

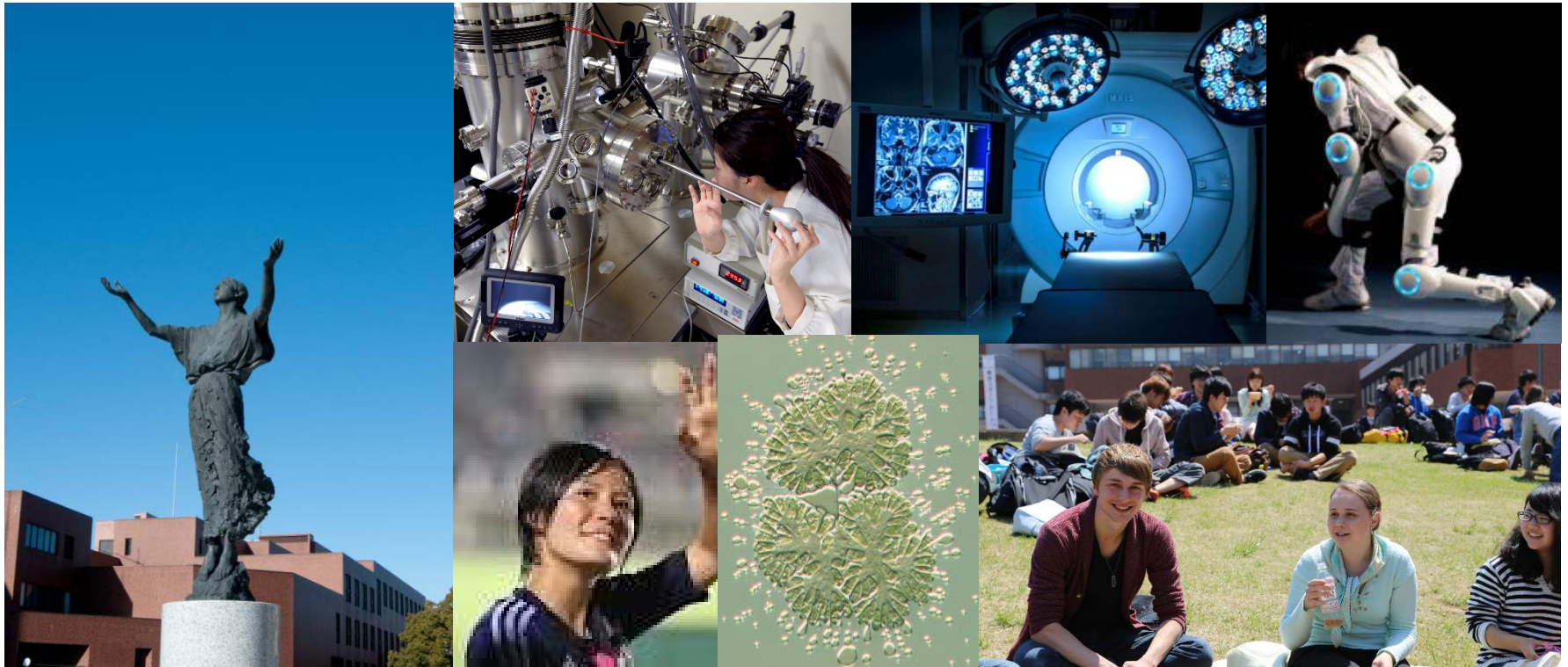


The University of Tsukuba & Industry-University Collaboration Activities

University of Tsukuba

International Industry-University
Collaborative Headquarters





Overview of the University of Tsukuba

Where is Tsukuba?



45min by train (**Tsukuba Express**)
from downtown Tokyo to Tsukuba

&

50min by car from Narita Airport
(**Metropolitan Inter-City Expressway**)

Center of Research and Development

Tsukuba is the largest science city in Japan

32 national research institutes,
(= 30% of all national institutes)
more than 200 private Institutes.

1 out of 10 residents of Tsukuba city is a researcher.



Forestry and Forest Products Research Institute



独立行政法人 物質・材料研究機構
National Institute for Materials Science



JAXA 宇宙航空研究開発機構
Japan Aerospace Exploration Agency



National Research Institute
for Earth Science
and Disaster Prevention.
NIED

NIA's National Institute of
Agrobiological Sciences

FNRI National Food
Research Institute

Functionality
Safety
Biotechnology

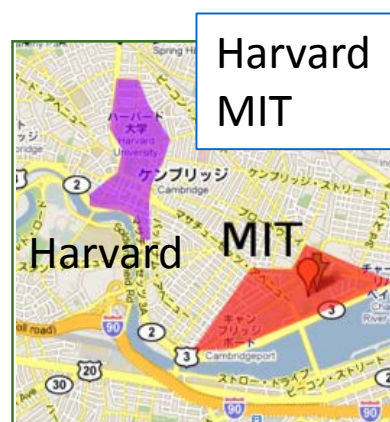
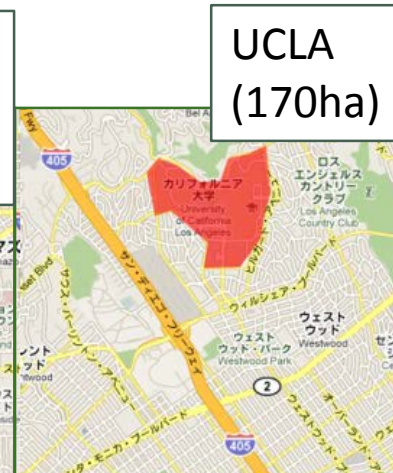
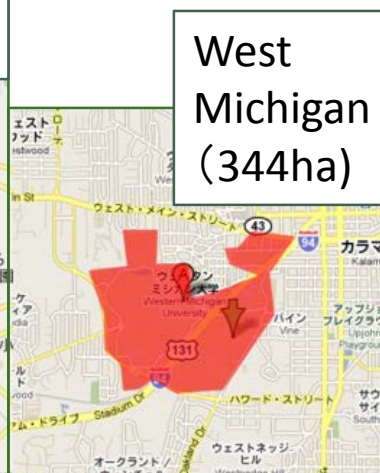


NRI National Institute for Rural Engineering

Meteorological
Research
Institute JMA

NARO 独立行政法人 農業・食品産業技術総合研究機構

2nd Largest Campus in Japan



44+101 Years of Unique History

145 years of History and Tradition

Funded as Higher Normal School (1872)

→ Tokyo University of Education (1949)

→ University of Tsukuba (1973)

3 Nobel Laureates



Dr. Esaki Leo
(Physics, 1973)



Dr. TOMONAGA Sin-Ichiro
(Physics, 1965)



Dr. SHIRAKAWA Hideki
(Chemistry, 2000)

63 Medals in Olympic Games



Silver Medalists at London Olympics 2012

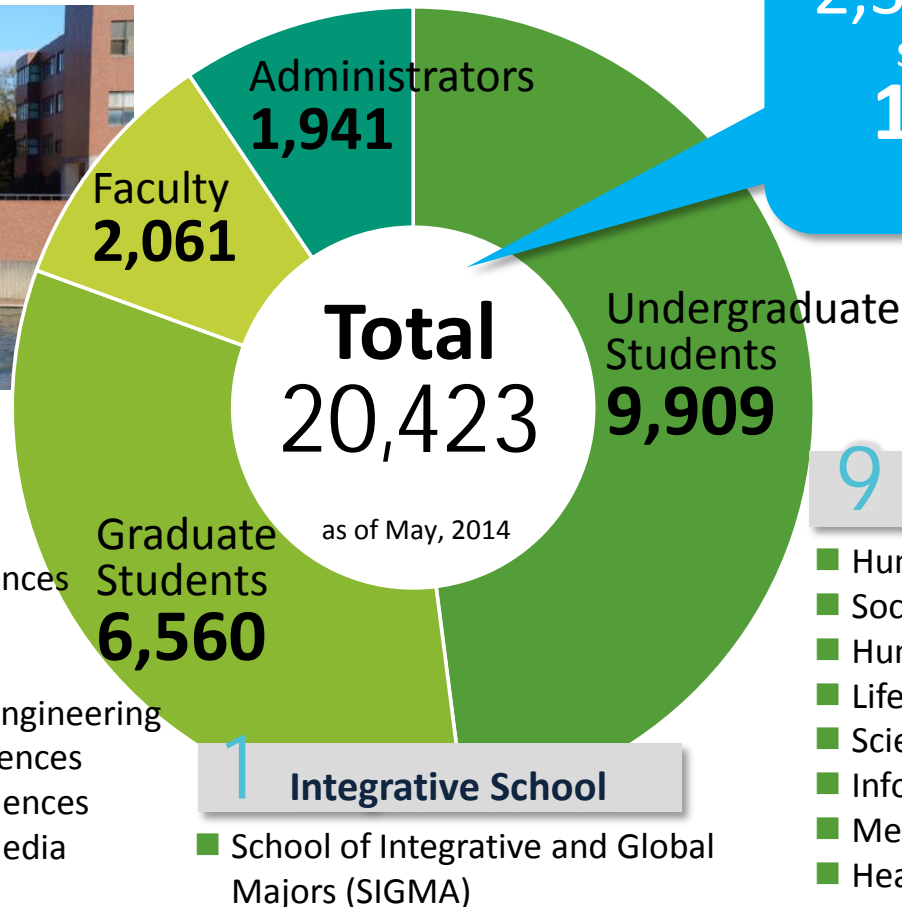


Number of Students and Staff



8 Graduate schools

- Education
- Humanities and Social Sciences
- Business Sciences
- Pure and Applied Sciences
- Systems and Information Engineering
- Life and Environmental Sciences
- Comprehensive Human Sciences
- Library, Information and Media Studies



1 Integrative School

- School of Integrative and Global Majors (SIGMA)

2,326 International students from **106** countries



9 Undergraduate Schools

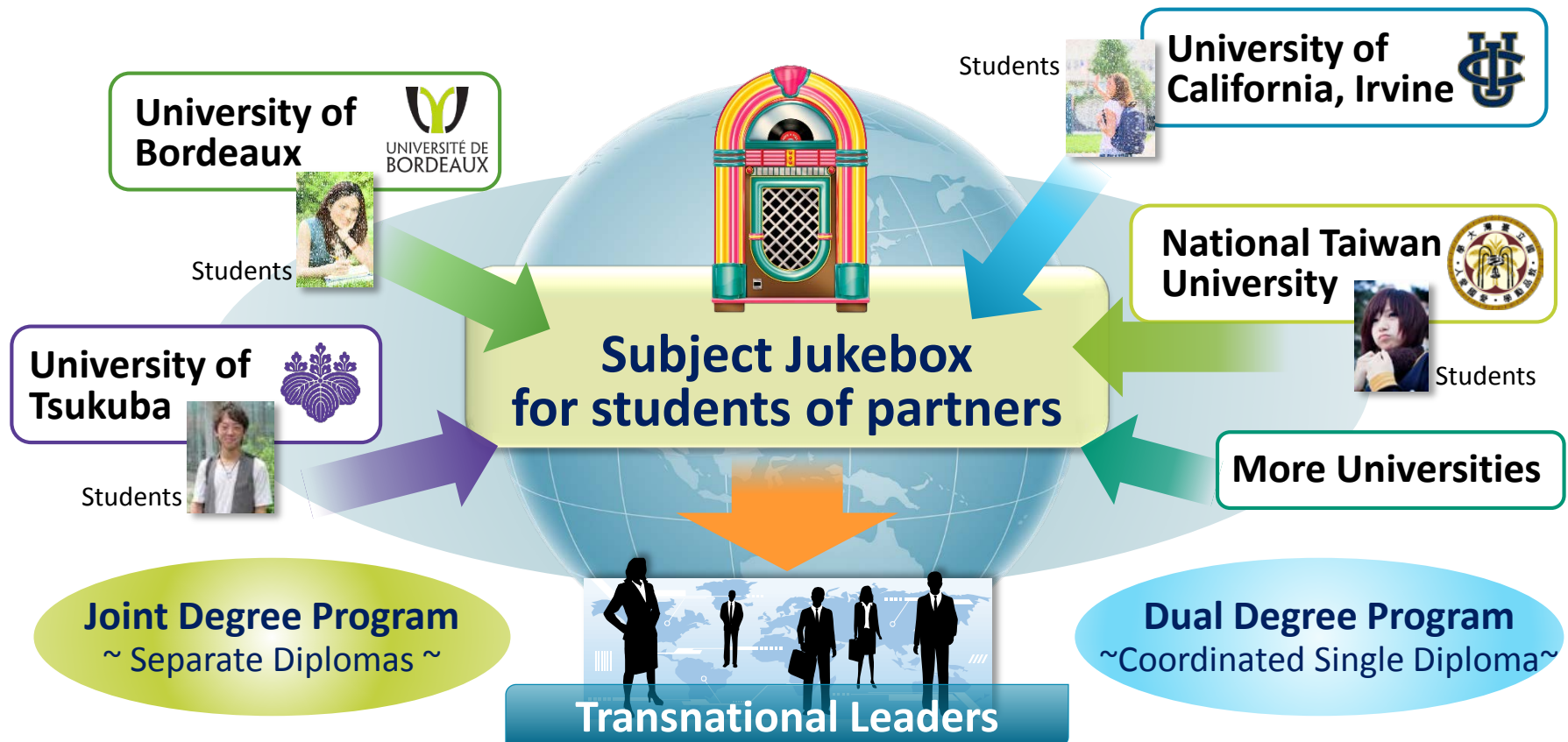
- Humanities and Culture
- Social and International Studies
- Human Sciences
- Life and Environmental Sciences
- Sciences and Engineering
- Informatics
- Medicine and Medical Sciences
- Health and Physical Education
- Art and Design

13 Overseas Offices in 12 Countries



Subject Jukebox for Students of Partners

CAMPUS-IN-CAMPUS for promoting Global Mobility
of Students and Researchers



University of Tsukuba Hospital

Mission: advanced medical care and medical research

- Opened 1978
- 34 clinical Departments
- 800 beds
- 1,782 staffs

category	number
Teaching Staff	294
Residents and Fellows	279
Clinical Assistant Professor	67
Nurses and Maternity Nurses	774
Pharmacists	49
Other Paramedical Staff	368

As of Apr. 2014



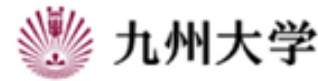
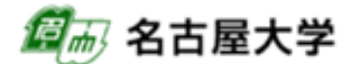
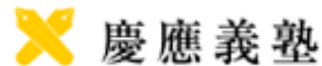
MRI operating room



Angiography operating room

RU11: Top Research Universities in Japan

RU11 is a consortium, established in 2009, consisting of 11 of the top Research Universities in Japan.



/ 781* Universities

*2014 School Basic Survey (Ministry of Education, Culture, Sports, Science and Technology, Japan)

Research Centers for Innovation

Nationwide joint-use institutes

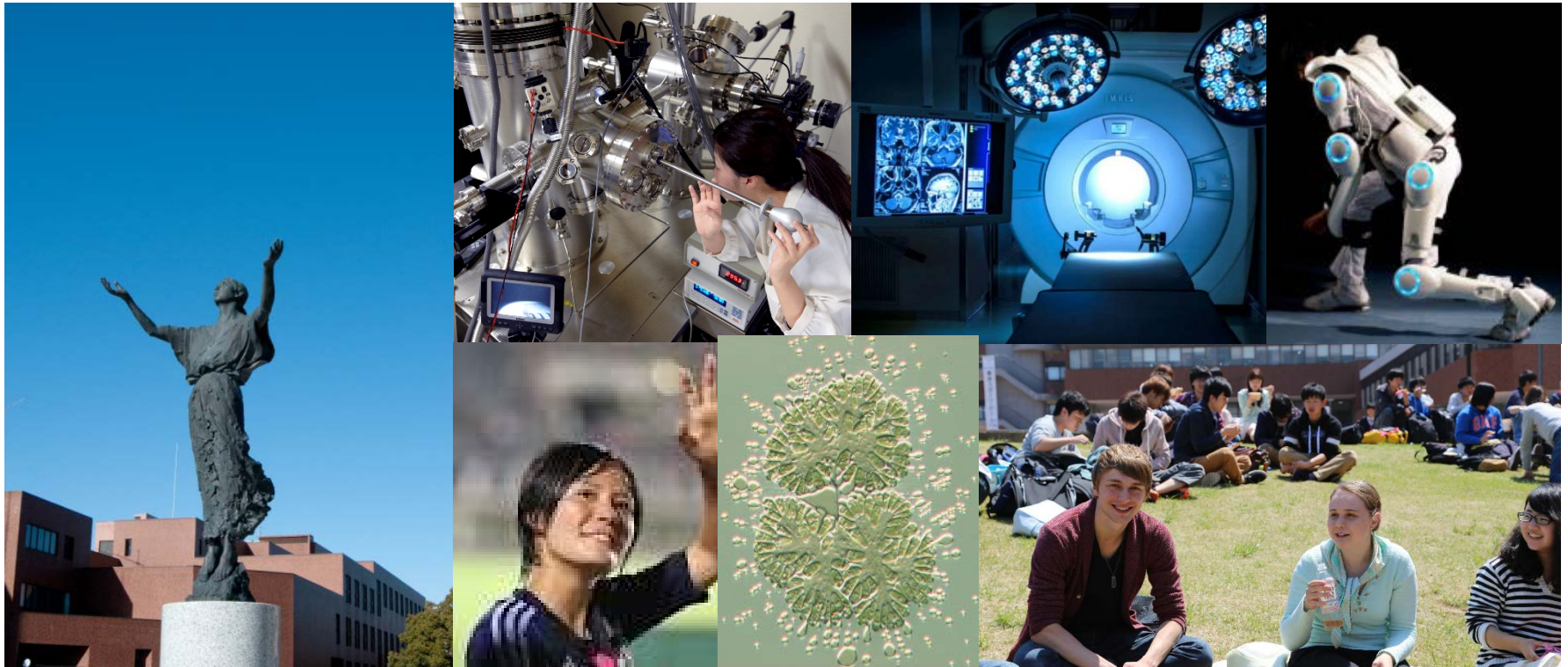
- Center for Computational Sciences
- Shimoda Marine Research Center
- Gene Research Center
- Plasma Research Center

Research cores

- International Institute for Integrative Sleep Medicine (IIIS)
- Core Laboratory for Algal Biomass and Energy System
- Innovation Medical Research Institute

Research centers

- Life Science Center of Tsukuba Advanced Research Alliance (TARA)
- Alliance for Research on North Africa
- Cybernics Research
- Center for Isotopes and Environmental Dynamics (CRiED)
- Tsukuba Research Center for Interdisciplinary Materials Sciences
- Agricultural and Forestry Research Center
- Proton Medical Research Center



Industry-University Collaboration at the University of Tsukuba

OUR MISSIONS

social and economic innovations

facilitating technology transfer which leads to social and economic innovations to make a social contribution through research findings of the University of Tsukuba;

University spin-offs

supporting university spin-offs by facilitating technological incubation and transfer;

technology transfer

promoting cooperative researches with private enterprises as one of the most important means of technology transfer;

intellectual properties

obtaining more international utilization of intellectual properties by making improvements of their assessment

Tsukuba Science City & Region

promoting university-industry-governmental institutes cooperation within Tsukuba Science City and strengthening community relationships with local public organizations such as Ibaraki Prefecture, Tsukuba City and so forth;

The University of Tsukuba
International
Industry-University
Collaborative Headquarters

OUR ROLE

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OUR ROLE

Strengths of the University of Tsukuba in Industry-University Collaboration

Interdisciplinary

Strong interaction between Faculties:
Humanities, Social, Life Sciences,
Medical, Engineering, Informatics,
Art, Phys. Ed.

International

of foreign students,
courses given using foreign languages
→ 2nd highest in Japan



Entrepreneurship

of university startups: 2nd highest
in Japan (2009), e.g., Cyberdyne Inc.
founded by Professor Sankai

Location

At the center of the largest
science city in Japan, with
15,000 researchers

Interdisciplinary Research for Emerging Society Needs

Faculty Structure optimized for Interdisciplinary Research, including Art, Sports and Medicine.

Unique Research System

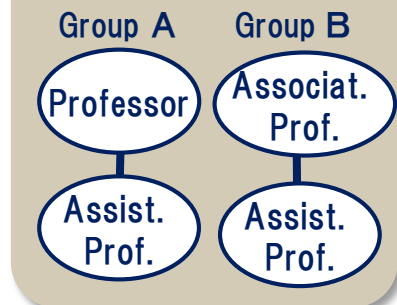
Conventional

Professor Chair System



U. of Tsukuba

Research Group System



⇒ Easy to create interdisciplinary research projects

⇒ Young researchers can easily start new research themes

Interdisciplinary Research Areas

- Integrative Sleep Medicine



- Research Center for Advanced & Interdisciplinary Life Sciences【TARA Center】



- Robot Suit HAL



- Boron Neutron Capture Therapy(BNCT)

- Center for Computational Sciences



- Health, Physical Ed. & Sport Sciences



Mapping U. Tsukuba's Research Potential onto Industry Areas

		Faculties of U. of Tsukuba						
		Medicine	Engineering, Info., Sys.	Pure & Appl Sci	Life, Environ.	Humanities	Art, Design	Health, Sport
Industrial Areas	Pharma	■	■		■			■
	Medical devices	■	■		■			■
	Health	■	■	■	■	■		■
	Transportation		■			■	■	■
	Energy, Environm		■	■	■			
	IT		■	■			■	
	Materials, Instrum		■	■				
	Food	■		■	■			■
	Sports	■	■			■		■
	Social, business	■	■		■	■	■	

Concept for Social & Economic Innovations by Interdisciplinary Research at U. Tsukuba

Macro trend of Global Society

Distributed, sharing
and circulation society

The expansion of EPA & FTA

The Growth of Emerging countries

Changes of Global Market

Toward Sustainable Society

Securing Water Resources, Energy, Food

Sophistication of Transportation System

Aging Infrastructure System Upgrading

Low birthrate & Aging Society Measures

Reduction of CO2

Promotion of Resource Recycling

Economic Innovation

Solution

Service for Human Life

Healthy quality of life

Next Society System

Compact City

IT/Cloud

AI/Robotics

IoT/loE

Cyber Security

loE: Internet of Everything



Products

Hydrogen Mobility

Clean Energy

Industrial Internet

Faculty of University of Tsukuba

Humanities & Social Science

Business Science

Pure & Applied Science

Engineering, Information & Systems

Life & Environmental Sciences

Human Sciences

Health & Sports Sciences

Art & Design

Medicine

Library Information & Media Science

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OUR ROLE

2nd in the Growth of Industry-University collaboration among Japanese universities

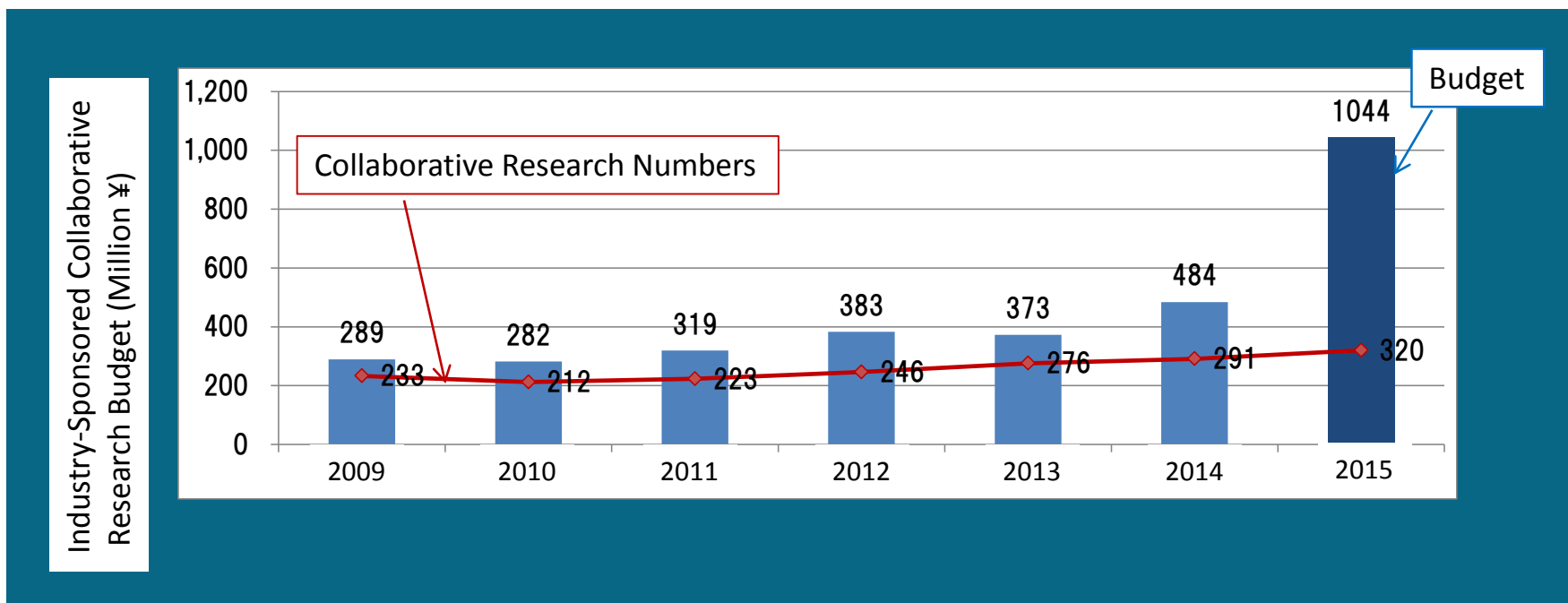
Average budget growth-rate of Industry-sponsored collaborative research between 2010-2015

University	Growth ratio (%)
1 Yamagata Univ.	52.7
2 Univ. of Tsukuba	35.2
3 Tohoku Univ.	17.2
4 Nagoya Inst. of Tech.	16.2
5 Nagasaki Univ.	15.6
6 Hokkaido Univ.	14.3
7 Waseda Univ.	13.4
8 Chiba Univ.	13.1
9 Toyohashi Univ. of Tech.	12.6
10 Shinshu Univ.	11.6

Budget Increase of Industry-sponsored collaborative research from 2014 to 2015

University	Budget Increase in 2015 (Million ¥)
3 Tohoku Univ.	561
2 Univ. of Tsukuba	560
6 Hokkaido Univ.	391
1 Yamagata Univ.	348
5 Tokyo Univ.	226
6 Nagoya Univ.	216
7 Osaka Univ.	207
8 Keio Univ.	204
9 Chiba Inst. of Tech.	188
10 Tokyo Univ. of Science	124

In 2015, the industry-sponsored collaborative research budget increased by 2-fold compared to 2014.



Industry-Sponsored Collaborative Research Budget of the University of Tsukuba

1. Made a platform for interdisciplinary industry-university co-creation

2. Innovated headquarters management structure of Industry-University Collaboration

3. Changed the strategy toward initiating large-scale collaborative research

1. Platform for Interdisciplinary industry-university co-creation

2. Innovation of headquarters management structure

**International Industry – University
Collaborative Headquarter
(2014 April)**

Industry – University Dep.

Technology Transfer Cheam

R&D Center(2015 July)



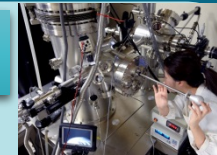
3. Large scale collaborative research creation program

①M2B2A type collaborative research(2014 Aug)

②Special collaborative research Project (2014 Dec.)

③Global Matching Program(2014 Aug.)

④Tsukuba Industry – University Collab. Boost Pj.(2015 April)



3. Promotion of industry-univ. collaboration and talent placement

①Innovation Medical Research Institute (2015 Aug.)

②Tsukuba Clinical R&D Organization (T-CReDO) (2015 May)

③Life Innovation Degree Program (2015 Nov.)

④Center for Artificial Intelligence Research (2017 April)



2. Industry-University Collaboration Structure

International Industry-University Collaborative Headquarters

(Established in April. 2014)



Dr. Kanaho (Executive Officer) Dr. Uchida (Professor)

General
manager

Deputy
Director
General

Vice
Director
General

Committee for
University-
industry
Collaboration

Industry-University Collaboration Department

- Intellectual property
- National fund
- Research Collaboration contracts

Technology Transfer Team

- 11 Technology Transfer Managers

Research & Development Center (established in July 2015)

<First R&D Center>

R&D Center for Algal Biomass
Energy System

Strategic plans to strengthen industry collaborations

U.Tsukuba Strategies for Industry–University Collaboration

I	“R&D Center” framework	July, 2015
II	Special Collaborative Research Projects	December, 2014
III	Market–to–Business–to–Academia Collaboration Process	Aug, 2014
IV	Expand international collaborations	Aug, 2014
V	Innovation Medical Research Institute	Aug, 2015

Missions of University of Tsukuba

Social Contributions



R&D Centers

Research

Research
Centers

Education



Schools

Innovative Organization operated by external funds

Objective

Create innovation

Participation of industry personnel

Speed up research

Cultivate industry-directed culture
& entrepreneurial talents

Management

Promote industry-univ. collaboration in
research areas with high social demands5 years duration
(with a possibility to extend)Will be abolished when external funding
is no longer available

R&D Center for Algal Biomass Energy System

Securing Energy Source ; A vital problem for Japan

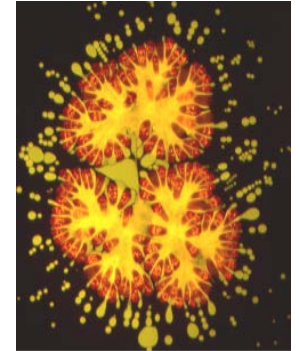
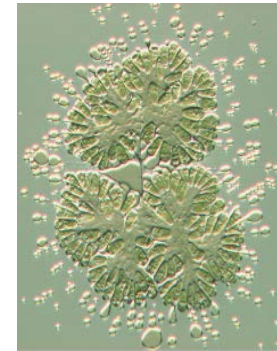
Hydrocarbon Producing Algae



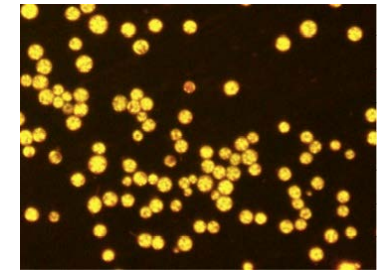
Prof. Makoto Watanabe



Botryococcus braunii produces 118 t oil ha/year



Aurantiochytrium has a high-growth rate, with a high content of the hydrocarbon called squalene.



The oil product is shown by yellow spheres.

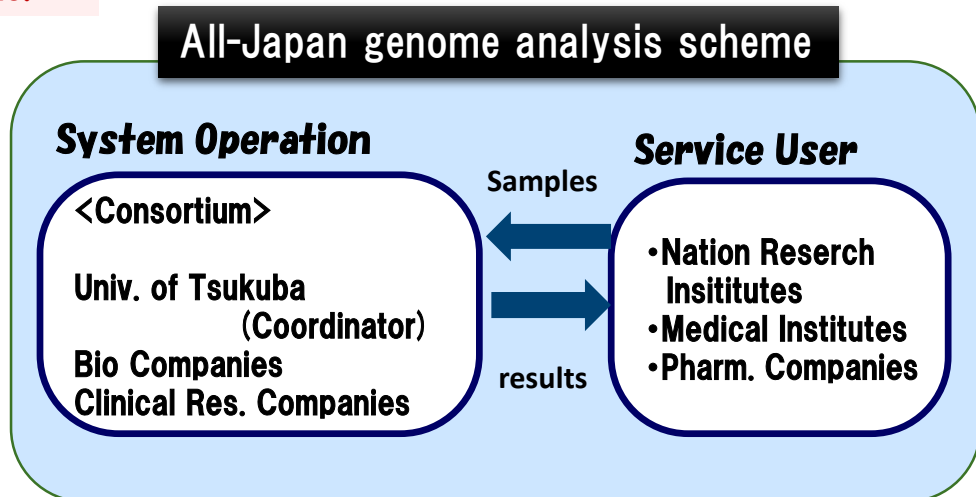
R&D Center for Precision Medicine

Japan's first \$1000 genome analysis center

Current Status: Precious genome information of the Japanese population is outflowing toward overseas.

Region	No.	Location of \$1000 genome analysis center
Japan	0	
USA	5	Alabama (1), California (2), New York (1), Missouri (1)
EU	7	GB (3), Iceland (1), DE (1), Austria (1), Sweden (1)
Korea	1	Seoul(1)
China	2	Beijing(1)、Shanghai(1)
Middle East	1	Qatar(1)

All-Japan genome analysis scheme

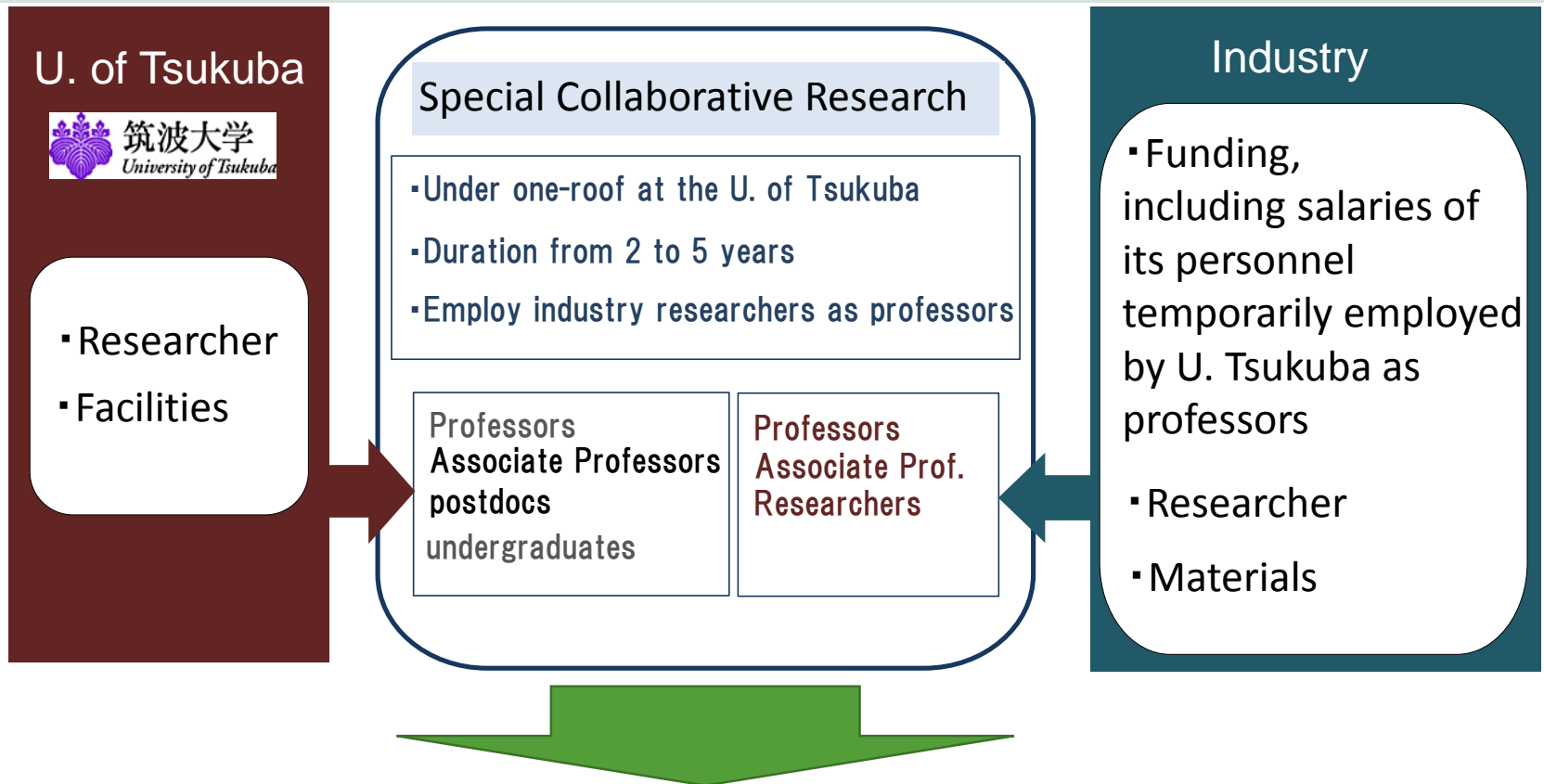


Innovation Medical Research Building



Collaborative research under one-roof between industry and U. of Tsukuba to promote social implementation of research outputs

Mutual understanding of what to be solved to achieve a business goal



① Industry & University researchers both participate to accelerate future business

② Industry researchers participate in education at the University

Example of a Full-scale university-industry research collaboration :
Special Collaborative Research PJ with an Automobile Company

“Advanced research for realization of smart accessible society”

To pursue how the social system will be transformed in the next generation, interdisciplinary research spanning diverse fields is necessary.

Automaker's Needs for Solutions toward the coming Society



U.Tsukuba's Research Potential

“Accessible society system”

- **Public transportation system**
- **Human behavior science**
- **Urban structure with smart accessibility**
- **City design**
- **Human friendly functions**
- **Economic system**
- **Legal framework**

Sharing problems



Innovative research theme

Faculty Structure optimized for Interdisciplinary Research

Psychology

F. Human Sci.

Cultural anthrop.

F. Media Sci.

Economics

F. Business Sci.

Law

F. Soc. Sci.

Risk Eng.

F. Life & Environ.

Policy Sciences

F. Engineering

Service Eng.

F. Pure&Appl. Sci.

Design

F. Art & Design

Ergonomics

F. Sport

F. Medicine

Create new discipline in academic research

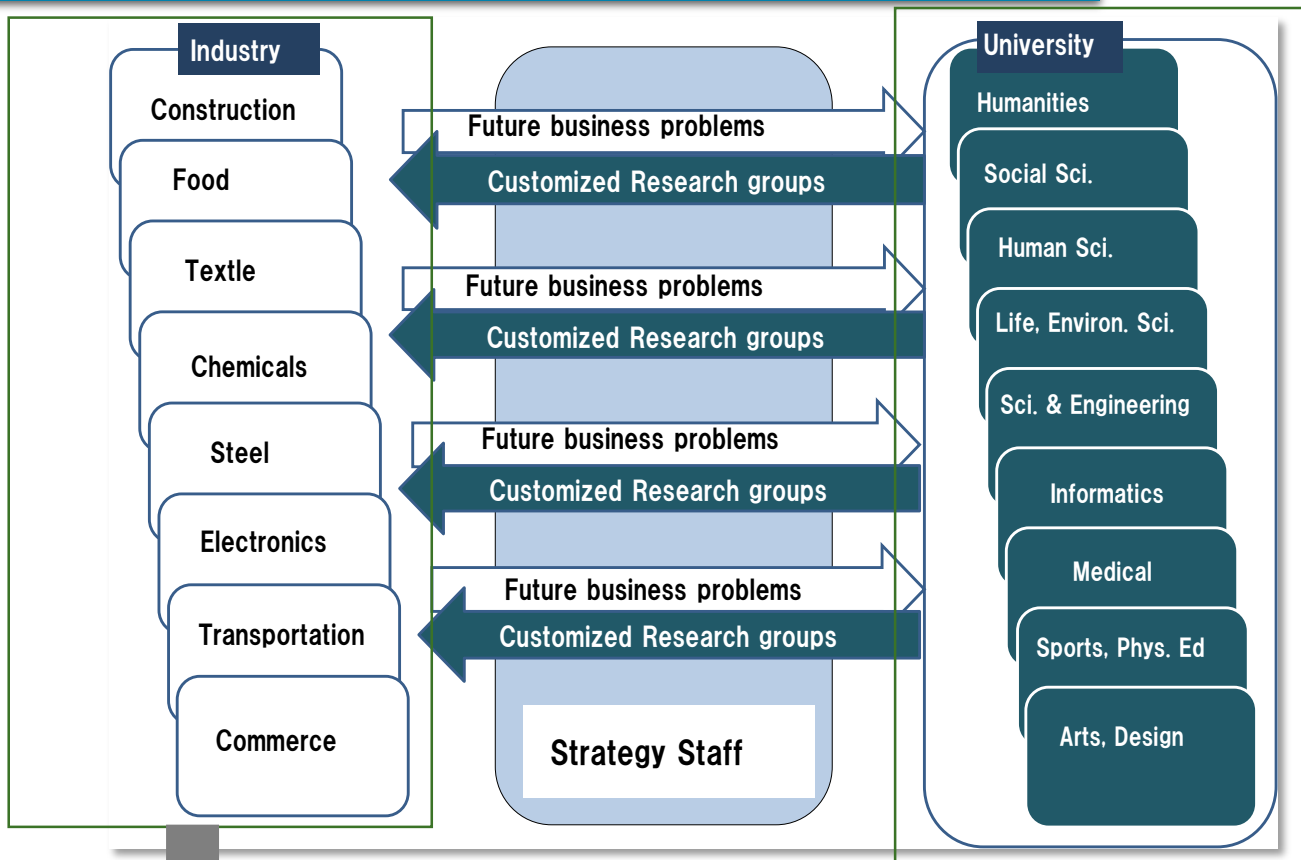
Started in November, 2015

Conventional collaboration

Tries to transfer technologies & IPs
developed at universitiesAcademia to Business to Market (A2B2M)A new strategy for expanding
industry collaborationExploits University's research potential to
realize future business plan of the IndustryMarket to Business to Academia (M2B2A)

Research Potential such as: facility, science network, academic knowledge, educational environment, clinical environment, technical seeds & IPs etc.

Management of M2B2A System in the University of Tsukuba

■ **Candidate Corporations**

Nikkei 225, World TOP20 pharma,
regional corporations

■ **Internal activities**

Analyze research potential
⇒ industry vs research DB & mapping



IV

Expand international collaborations

Aug, 2014

Plans for large-scale collaborative research Focusing to global top 20 pharma

(Global pharma Ranking in 2013)

Domestic pharmas with ongoing collaborative research



(16)



(18)



Daiichi-Sankyo

(20)

Started in 2015



(5)



Bristol-Myers Squibb

(15)



Bayer

(16)

Negotiating to start in 2016



(1)



(9)



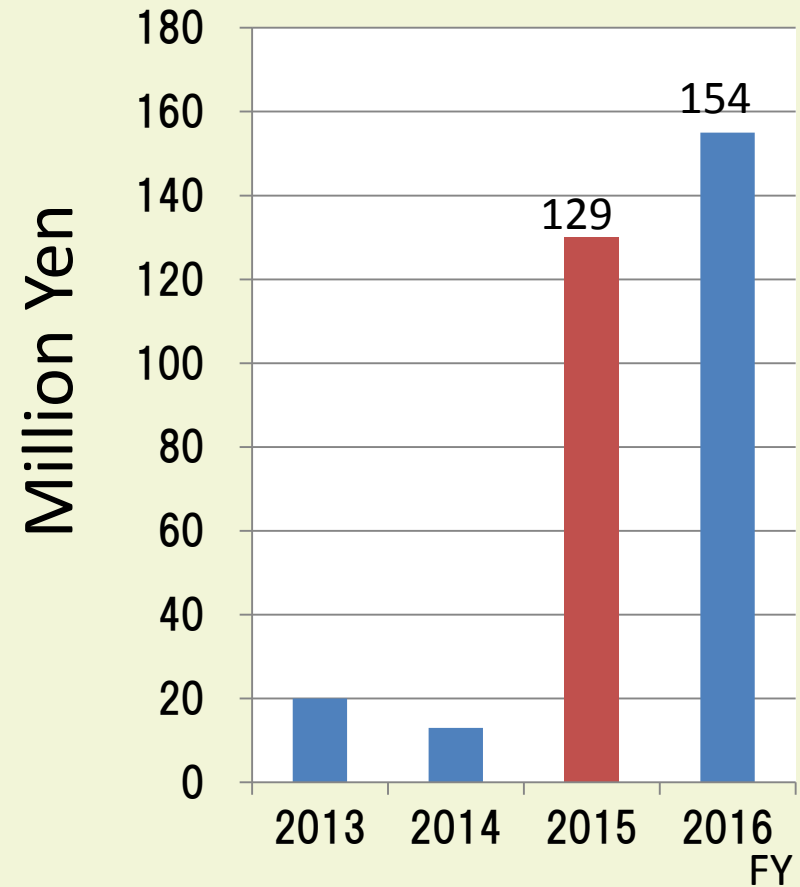
SAINT-GOBAIN

Collaborative Research Funding from Foreign Companies

Ranking of Collaborative Research Funding from Foreign Companies (FY2016, million yen)

University	Fee
1 Tohoku Univ.	245
2 Univ. of Tsukuba	130
3 Nagoya Univ.	123
4 Univ. of Tokyo	122
5 Tokyo Inst. of Tech.	95
6 Kyoto Univ.	80
7 Jap. Adv. Inst. of Sci. & Tech. (北陸先端科学技術大学院大学)	43
8 Osaka Univ.	37
9 Waseda Univ.	35
10 Tokyo Univ. of Marine Sci. & Tech. (東京海洋大学)	27

U. Tsukuba's Collaborative Research Funding from Foreign Companies





Professor, Kanaho

To develop revolutionary medical therapy that insures healthy quality of life toward the age of super-aging Japanese society

Research Focus: **Proactive P4 Medicine**

Predictive, **P**reventive,
Personalized, **P**articipatory

Total floor capacity 6000 m²



Innovation Medical Research Institute

MEXT 's Project for Innovation by Industry-Academia Collaboration (2012)
「地域資源等を活用した産学連携による国際科学イノベーション拠点整備事業」



Industry–University collaboration under one–roof**5th Floor****R&D of Efficient Medical Drugs**
(Pharma & Startup companies)**4th Floor****Health promotion by Food and Exercise**

(Fuji Film, Tanita, Renaissance, NIPPN, Kyowa-Hakko-Bio)

MEXT Center of Innovation Program
*COI Stream “Food & Exercise Expert” Satellite**2nd, 3rd Floor****Revolutionary clinical diagnostic technologies***Prof. Sato: Shimadzu Co. Fellow &
Director of Shimadzu Life Science Laboratory**1st Floor****Entrance Hall**
Industry–University
Collaboration
Department

3-1 OUR MISSIONS

social and economic innovations

facilitating technology transfer which leads to social and economic innovations
to make a social contribution through research findings of the University of Tsukuba;

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OUR ROLE

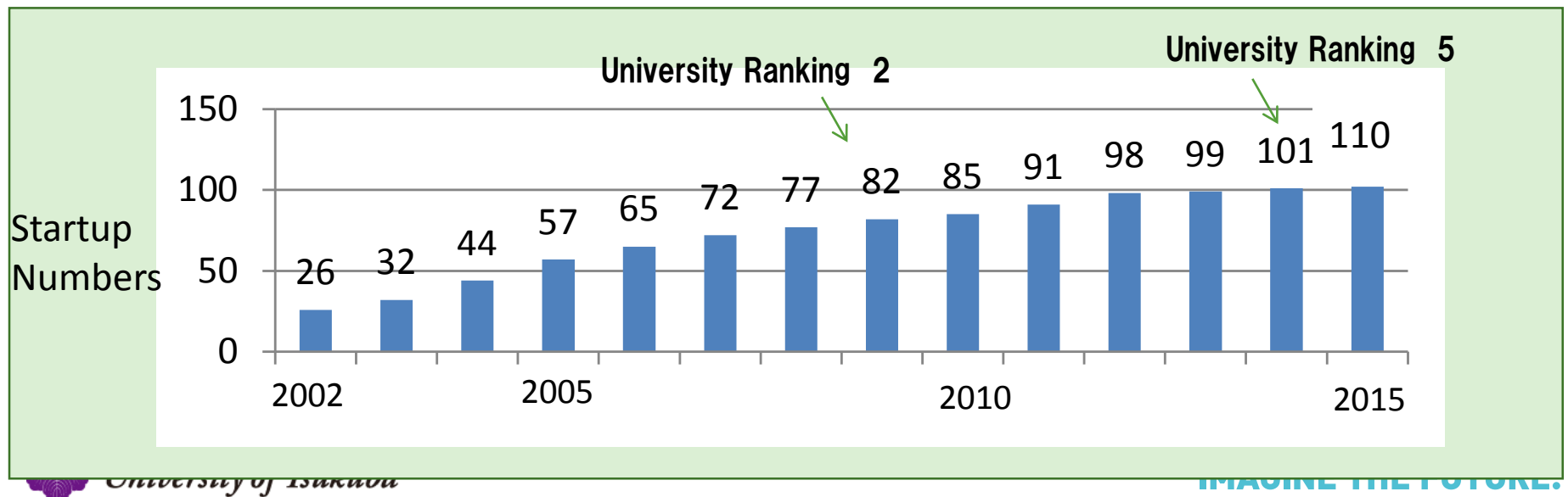
University Startups support

Industry–University Collaboration PJ

- Rents rooms for startup companies
- Awards incubation funds to startups



ILC (Industrial Liaison and Cooperative Research Center)



University of Tsukuba Spin-offs Making a Global Impact



Prof. Sankai

A university venture company

Cyberdyne

Established in 2004
by Prof. Yoshiyuki Sankai
at ILC center.



- **HAL is the World's first cyborg-type robot**
- HAL detects electrical signals from the nerves & physical movements of muscles
- A leading Spin-off in Japan (IPO company)
- **Market capitalization = 350 billion yen**
Listed in 2014/3/26



Towards a society with elderly and physically-challenged people having daily life as safely and as independently as possible.



University of Tsukuba Spin-offs from ILC

Laughwell CO., LTD



Keiko Hayashi, Ph.D (Medical, 1999)



Visiting Nursing Care;
Prevention of life-style-
related disease with laugh



Founded 2006

R-body Project CO., LTD



Takeshi Suzuki, Ph.D (Sports Medicine, 2008)



<http://www.r-body.com/trainers/index.html>

Training, Exercise,
Education with 50 trainers

Founded 2003

SoftEther CO., LTD



Daiyu Npbori (PhD Student)



The world's 2nd company in
“Virtual Private Network “



Founded 2004

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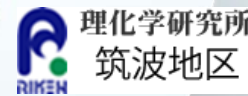
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OUR ROLE

TSUKUBA SCIENCE CITY

In Tsukuba, there are 32 public research centers and R&D centers.

Over 15,000 researchers work in Tsukuba
including 8,000 Ph.D.'s



TSUKUBA SCIENCE CITY

AIST & Tsukuba Matching funds

「Awasewaza funds」 in 2014

67 applicaions in 2014. Funds awarded to 9 projects



AIST & Tsukuba Univ. each contributes 10 M¥ to the fund to support collaborative research projects

An example

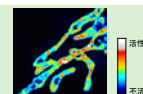
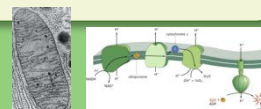
【U. of Tsukuba】

【AIST】

Kinetics analysis of factors that stimulate mitochondria for energy metabolism

Observation technique using a Super-Resolution Fluorescent Microscope (equivalent to 2014 Nobel prize)

Observe live cells and proteins with nano resolution



from Physical Biology of the Cell, 2nd ed.

Video observation of mitochondria-stimulating factor MAF

- therapy for mitochondria disease
- anti-aging preventive medicine

*Awasewaza: Combining Difference Technology. Etymology Judo

Expanded to all Tsukuba area

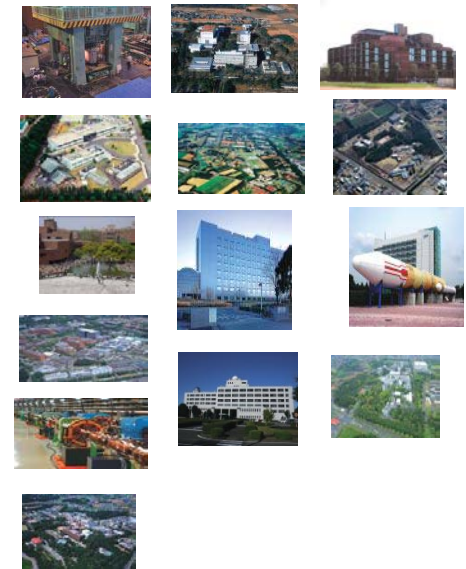
“Tsukuba Collaboration-Boost PJ” in 2015

21 projects are ongoing, which were selected out of 102 applications

AIST: National Institute of Advanced Industrial Science and Technology
 National Institute for Materials Science
 RIKEN: Institute of Physical and Chemical Research
 NABIO: National Institute of Biomedical Innovation,

Tsukuba Collaboration-Boost PJ

AIST: 17 projects
 NIMS: 2 projects
 RIKEN: 1 project
 NIBIO: 1 project



Target: Industry Collabo.

Industry

Transport Electronics Materials Chemical Medical Service



The University of Tsukuba & Industry-University Collaboration Activities

University of Tsukuba

**International Industry-University
Collaborative Headquarters**