Providing basic knowledge for students not allowed into Japan, 90%+ positive feedback

◆ Online Short Japanese Program

- 2 online summer programs in 2020
- Participants from the National University of Singapore, etc.



International Bachelor Course Pre-admission online courses

Supporting International Students Online

◆ Online Help Desk

- Mutual support by students via online “Help Desk”
- Answering frequently asked questions for everyday life

◆ Online Orientation

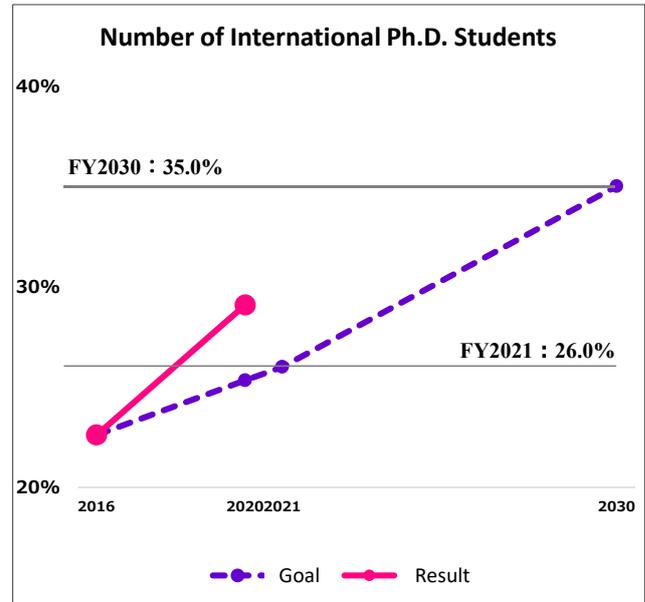
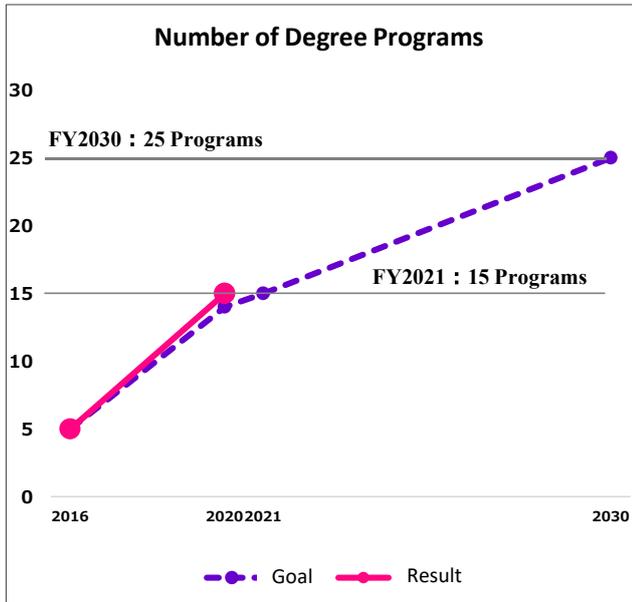
- Online orientation for new international students
- Multiple events for international students



Online Help Desk



- Realizing the goal “expand degree programs from 6 to 15 by 2021” ahead of time
- Realizing the 2021 goal toward “35% international Ph.D. students 2030” ahead of time



Concept:

Establish Core Research Clusters in four research fields

Actions:

- Create a 3-Layered ‘Research Innovation System’
- Promote research, internationalization and practical implementation at the Core Research Clusters
- Foster brilliant young researchers for the next generation





3-Layered 'Research Innovation System' with the Organization for Advanced Studies

Goal

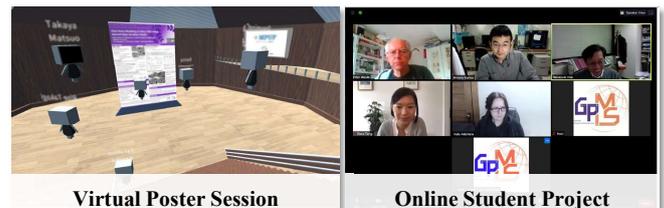
- Formation of Research Centers
- Promotion of Activities by Young Researchers



Developments at the Core Research Clusters: Spintronics

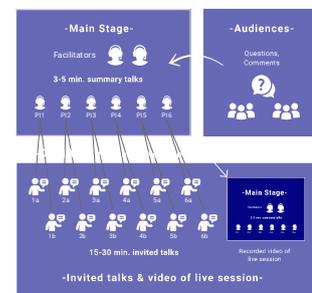
Collaboration with International Joint Graduate Programs

The 4th Symposium of the Core Research Cluster for Materials Science, the 3rd Symposium of the International Joint Graduate Program in Materials Science (2020.11.16-18)



1st Online RIEC International Workshop on Spintronics (2021.11.18)

Not only did renowned researchers give lectures about their finding, but talented students also had the opportunity to present their work in a unique environment



- **Number of Publications: 195 (#1 world-wide)**
- **Number of Top 10% Publications: 47 (#1 world-wide)**
(2016~2020, Spin & Spintronics, SciVal 2021.12.21)
- **Tohoku and Purdue University jointly developed a device harnessing thermal fluctuations and showed a proof-of-concept for probabilistic computing. The achievements appeared in Nature in September 2019, receiving critical acclaim.**





Valuable Biobank established with the trust of 150,000 community participants

- World's first 3 generation cohort study (73,000 participants) centered around expecting mothers
- Regional cohort study (84,000 regional participants) for the discovery of early biomarkers of dementia etc.



Development of the genome analysis tool 'Japonica Array®' optimized for people in Japan

- Realizing quick and reasonable genome analysis (ca. 10,000 JPY / person) compared to a full genome analysis (ca. 150,000 JPY / person)



Front runner in establishing next-gen medicine in public-private partnership

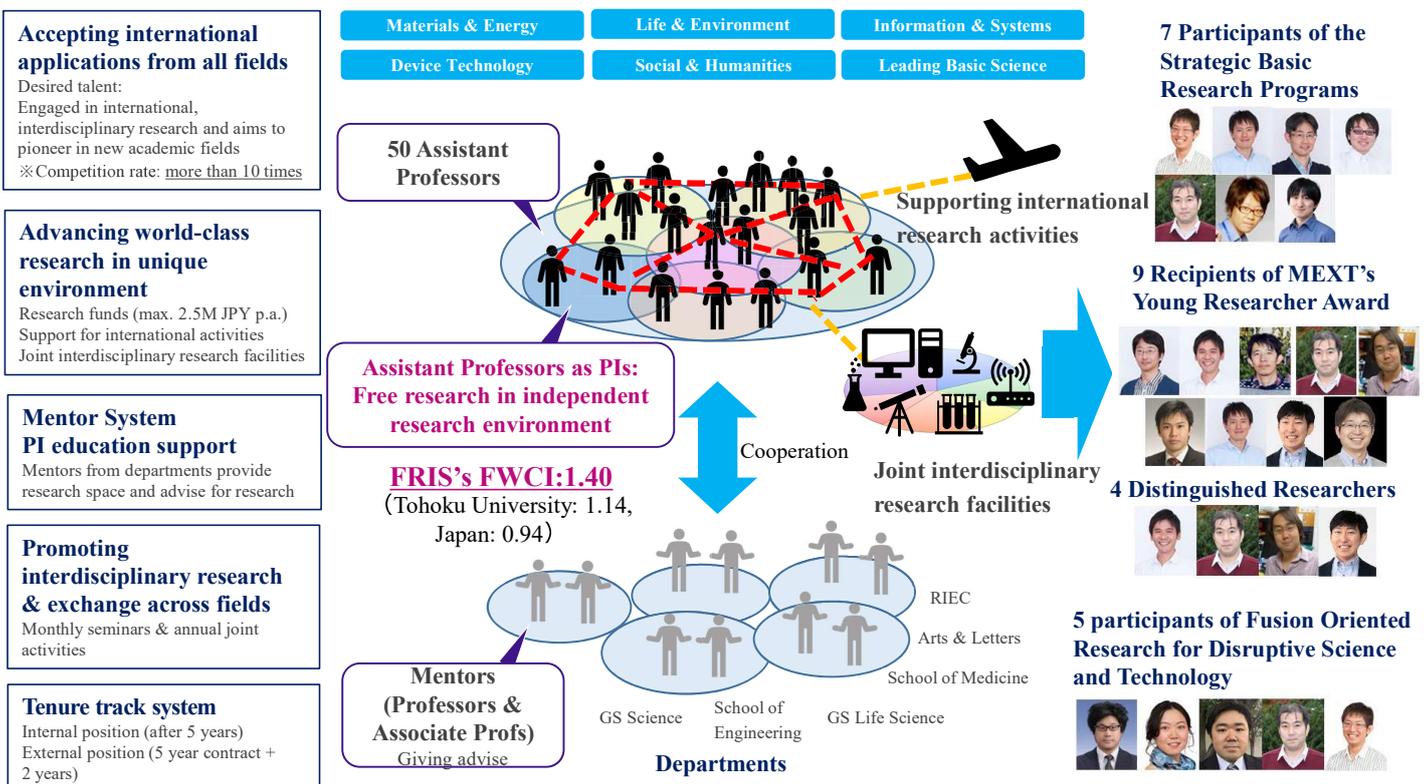
- The Tohoku Medical Megabank Organization aims to establish an individualized medication hub by utilizing connections in industry and academia, introducing a cutting-edge cryo-electron microscope within the facility for further actions.

The international joint research group at the Tohoku Medical Megabank Organization conducted a genome-wide association study (GWAS), which received critical acclaim from international researchers and was published in Nature in December 2021.



The independent research environment at the "Frontier Research Institute of Interdisciplinary Sciences" (FRIS)

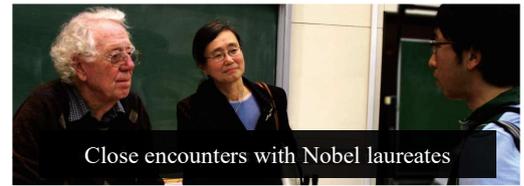
50 young researchers from all fields advancing interdisciplinary research and pioneering new research fields





Tohoku Forum for Creativity (2013~)

First international visitor research institute in Japan.
Inviting outstanding researchers from all over the world to inspire and foster young researchers.



FY2013 Barry Barish 2017 Nobel Prize (Physics)	 Steven Weinberg 1979 Nobel Prize (Physics)	 David Gross 2004 Nobel Prize (Physics)	 Oliver Smithies 2007 Nobel Prize (Medicine)	 Hiroshi Amano 2014 Nobel Prize (Physics)	FY2014 Gerardus 't Hooft 1999 Nobel Prize (Physics)	 François Englert 2013 Nobel Prize (Physics)	 Martin Hairer 2014 Fields Medal	 Makoto Kobayashi 2008 Nobel Prize (Physics)	 Susumu Tonegawa 1987 Nobel Prize (Medicine)	FY2015
FY2015 Koichi Tanaka 2002 Nobel Prize (Chemistry)	 Klaus von Klitzing 1985 Nobel Prize (Physics)	 Eberhard E. Riedel 2014 Nobel Prize (Medicine)	 Maxim Konsevich 1998 Fields Medal	 Shing-Tung Yau 1982 Fields Medal	 Kenji Fukaya 2009 Asahi Prize	 Peter A. Grünberg 2007 Nobel Prize (Physics)	 Hiroshi Komiya 28 th President Tokyo University	 Takaaki Kajita 2015 Nobel Prize (Physics)	 Mitsuhiko Yanagida 2011 Order of Culture	FY2016
FY2018 Edward Witten 1990 Fields Medal	 Shing-Tung Yau 1982 Fields Medal	 Jennifer A. Doudna 2020 Nobel Prize (Chemistry)	 Daniel Shechtman 2011 Nobel Prize (Chemistry)	 Tasuku Honjo 2018 Nobel Prize (Medicine)	 Takaaki Kajita 2015 Nobel Prize (Physics)	 Rainer Weiss 2017 Nobel Prize (Physics)	 Barry Barish 2017 Nobel Prize (Physics) (in March 2022)			FY2017
		FY2019	FY2020			FY2021				

Inviting a total of 28 outstanding leading researchers



Highly Cited Researchers 2021 (Clarivate Analytics)

Tohoku University has the 2nd highest number of researchers with impact on the academic community in Japan (9 researchers)

 Mingwei Chen Materials Science	 Zubair Fadhil Computer Science	 Nei Kato Computer Science	 Hiroshi Maeda Pharmacology	 Hozumi Motohashi Cross-Field	 Hideo Ohno Cross-Field	 Eiji Saitoh Physics	 Fengxiao Tang Cross-Field	 Masayuki Yamamoto Cross-Field
---------------------------------------	---------------------------------------	----------------------------------	-----------------------------------	-------------------------------------	-------------------------------	----------------------------	----------------------------------	--------------------------------------

EVP Motoko Kotani is named new President-elect of International Science Council (starting 2024)



Activities of Young Researchers

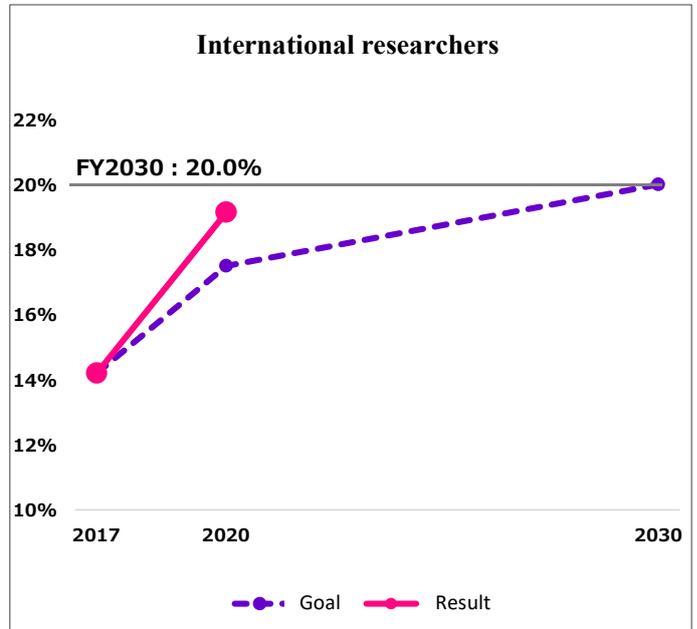
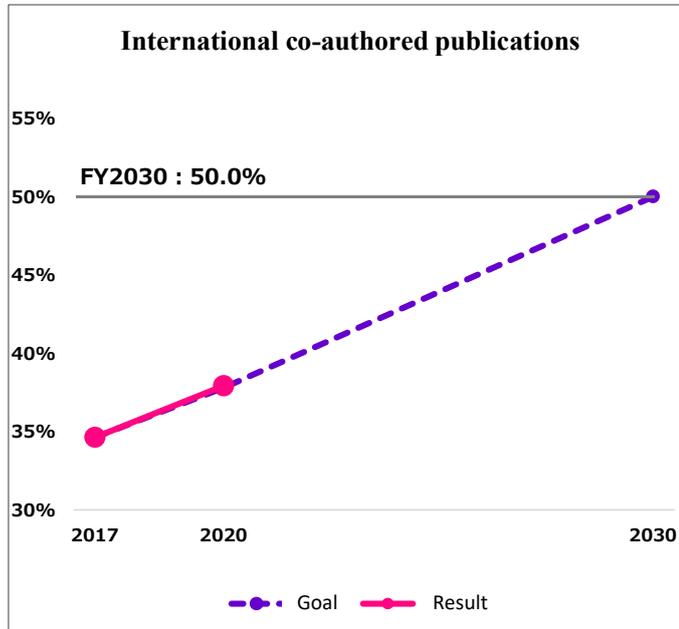
- ❑ Fusion Oriented Research for Disruptive Science and Technology: 27 Projects (#1 in Japan)
- ❑ University fellowships program for the creation of science and technology innovation: 120 Participants (#1 in Japan)
- ❑ MEXT's Young Researcher Awards: 53 Laureates (#2 in Japan) (2016~2020)
- ❑ Support for Pioneering Research Initiated by the Next Generation: 511 Participants (#3 in Japan)

5 Selections at the 'Moonshot Research & Development Program' (#2 in Japan)

Project Manager	Research Objectives
School of Medicine Hideki Katagiri 	Overcoming diabetes and co-morbidities by understanding and controlling homeostasis
School of Engineering Yasuhiro Hirata 	AI robots for a vibrant society
GS Life Sciences Kiwamu Minamisawa 	Reduction of greenhouse gas emissions from agricultural land through optimization of resource circulation
School of Engineering Yasuhiro Fukushima 	Development of an integrated fixation and reaction system (quad-C system) that can utilize atmospheric CO ₂
School of Medicine Takaaki Abe 	Mitochondrial preemptive medicine



Steady progress with 37.9% international co-authored publications (Goal: 50% by 2030) and 19.2% international researchers (Goal: 20% by 2030) at the Core Research Clusters.



Concept:

Leading innovation by creating a global industry collaboration hub

Actions:

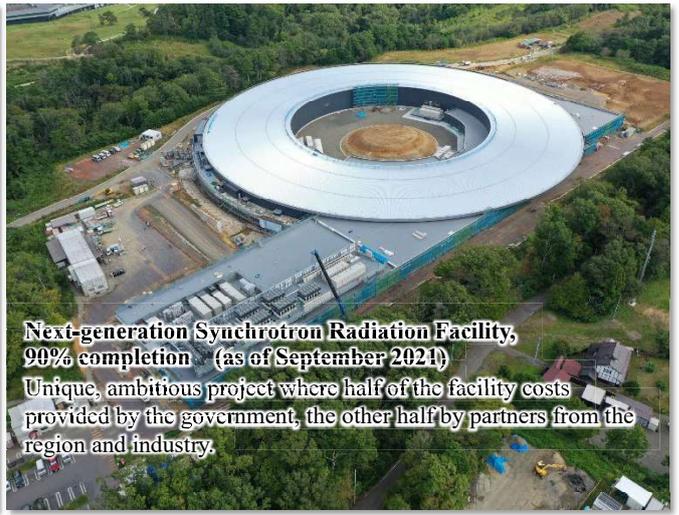
- Establish an under-one-roof industry collaboration hub (Cooperative Research Square)
- Large-scaled industry collaboration at the Science Park





Under-one-roof Industry Collaboration Hub (Cooperative Research Square)

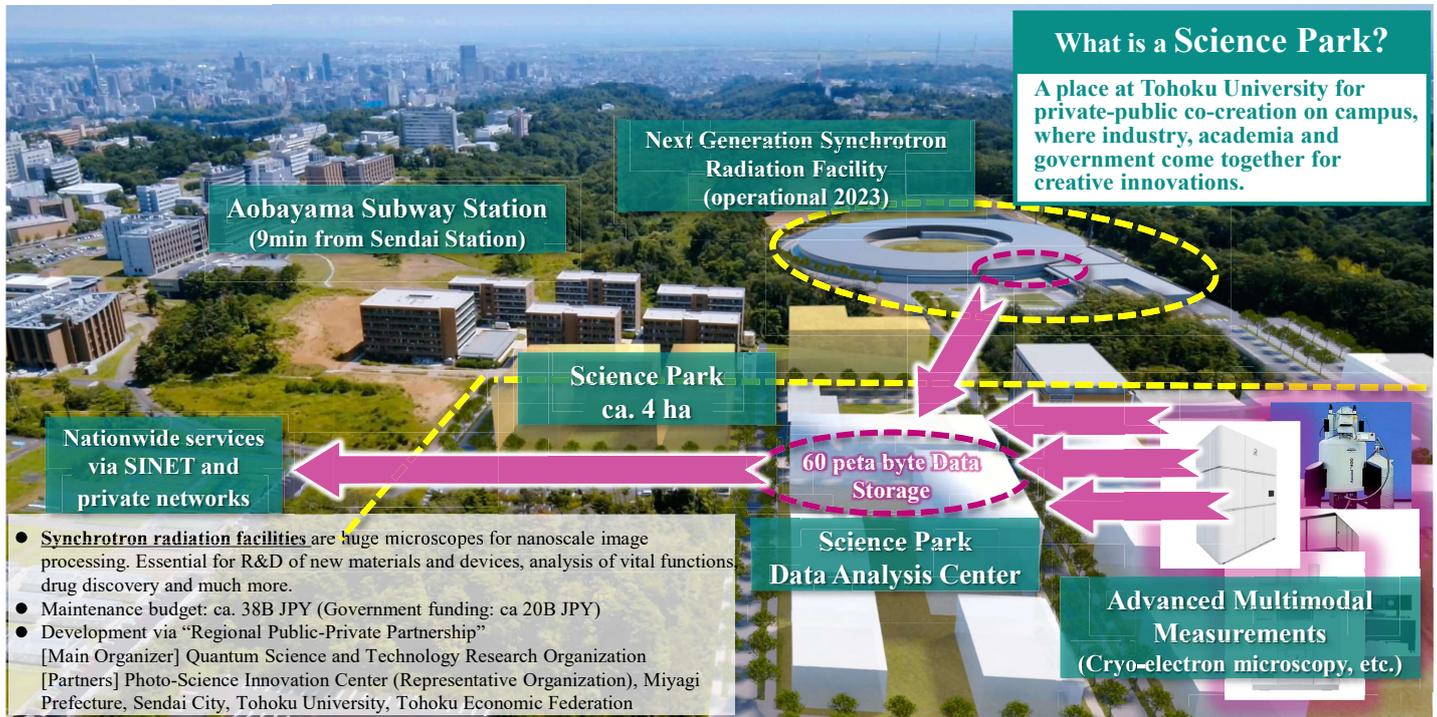
- Consolidated all services related to industry collaboration in October 2018 and established the under-one-roof industry-academia cooperation center at the new extension of the Aobayama campus with direct connection to the subway
- The Material Innovation Center was donated by JX Nippon Mining & Metals Co. The building was completed and made accessible in September 2020.
- This was showcased as good practice in the “Guidelines for Joint Research Projects in Private Public Collaboration”(published June 30, 2020, by MEXT and METI)
- Collaboration with the next-gen synchrotron radiation facility and the Science Park



Large-scaled Industry Collaboration at the Science Park ①

- Strengths of Tohoku University**
- **Top level research and infrastructure in materials science**
Highly competitive researchers and facilities, nano-tech platform, etc.
 - **Unique strategy of the Tohoku University Science Park Concept**
Responding to needs after COVID, maintaining a 26B JPY campus
 - **New industry co-creation at the Next-Gen Synchrotron Ratiakon**
Chance for Japan’s largest data collaboration with 75 members

- Future Tasks**
- **On-site data analysis** (Low-energy processing of big data)
 - **High value data analysis service** (Leading tech + industry application)
 - **Remote sharing, automatic accumulation & analysis**
 - **60 peta byte high speed servers, analysis software development**
 - **Continuous funding for data platform maintenance**
(Stable operation via multiple sources from government and industry)





‘1st International Forum for Innovation in Next Generation SR’

(April 21~23, 2019, organized by Tohoku University)

AOBA communique, published April 22, 2019

- Congratulate Japan on successfully initiating the next generation 3GeV Synchrotron Radiation facility construction in Tohoku and hosting the 1st International Forum for innovation in Next Generation SR. This proves to the world Japan's full-fledged recovery from the Great East Japan Earthquake.
- Establish the Summit Meeting amongst SR facilities worldwide to be held on a regular basis as a forum for development of alliances between universities, industry and the facilities to promote basic and applied research.



Chair: Tohoku University President Hideo Ohno

‘2nd AOBA SUMMIT’ (2020.4.24, online)

AOBA communique2, published April 24, 2020

- Share information and contribute to the coordination of efforts across all X-ray Science Facilities on scientific research addressing COVID-19
- Explore the establishment of a worldwide X-ray Science Facilities network including university and industrial users for a comprehensive mobilization
- Development of a shared IT system to accelerate the process of information
- Exchange experience on remote access and sample mail-in procedures by the user community to maintain and strengthen experimental activities
- Coordinate efforts with those of other analytical facilities



AOBA SUMMIT 2 (updated on May 10th, 2020)

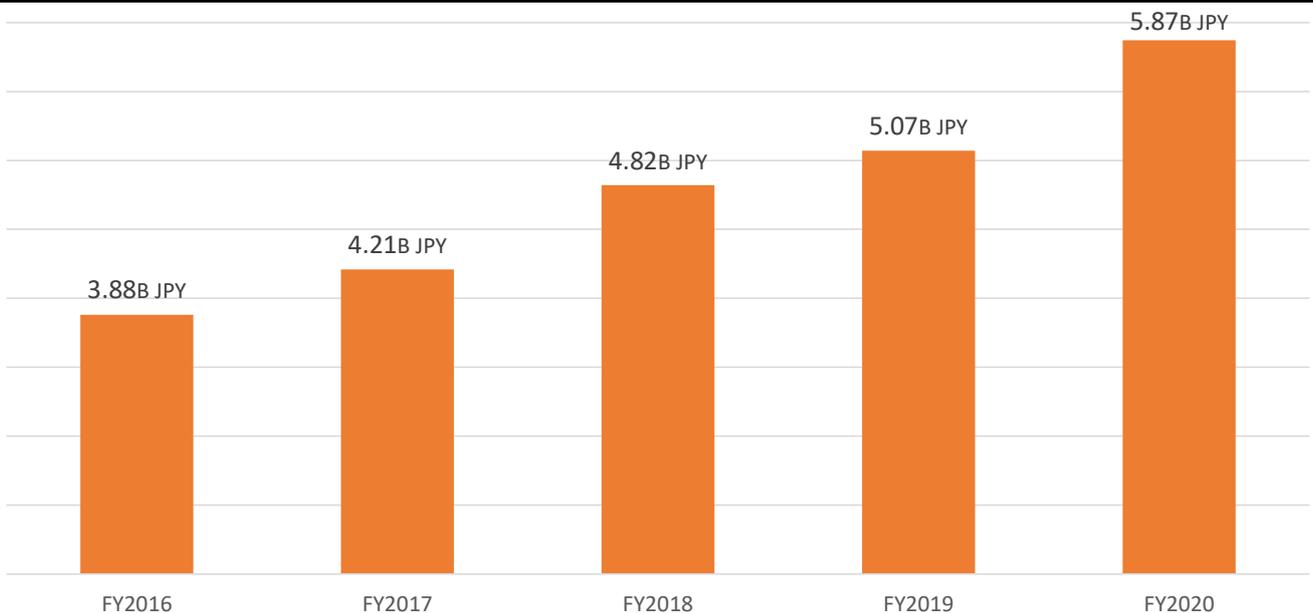
‘3rd International Forum for Innovation in Next Generation SR’ (July 1, 2021, Int. Symposium)

- Lectures and keynotes by the directors of the world's major synchrotron radiation facilities, such as Francesco Sette, as well as young researchers. Lively discussions were held about new developments

Importance of data-driven research for the future

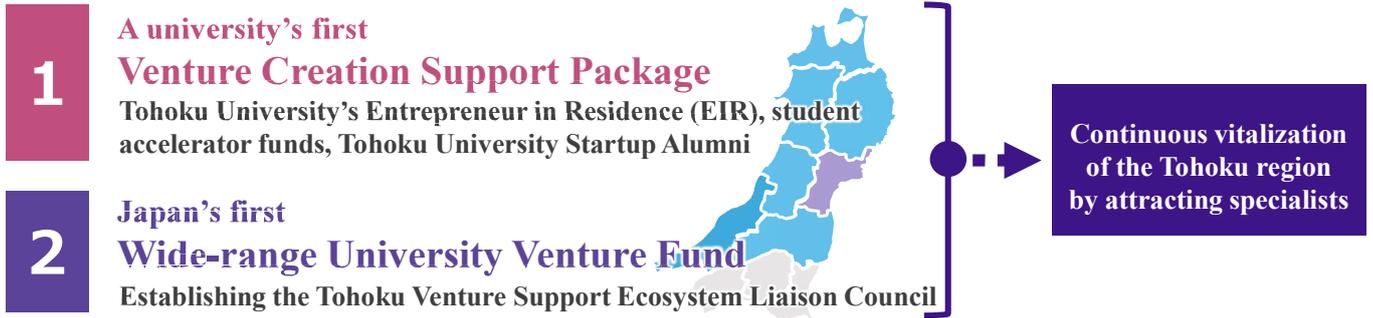


Significant increase of joint research funds (+51% compared to 2016) due to large-scaled organization-to-organization industry co-creation, the establishment of the Head Office for Open Innovation Strategy (December 2018) and the Co-creation Research Center (April 2021)





Following actions after the **Startup University Declaration** in Oct. 2020



Prominent University Startups

Kringle Pharma, Inc. (public listing in Dec. 2020)

R&D of recombinant human protein

Renasience Inc. (public listing in Sep. 2021)

R&D of medical care for enjoy lifelong health

Susmed Inc. (public listing in Dec. 2021)

Development of medical care applications



THE Impact Ranking 2021

Global performance tables that assess universities against the United Nations' Sustainable Development Goals (SDGs).



Rank 9



Rank 94



Rank 32



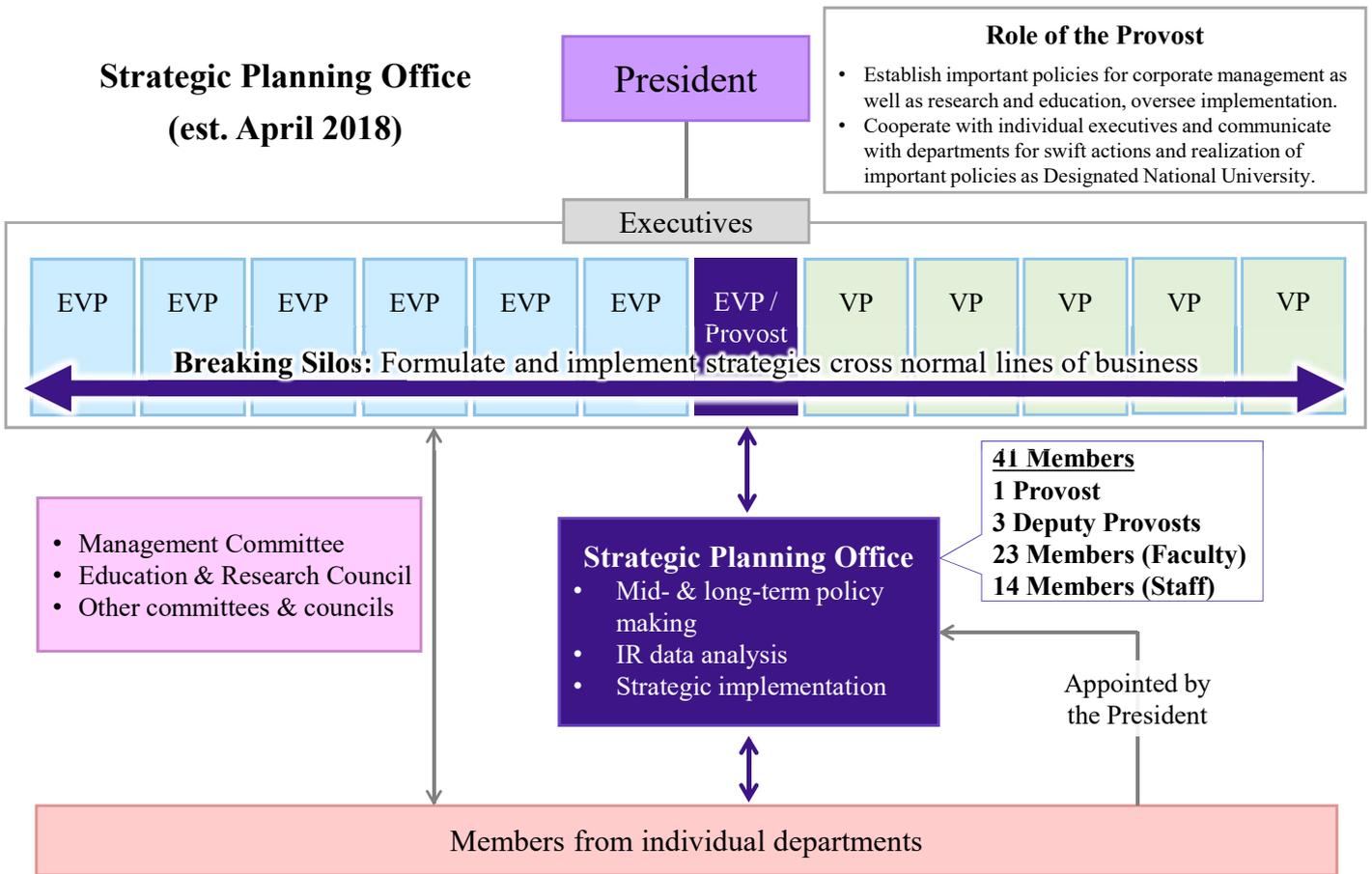
Concept:

Reinforced functionality based on leading academic governance

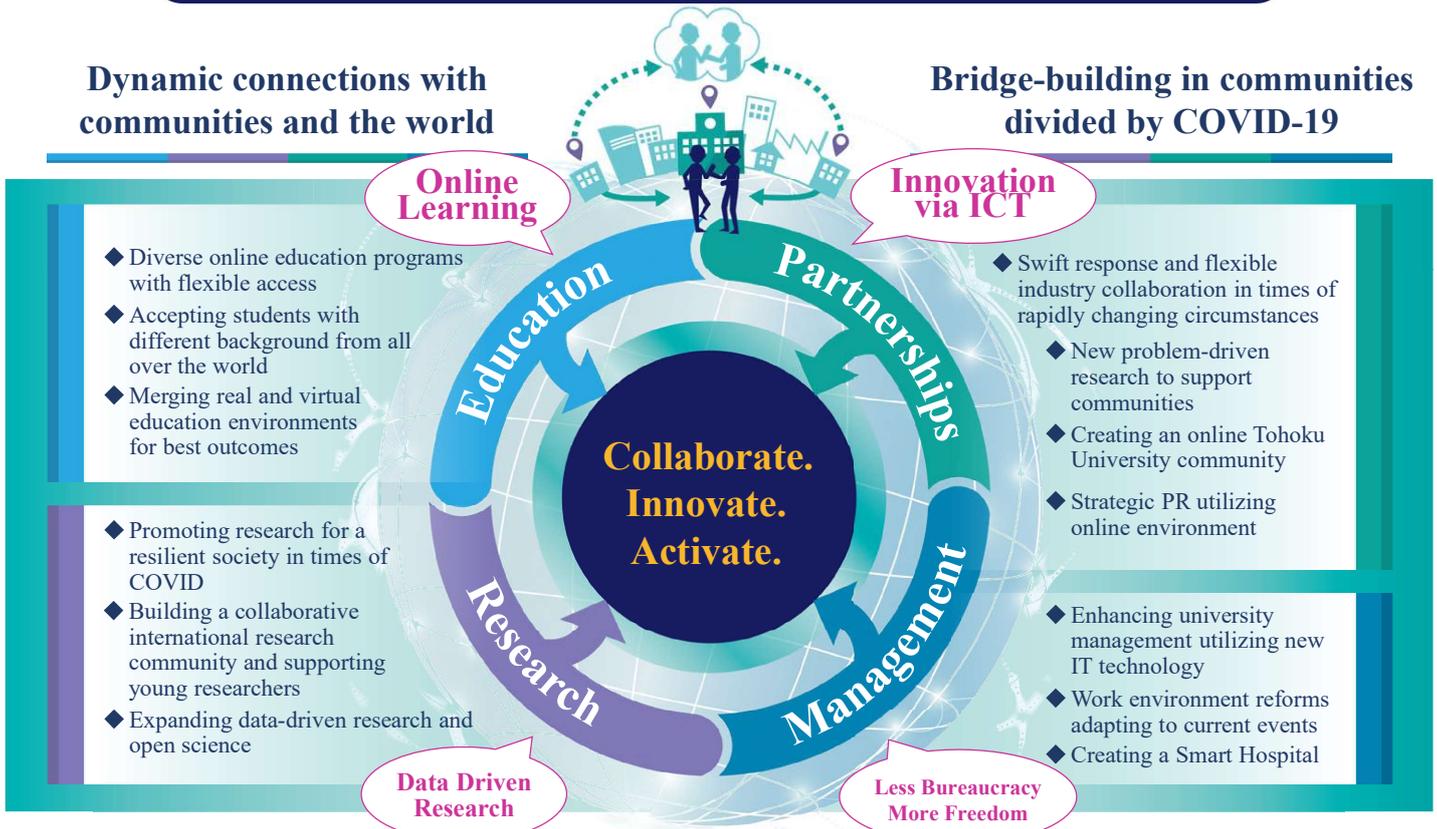
Actions:

- Reinforce organizational support of the president
- Advance priority policies utilizing one of the largest President's Budget as national university





Swift Digital Transformation of All University Actions





Recommendations by the 2nd International Advisory Board (2019)

Based on the recommendation “to increase international excellence in research, you need to attract global talent and young researchers”, we established the ‘Young Researchers Initiative’ and reinforced acquisition of international researchers



Providing an environment where young researchers can unfold their individuality

- ‘Prominent Research Fellow System’ for Assistant Professors who challenge unique research projects
- Half exemption of facility fees for young researchers with the ‘Facility Utilization Support for Young Researchers’

Seamless support for diverse career paths for motivated young researchers

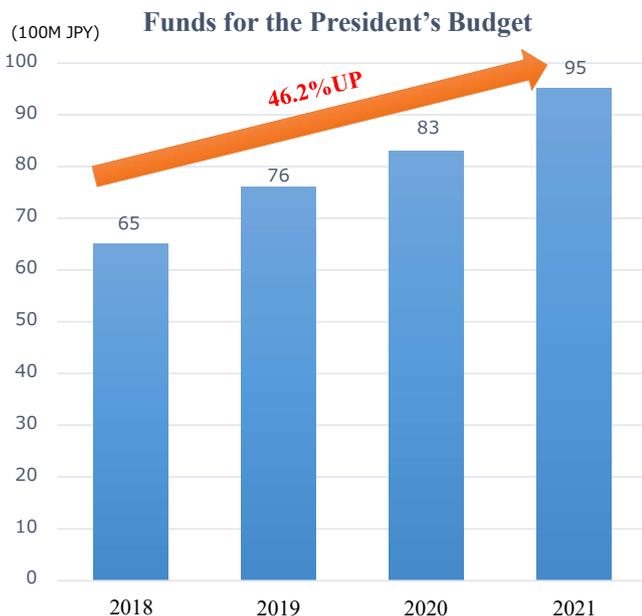
- Providing a comprehensive support package for young researchers

Establish personal connections with leaders of leading overseas universities

Joint chair by President Hideo Ohno and former UCL President Michael Arthur at the Academy President’s Meeting during the STS Forum 2019



Utilizing various resources including the President’s Budget for further internationalization



President’s Budget		
FY2021 Ca. 2.1B JPY	Education programs at the International Joint Graduate School etc.	390M JPY
	Promotion of the Core Research Cluster etc.	940M JPY
	Promotion of international industry collaboration	290M JPY
	Organizational reinforcement for further globalization	480M JPY



	Best Practices	Tohoku University's Progress
University of Washington	<ul style="list-style-type: none"> The University of Washington established the UW Graduate School to provide a flexible system for leading interdisciplinary education and is a model for the "Tohoku University Advanced Graduate School" 	<ul style="list-style-type: none"> The Tohoku University Advanced Graduates School is operational as of April 2021, advancing further development of Degree Programs and related actions.
University of Chicago	<ul style="list-style-type: none"> The University of Chicago's top management flexibly establishes new research units specializing in innovative actions in new domains and partnerships with industry. 	<ul style="list-style-type: none"> The 3-Layered Research Innovation System allows for swift arrangement and formation of new research units, leading to an increased ratio of international collaborations and higher quota of overseas researchers among our members.
University of Cambridge	<ul style="list-style-type: none"> The University of Cambridge attracts R&D of companies on its West Campus, where natural science and engineering fields are consolidated. The university has established a cycle of funds, knowledge and human resources for industry collaboration. 	<ul style="list-style-type: none"> In 2018 Tohoku University established one of the largest under-one-roof industry collaboration hubs in Japan at the new extension of the Aobayama campus. Furthermore, collaborating with the next-gen. synchrotron radiation facility (operational 2023), we will advance data driven research at the Science Park.
Heidelberg University	<ul style="list-style-type: none"> Heidelberg University chooses strategic partners according to their research priorities and strategic international collaborations. 	<ul style="list-style-type: none"> The International Strategy Office (est. 2018) promotes international projects and strategic international partnerships based on recommendations by the International Advisory Board.
University of Melbourne	<ul style="list-style-type: none"> The University of Melbourne provides Ph.D. students with financial support through scholarships from the federal government and endowments as well as combining research and teaching assistant duty to support all students. 	<ul style="list-style-type: none"> Through the comprehensive financial support package (1.3M JPY average per student per year), we provide financial support to all Ph.D. students, and achieved "100% of doctoral students receiving financial support."



HR Acquisition & Research

- Establish world-class research and education environment (including support for staff and research)
- Attract talented Ph.D. students from around the world and provide leading education programs

Business Strategy

- Establish new business strategy for 3% growth, including private funding etc.



Tohoku University will implement the aforementioned concepts to establish a virtuous cycle involving education, research and community contribution to manifest the synergy of excellence and innovation toward the future of our society.

