



JSPS

WISE Program

Doctoral Program for
World-leading Innovative &
Smart Education

Message



Chair, WISE Program Committee
ARINOBU Mutsuhiro

As we look at today's world and see sweeping changes in the political and economic underpinnings of society, I believe that rapidly accelerating advances in science and technology are what will pioneer a completely new world. On the other hand, there's an urgent need to respond to the increasingly tangible impacts that the expansion of human activities is exerting on the environment. Against this backdrop, it will be imperative for Japan to create new key industries rooted in transformative concepts and technologies (that is, to realize "Society 5.0") if it is to progress sustainably while retaining its aspirations for the future. It will be a new generation of professionals who acquire high levels of knowledge and expertise that will be the incubators of the new societies. These "knowledge professionals" will be cultivated in graduate schools positioned at the apex of higher education. These graduate schools are expected to produce the knowledge professionals who will be capable of generating new genres of knowledge and knowhow and merging new knowledge assets with new societal values.

Currently, however, there are concerns that talented students in Japan are shying away from matriculating doctoral courses for a variety of reasons, which include not having the financial means or not feeling post-graduate education to be an attractive option. In response, it must be said that the graduate school education in Japan faces challenges in terms of both quality and quantity.

Given this situation, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) launched the "Doctoral Program for World-leading Innovative and Smart Education" (WISE Program) in FY 2018. The WISE Program has as its aim the fostering of excellent doctoral students, who will be the high-level "knowledge professionals" who can take a lead in generating and applying new knowledge, and spark the innovation and create the values that will define the next generation. In working to reform Japan's leading graduate schools, the WISE Program expects each university to take the lead in creating doctoral programs that amplify their unique institutional characteristics and strengths and in making program proposals that give expression to their own free ideas.

During the period up to FY 2020, 140 applications had been received from Japanese national, public and private universities, among which a total of 30 programs were selected. Each selected university is now creating and implementing doctoral degree programs, reforming graduate education, and/or taking other measures to initiate system reforms.

Administrators and faculty of selected universities are now asked to take the initiative under the president's lead in creating a system to implement the WISE program, through which an all-out effort is made to reform the university's entire graduate program. The WISE Program Committee carries out follow-up reviews of the universities' WISE programs and from FY 2021 has been conducting mid-term evaluations of them via which it provides support for each program.

The onset of Covid 19 has spawned a period of transition within Japanese universities. Now, we expect each program to foster the high-level knowledge professionals who will overcome and transcend problems imposed by the pandemic while personifying in their careers the WISE creed. We also strongly anticipate and look forward to the results attained through the WISE program being used to advance university reform throughout Japan.

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At its core, what propels the WISE Program is each university leveraging its unique strengths and capabilities. Building upon their heretofore accomplishments in campus reform, these universities carry out systematic collaborations with other universities, research institutions and corporations in and outside Japan. By establishing integrated master's-doctoral programs, which over a 5-year period endow their students with a melding of top world-class educational and research prowess, these universities cultivate the kind of outstanding PhD professional who can pilot forward various sectors of society. Concurrently, the program propels the establishment of excellent academic hubs capable of sustainably advancing human resource development and exchange and of generating new joint research initiatives.

The WISE Program's Purpose and Backdrop

Purpose

Spearheading the generation and use of new knowledge, the WISE Program works to create the values that will bolster the next generation. Concomitantly, the program fosters the kind of high-level knowledge professionals who can enrich society with new genres of innovation while taking on the challenge of solving difficult societal issues.

Backdrop

On one hand, Japan has increased the number of master's and PhD graduates via a quantitative expansion of its university graduate schools and has moved forward in improving the research environment of its universities and in increasing the number of research fields in which the country is globally competitive. On the other hand, Japan's international presence is wavering amidst the country's declining economic growth. Recent years have seen a situation that can be called "PhD flight," in which excellent young Japanese students are not going on to take doctoral courses. This foretells a future decline in the nation's intellectual creative capacity, which will weaken Japan's international competitiveness including its scientific and technological innovative prowess.

To sustain and grow the affluence currently enjoyed in Japan, the government is expected to take the lead in creating the new key industries of the future while staying abreast of the quickly advancing global industrial structure propelled by rapid changes in the world economies and societies. To that end, university graduate schools in Japan are expected to be a wellspring of the new knowledge and technologies need to create new key industries while being an incubator of talented people attuned with the social values attending these innovations.

Transition

In and after 2015, the government's Council on Investments for the Future and its Central Council for Education proposed the establishment of a top-notch graduate program that could provide cutting-edge education via universities collaborating with corporations, overseas institutions, and other entities in fields in which Japan excels, after which the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Japan Society for the Promotion of Science (JSPS) began to consider a concrete system design for that graduate program.

Then, in FY 2018, the "Doctoral Program for World-leading Innovative and Smart Education" (WISE Program) was launched. It is positioned as a component within the government's innovation strategy.

Program Outline

Through the WISE Program, national, public and private universities with established graduate schools take the lead in generating and utilizing new knowledge while creating values that will drive forward the next generation. To foster high-level knowledge professionals, the program establishes a clearly defined profile of the kind of persons to be fostered and works to build and develop a degree program for them—one that maintains a consistent level of high quality across its master's and doctoral curricula.

In endeavoring to reform Japan's leading graduate schools, the WISE Program expects each university to create programs that amplify their own unique institutional character and strengths and to make program proposals that give expression to their own free ideas.

— Targets of support: National, public and private universities with established doctoral programs

— Period of program support: 7 years (At the 4-year mark, an overall program assessment is conducted in addition to an evaluation of each individual doctoral program. On and after the eighth year, a program extension is

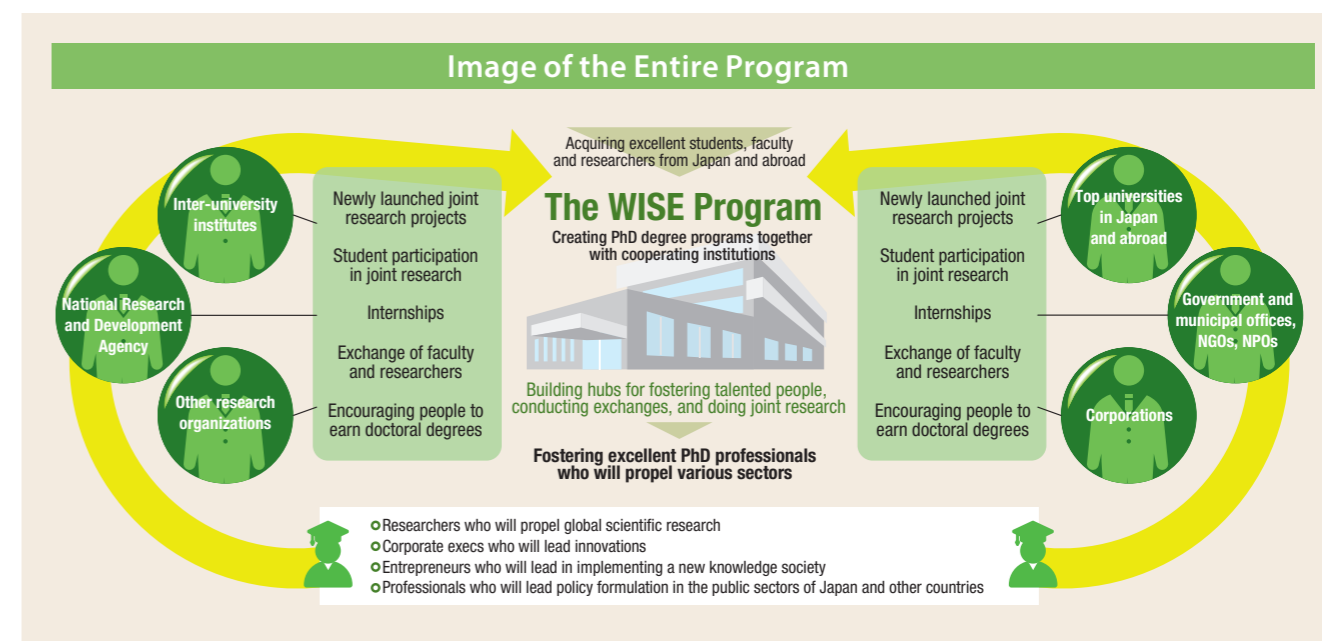
considered based on these evaluation results.)

— Amount of support: Up to ¥423 million

— Domains for proposal calls: For the purpose of fostering excellent PhD professionals, the following four recruitment domains are established.

- (1) Research fields in which Japan has an international position of predominance or particular excellence
- (2) Domains that fuse the sciences and humanities, that are interdisciplinary, or that are new and can create diverse values and systems within society
- (3) Domains that are at the core of the industrial structure and that create new industries which contribute to economic development
- (4) Domains in which Japan is expected to make contributions from a perspective of preserving academic diversity in the world

— Follow-up: Program officers (POs) are staffed within the WISE Program. They regularly examine and ascertain the state of progress of the selected programs and provide them with consultation and advice.



Q&A

Q How can I enter the WISE Program?

A To enter the program, you will need to take a selection exam and carry out the entrance procedures. For details, please inquire directly to your preferred WISE program in the university. Website links and contact information are contained in the "List of Programs." For information on coming to Japan to study, please use the following links:
Study in Japan Comprehensive Guide: <http://www.studyinJapan.go.jp/en/index.html>
JASSO: <https://www.jasso.go.jp/en/index.html>

Q If I belong to a university that has become a WISE cooperating institution, may I join the program?

A You cannot join the program just because you belong to a WISE cooperating institution. For details, please inquire directly to your preferred WISE program in the university.

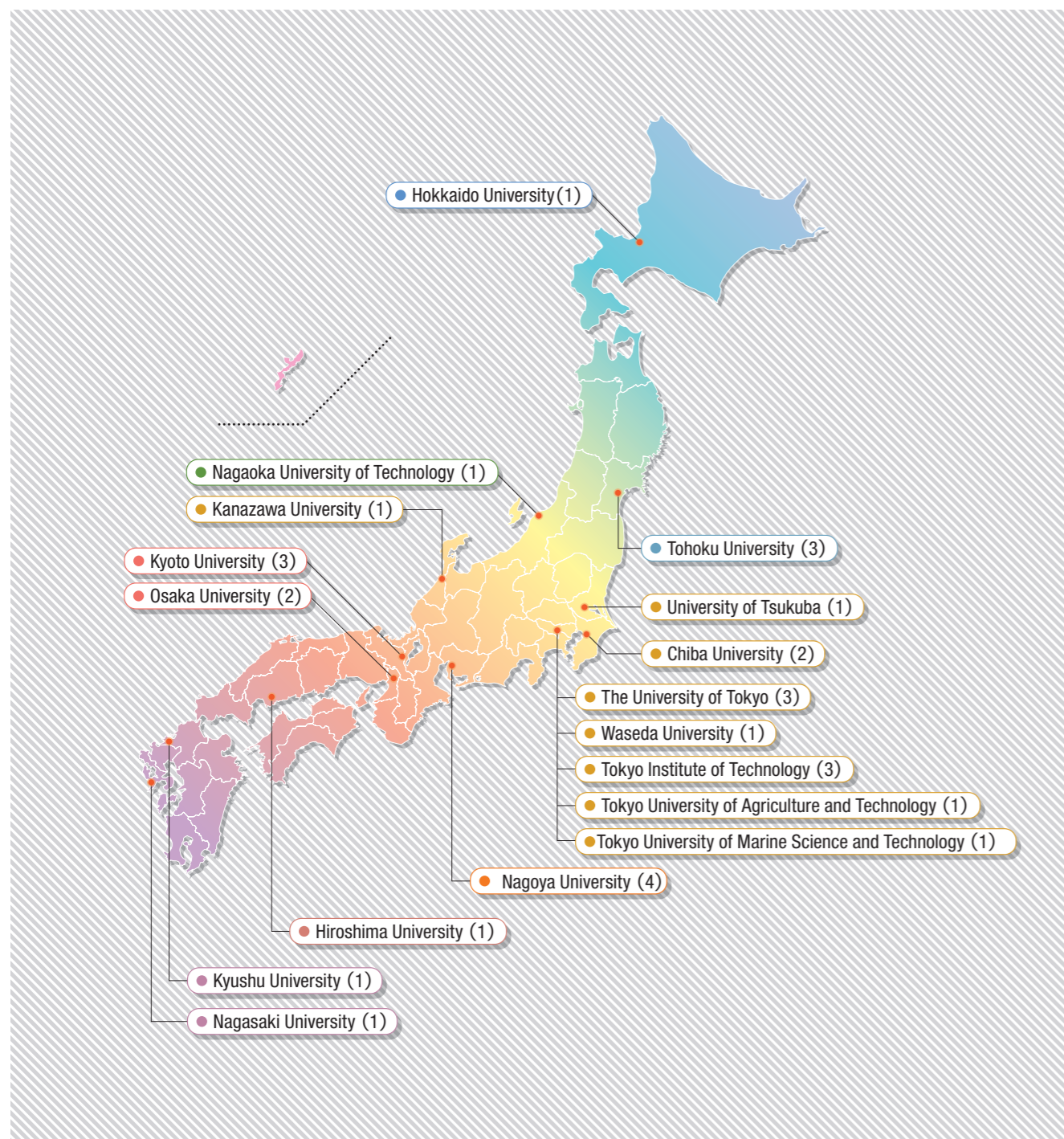
Q What is studying like WISE doctoral programs?

A To enter a WISE program, you will need to have earned a bachelor's degree. In the program, you will study for a period of five years via an integrated master's and doctoral course curricula. As to course completion, a qualification exam is carried out based on the program's own standards.

Q Can I receive a different degree from a WISE-affiliated graduate school? Is there a joint degree program?

A The WISE Program does not issue PhD degrees. They are issued by your affiliated research department. However, some universities have joint degree programs. For details, please inquire directly to your preferred WISE program in the university.

List of Programs



Applications and Selections

Fiscal year	Number of applications		Number of selections	
	Number of universities	Number of programs	Number of universities	Number of programs
FY 2018	38	54	13	15
FY 2019	29	44	9	11
FY 2020	27	42	4	4

List of Programs Selected in FY2018

No.	Names of programs	Names of universities	Names of Program Coordinator	WISE cooperating institutions	Page
1801	WISE Program for One Health Frontier Graduate School of Excellence	Hokkaido University	HORIUCHI Motohiro	Obihiro University of Agriculture and Veterinary Medicine Graduate School (National Research Center for Protozoan Diseases) / Rakuno Gakuen University Graduate School / Shionogi & CO., LTD. / Fuso Pharmaceutical Industries, LTD. / World Health Organization (WHO) / The World Organisation for Animal Health (WOAH) / Japan International Cooperation Agency (JICA)	14
1802	Advanced Graduate Program for Future Medicine and Health Care	Tohoku University	NAKAYAMA Keiko	Miyagi Prefectural Government / South Miyagi Medical Center / Katta General Hospital / National Institutes of Health (USA) / National University of Singapore / University of Sydney / Tropical medicine, Philippines / Peking University / Norwegian University of Science and Technology / ONO PHARMACEUTICAL CO., LTD / GC Corporation / J. MORITA CORP. / Tokuyama Dental Corporation / Canon Medical Systems Corporation / Philips Japan, Ltd. / SHIMADZU Corporation / OMRON HEALTHCARE Co., Ltd. / NTT DOCOMO, INC. / Yakult Honsha Co., Ltd. / Kagome Co., Ltd. / TOPCON CORPORATION / Kajima Corporation Technical Research Institute / FRACTA, INC. / Allm Inc. / Olympus Corporation / ClayTech, Inc. / Sumitomo Pharma Co., Ltd.	16
1803	WISE Program for AI Electronics	Tohoku University	KANEKO Toshiro	NEC Corporation / TOSHIBA CORPORATION / CANON MEDICAL SYSTEMS CORPORATION / Hitachi Solutions East Japan, Ltd. / Keihin Corporation / E&M Corporation / AISIN SOFTWARE Co., Ltd. / KDDI Research, Inc. / Mitsubishi Electric Corporation / SHOWA DENKO K.K. / ALPS ALPINE CO., LTD / TDK Corporation / KPIT Technologies Ltd. / National Institute of Information and Communications Technology	18
1804	Ph.D. Program in Humanics	University of Tsukuba	YANAGISAWA Masashi	University of California, Irvine / University of Bordeaux / National Taiwan University / The University of Edinburgh / National Institute for Materials Science / National Institute of Advanced Industrial Science and Technology / TOYOTA MOTOR CORPORATION / Hitachi, Ltd. / Shimadzu Corporation / CYBERDYNE, Inc. / Astellas Pharma Inc.	20
1805	World-leading Innovative Graduate Study Program for Life Science and Technology	The University of Tokyo	KIKKAWA Masahide	Astellas Pharma Inc. / Olympus Corporation / CANON MEDICAL SYSTEMS CORPORATION / SHIONOGI & CO., LTD. / Sysmex Corporation / Johnson & Johnson Group / DAIICHI SANKYO COMPANY, LIMITED / Takeda Pharmaceutical Company Limited / Utokyo Innovation Platform Co., Ltd.	22
1806	Excellent Leader Development for Super Smart Society by New Industry Creation and Diversity	Tokyo University of Agriculture and Technology	OHTSU Naoko	KUBOTA Corporation / AEON AGRI CREATE Co., Ltd. / SHIMADZU Corporation / Japan Automobile Research Institute / Japan Agricultural Corporations Association / Greater Tokyo Initiative / Leave a Nest Co., Ltd. / Recruit Co., Ltd. / Tokyo Electron Ltd. / AgVenture Lab / Jissen Women's University / Cornell University / University of California, Davis / University of Oxford / The Leibniz Centre for Agricultural Landscape Research (ZALF) / University of Bonn / Vietnam National University of Forestry / Gadjah Mada University / The University of North Carolina at Chapel Hill	24
1807	Creating sustainable societies through [Material×Information] multi-talented human resource development	Tokyo Institute of Technology	YAMAGUCHI Takeo	NIMS / AIST / Leiden University / McGill University / Max Planck Institute / Imperial College London / Cornell University / Sorbonne University / Tsinghua University / Beijing Normal University / Chulalongkorn University / Indian Institute of Technology Madras / AGC Inc. / ASAHI KASEI CORPORATION / ENEOS Corporation / FUJIFILM Corporation / Hamamatsu Photonics K.K. / Idemitsu Kosan Co., Ltd. / JEOL Ltd. / JFE Steel Corporation / JX Nippon Mining & Metals Corporation / KANEKA CORPORATION / Kao Corporation / KYOCERA Corporation / LG Japan Lab Inc. / Mitsubishi Chemical Corporation / MITSUBISHI GAS CHEMICAL COMPANY, INC. / MITSUBI MINING&SMELTING CO., LTD. / NAGASE & CO., LTD. / NGK INSULATORS, LTD. / NGK SPARK PLUG CO., LTD. / Nissan Motor Co., Ltd. / Panasonic Corporation / SEIKO EPSON CORPORATION / SHOWA DENKO K.K. / Showa Denko Materials Co., Ltd. / Sumitomo Electric Industries, Ltd. / SUMITOMO CHEMICAL Co., Ltd. / TAIYO YUDEN CO., LTD. / TDK Corporation / TODA KOGYO CORP. / Toshiba Corporation / TOSOH CORPORATION / Toyo Seikan Group Holdings, Ltd. / TOYOTA MOTOR CORPORATION/ ZEON CORPORATION	26
1808	Global Pro-Active Root Technology Program	Nagaoka University of Technology	UMEDA Minoru	Aalto University / Mondragon University / University of York / Bristol University / University of Sheffield / University of Leeds/University of Deusto / Indian Institute of Technology Madras / University of Antwerp/University of Bordeaux / TH Köln-Technology, Arts, Sciences / Friedrich-Alexander Universität Erlangen-Nürnberg, FAU / Universität Bielefeld / Swiss Federal Laboratories for Materials Science and Technology / Sankyo Tateyama, Inc / Sumitomo Electric Industries, Ltd / Nagaoka Power Electronics Co., Ltd / Unipulse Corporation / Fuji Electric Co., Ltd / SANKI ENGINEERING CO., LTD / Japan Business Create Co.,Ltd / IBSYSTEM Co., Ltd / Japan Fine Ceramics Association / Niigata Industrial Creation Organization / The Institute of Applied Energy / National Institute of Advanced Industrial Science and Technology / Niigata City / Nagaoka City / Sado City / Shibata City	28

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1809	Graduate Program of Transformative Chem-Bio Research	Nagoya University	YAMAGUCHI Shigehiro	Institute for Molecular Science, National Institutes of Natural Science / National Institute for Basic Biology, National Institutes of Natural Science / the Graduate University for Advanced Studies / Institute of Physical and Chemical Research / Kaneka Co. / Konica Minolta, Inc. / ITbM-GTR consortium	30
1810	DII (Deployer-Innovator-Investigator) Collaborative Graduate Program for Accelerating Innovation in Future Electronics	Nagoya University	AMANO Hiroshi	Innovation for High Performance Micro-electronics / Interuniversity Microelectronics Center / Office ATOQS / Japan Aerospace Exploration Agency / National Institute for Materials Science / National Institute of Advanced Industrial Science and Technology / KAPION Inc. / SCIOCS COMPANY LIMITED/DENSO CORPORATION / TOSHIBA CORPORATION / TOYOTA CENTRAL R&D LABS., INC. / Hitachi, Ltd. Central Research Laboratory / FUJITSU LABORATORIES LTD. / Miraiproject Corporation / Sumitomo Electric Industries, Ltd. / National University of Singapore / TAIYO NIPPON SANSO CORPORATION / Tokyo Electron Ltd. / TOYODA GOSEI CO., LTD. / Nissan Motor Co., Ltd. / Furukawa Electric Co., Ltd. / Mitsubishi Electric Corporation / Nanjing University / Japan Venture Capital Association / NC State University / Forschungszentrum Jülich / MIRISE Technologies Corporation	32
1811	Innovation of Advanced Photonic and Electronic Devices	Kyoto University	KIMOTO Tsunenobu	University of Cambridge / Humboldt University of Berlin / ETH Zurich / Dresden University of Technology / Nanjing University / Sungkyunkwan University / National Institute for Materials Science / National Institutes for Quantum and Radiological Science and Technology / Central Research Institute of Electric Power Industry / National Institute of Advanced Industrial Science and Technology / Nidec Corporation / Mitsubishi Electric Corporation / Shimadzu Corporation / Sumitomo Electric Industries, Ltd.	34
1812	Transdisciplinary Program for Biomedical Entrepreneurship and Innovation	Osaka University	MORII Eiichi	Pfizer Inc. / Novartis Pharma K.K. / Johnson & Johnson Innovation / IQVIA Solutions Japan K.K. / Eli Lilly Japan K.K. / Chugai Pharmaceutical Co., Ltd. / Otsuka Pharmaceutical Co., Ltd. / Shionogi & Co., Ltd. / Daiichi Sankyo Company, Limited / Mitsubishi Tanabe Pharma Corporation / SYSMEX CORPORATION / Takara Bio Inc. / Quantum Operation, Inc. / Cytiva / EY Strategy and Consulting Co., Ltd. / Osaka Prefectural Government, Department of Commerce, Industry and Labor / Pharmaceuticals and Medical Devices Agency / National Institute of Health Sciences / National Institutes of Biomedical Innovation, Health and Nutrition	36
1813	The Frontier Development Program for Genome Editing	Hiroshima University	YAMAMOTO Takashi	Center for iPS Cell Research and Application, Kyoto University/ Graduate School of Technology, Industrial and Social Sciences, Tokushima University / Department of Molecular and Cellular Biology, Harvard University / Technical Research Center, Mazda Motor Corporation	38
1814	Global Health Elite Programme for Building a Healthier World	Nagasaki University	ARIYOSHI Koya	London School of Hygiene and Tropical Medicine / Hokkaido University Research Center for Zoonosis Control / National Research Center for Protozoan Diseases, Obihiro University of Agriculture and Veterinary Medicine / School of International Health, Graduate School of Medicine, The University of Tokyo / National Center for Global Health and Medicine / JICA / National Institute of Infectious Diseases / Sysmex Corporation / Shionogi & Co., Ltd.	40
1815	Graduate Program for Power Energy Professionals	Waseda University	HAYASHI Yasuhiro	Hokkaido University / Tohoku University / University of Fukui / University of Yamanashi / Tokyo Metropolitan University / Yokohama National University / Nagoya University / Osaka University / Hiroshima University / Tokushima University / Kyushu University / University of the Ryukyus / The University of Tennessee, Knoxville / University of Chicago / University of Washington / Tsinghua University / Chulalongkorn University / Technical University of Munich / ENEOS Corporation / Tokyo Gas Co., Ltd. / Central Research Institute of Electric Power Industry / National Institute of Advanced Industrial Science and Technology / Power Academy	42

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1901	WISE program for Sustainability in the Dynamic Earth	Tohoku University	NAKAMURA Michihiko	Stanford University / Harvard University / University of Washington / University College of London / University of Indonesia / Sorbonne University / University of Hawaii at Manoa / JICA / Tokio Marine & Nichido Fire Insurance Co., Ltd / Nippon Koei Co., Ltd / Penta-Ocean Construction Co., Ltd / NTT DATA, Inc / Mitsubishi Electric Software Corporation / Japan Organization for Metals and Energy Security / Sumitomo Metal Mining Co., Ltd. / National Institute of Advanced Industrial Science and Technology / National Research Institute for Earth Science and Disaster Resilience	44
1902	Applied Humanities Program for Cultivating Global Leaders	Chiba University	YONEMURA Chiyo	Okayama University / Nagasaki University / Kumamoto University / The Graduate University for Advanced Studies / Zhejiang Gongshang University / Institute for Oriental and Classical Studies, National Research University "Higher School of Economics"(russian) / National Museum of Japanese History / Aeon Environmental Foundation / AEON CO.,LTD / JTB Tourism Research & Consulting Co. / Chiba Bank / Keiyo Bank	46
1903	Innovative Medicine CHIBA Doctoral WISE Program	Chiba University	SAITO Tetsuichiro	University of California San Diego / University of Southern California / Charité – Universitätsmedizin / University of Toronto / Institute of Physical and Chemical Research / National Institute of Advanced Industrial Science and Technology / National Institute for Quantum Science and Technology / Takeda Pharmaceutical Company Limited / Microsoft Japan Co., Ltd / Sysmex Corporation / Eli Lilly Japan K.K. / Olympus Corporation / DNA Chip Research Inc. / H.U. Group Research Institute G.K. / GeneFrontier	48
1904	Forefront Physics and Mathematics Program to Drive Transformation	The University of Tokyo	MURAYAMA Hitoshi	Nippon Steel Corp./ NTT Corp./ Macromill, Inc. / École Polytechnique / California Institute of Technology / UC Berkeley / Korea Institute for Advanced Study / National Taiwan University / ETH Zurich / Tsinghua University / Seoul National University / Harvard University / Princeton University / Peking University / ENS de Lyon / HSE University / CERN / Mathematical Sciences Research Institute / IHES / Paul Scherrer Institute	50
1905	World-leading Innovative Graduate Study: Advanced Business Law Program	The University of Tokyo	TAMURA Yoshiyuki	Harvard Law School / Peking University / Seoul National University / National Taiwan University / University of Strasbourg / Hitachi, Ltd. / FUJIFILM Corp. / SoftBank Corp. / Yahoo Japan Corp. / Nippon Life Insurance Co. / Intellectual Property Department, Takeda Pharmaceutical Co., Ltd. / Google Japan G.K. / Westlaw Japan K.K. / The Asahi Shimbun Company / East Japan Railway Company / Institute for Monetary and Economic Studies, Bank of Japan	52
1906	Engineering Education Program for Super Smart Society based on Advanced Quantum Science	Tokyo Institute of Technology	SAKAGUCHI Kei	National Agriculture and Food Research Organization / National Institutes for Quantum and Radiological Science and Technology / RIKEN Center for Advanced Intelligence Project / Japan Agency for Marine-Earth Science and Technology / NICT Wireless Networks Research Center / AIST Information Technology and Human Factors / JTEKT Corporation / NEC Corporation / NSK Ltd. / Yaskawa Electric Corporation / Azbil Corporation / Yokogawa Electric Corporation / Kodan Electronics Co., Ltd. / KDDI Corporation / SoftBank Corp. / Huawei Japan / SHO-BOND Corporation / Anritsu/DENSO Corporation / LG Japan Lab Inc. / Kawasaki Heavy Industries, Ltd. / Kubota / Komatsu Ltd. / Panasonic Corporation / Mitsubishi Electric / Central Japan Railway Company / Rakuten Mobile / Kawasaki City / Ota City / Ministry of Agriculture, Forestry and Fisheries / Ocean Policy Research Institute / Google LLC / CEA Leti / National Taiwan University of Science and Technology / University of Twente / University of Rome Tor Vergata / The Ohio State University / Thammasat University Thailand / Univ. Glasgow / Technical University of Munich / Fraunhofer Heinrich-Hertz-Institute / University of Sydney / Institute for Infocomm Research / Cornell University / Yonsei University / RWTH Aachen University / Airgain / Japanese Chamber of Commerce & Industry of NY / the Henry Samueli School of Engineering, University of California, Irvine / Georgia Institute of Technology / University of Melbourne	54

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No.	Names of programs	Names of universities	Names of Program Coordinator	WISE cooperating institutions	Page
1907	Development of WISE (World-leading Innovative & Smart Education) Program to foster AI (Artificial Intelligence) Professionals for Marine Industries	Tokyo University of Marine Science and Technology	SHOJI Ruri	Japan Agency for Marine-Earth Science and Technology / Japan Fisheries Research and Education Agency / National Institute of Maritime, Port and Aviation Technology / Technical University of Denmark / BEMAC Corporation / IDEA Consultants, Inc. / Innoqua Inc. / Maruha Nichiro Corporation / Nippon Suisan Kaisha, Ltd. / Ocean Policy Research Institute of Sasakawa Peace Foundation / Japan Weather Association / NPO Marine Technologist	56
1908	WISE Program for Nano-Precision Medicine, Science and Technology	Kanazawa University	HANAYAMA Rikinari	Imperial College London / University of British Columbia / Nikon Solutions Co., Ltd. / Pfizer R&D Japan G.K. / Ricoh Co., Ltd. / FUJIFILM Wako Pure Chemical Corporation / Olympus Corporation / Daicel Corporation / Hamamatsu Photonics K.K. / Shibuya Corporation / Carepro, Inc. / Kopernik Japan / Nissan Chemical Corporation	58
1909	Convolution of Informatics and Biomedical Sciences On Global Alliances	Nagoya University	KATSUNO Masahisa	Gifu University / National Institute for Physiological Sciences / Aichi Cancer Center/National Center for Geriatrics and Gerontology / Aichi Developmental Disability Center Institute for Developmental Research / Institute of Statistical Mathematics / University of Adelaide / Lund University / Albert-Ludwigs-Universität Freiburg / University of Nottingham / The Chinese University of Hong Kong / University of Bologna / LMU Munchen / Korea University / Erasmus Medical Centre Rotterdam / Monash University / Shimadzu Corporation / Novartis Pharma / NVIDIA Corporation / Eisai Co., Ltd. / Olympus Corporation / RaQualia Pharma / Sumitomo Pharma Co., Ltd. / Mitsubishi Tanabe Pharma Corporation / Takeda Pharmaceutical Co., Ltd. / CBmed / Hitachi Co., Ltd. / Astellas Pharma Inc	60
1910	Graduate Program for Medical Innovation	Kyoto University	WATANABE Dai	University of California, San Diego / University of Toronto / National Taiwan University / The FIRC Institute of Molecular Oncology / National Institutes of Health / Max-Planck Institute / NeuroSpin / RIKEN / Institute of Biomedical Research and Innovation, Foundation for Biomedical Research and Innovation at Kobe / Tazuke Kofukai Medical Research Institute Kitano Hospital / Bioorganic Research Institute, Suntory Foundation for Life Sciences / NTT DATA Corporation / Deloitte Tohmatsu Consulting LLC. / mixi, Inc. / KBBM, Inc. / MICIN, Inc./Eisai Co., Ltd. / Daiichi Sankyo Co., Ltd. / Chugai Pharmaceutical Co., Ltd. / Asahi Kasei Pharma Corporation / Taisho Pharmaceutical Co., Ltd. / Sumitomo Dainippon Pharma Co., Ltd. / ONO PHARMACEUTICAL CO., LTD. / Mitsubishi Tanabe Pharma Corporation / KYORIN Pharmaceutical Co., Ltd. / Chordia Therapeutics, Inc.	62
1911	Multidisciplinary PhD Program for Pioneering Quantum Beam Application	Osaka University	NAKANO Takashi	High Energy Accelerator Research Organization Institute of Materials Structure Science / High Energy Accelerator Research Organization Institute of Particles and Nuclear Studies / National Institutes for Quantum and Radiological Science and Technology / Cyclotron and Radioisotope Center, Tohoku University / Research Center for Electron Photon Science, Tohoku University / J-PARC Center / Kyoto Institute of Technology / Graduate School of Informatics, Kyoto University / Isotope Science Center, The University of Tokyo / Kavli Institute for the Physics and Mathematics of the Universe, The University of Tokyo / RIKEN / TRIUMF / The University of Queensland / Heidelberg University Hospital / Heinrich Heine University Dusseldorf / National Institute of Health Science / ATOX / Telix Pharmaceuticals Japan / SOCIONEXT / Hitachi, Ltd. / Nihon Medi-Physics Co, Ltd. / Sumitomo Heavy Industries, Ltd. / FUJIFILM Toyama Chemicals Co., Ltd. / Kyoto Medical Technology / EPS Corporation / Metal Technology Co. Ltd. / Toshiba Electronic Devices & Storage Corporation / Yamato Scientific Co., Ltd. / Japan Radioisotope Association / Anderson M&ri & Tomotsune / Alpha Fusion Inc.	64

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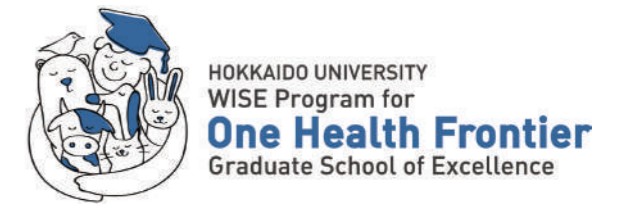
No.	Names of programs	Names of universities	Names of Program Coordinator	WISE cooperating institutions	Page
2001	Multi-Scope Energy WISE Professionals	Tokyo Institute of Technology	IHARA Manabu	IHI Corporation / Azbil Corporation / Iwatani Corporation / ENEOS Corporation / NTT DATA CUSTOMER SERVICE CORPORATION / NTT DATA BUSINESS SYSTEMS CORPORATION / NTT FACILITIES, INC. / KAJIMA CORPORATION / Kawasaki Heavy Industries, Ltd. / JFE Engineering Corporation / SUMITOMO CORPORATION / SHOWA DENKO K.K. / Sony Group Corporation / Chiyoda Corporation / Deloitte Touche Tohmatsu Limited. / Tokyo Electric Power Company Holdings, Inc. / TOSHIBA CORPORATION - Toshiba Energy Systems & Solutions Corporation / Tokuyama Corporation / TOYO KANETSU K.K. / Panasonic Corporation / Fujitsu Limited / BROTHER INDUSTRIES, LTD. / Mizuho Research & Technologies Ltd. / Mitsubishi Electric Corporation / Japan International Cooperation Agency (JICA) / CEA-Liten / National Institute of Advanced Industrial Science and Technology (AIST) / Thailand National Science and Technology Development Agency / Forschungszentrum Jülich (Jülich Research Centre) / Deutsches Zentrum für Luft- und Raumfahrt(DLR) / Kawasaki City / HITOTSUBASHI UNIVERSITY / Georgia Institute of Technology / Imperial College London / INSA Lyon / Korea Advanced Institute of Science and Technology / Massachusetts Institute of Technology / Princeton University / Nanyang Technological University / RWTH Aachen University / Tsinghua University / University of California, Santa Barbara / University of Cambridge, Judge Business School / Uppsala University / University of Stuttgart	66
2002	Graduate Program for Lifestyle Revolution based on Transdisciplinary Mobility Innovation	Nagoya University	KAWAGUCHI Nobuo	Gifu University / University of Michigan (USA) / Virginia Institute of Technology (USA) / The Ohio State University (USA) / Chalmers Institute of Technology (Sweden) / National University of Singapore (Singapore) / Chulalongkorn University (Thailand) / Hanoi University of Science and Technology (Vietnam) / WHILL Inc. / MTG Ventures / KYOCERA Mirai Envision Co., Ltd. / KDDI Research, Inc. / Cisco Systems / 01 Booster, Inc. / Sohgo Security Services Co., Ltd. / Sompō Japan Insurance Inc. / Central Japan International Airport Co., Ltd. / Tier IV, Inc. / Denso Corporation / Toenec Corporation / Toyota Motor Corporation / Toyota Technical Development Corporation / Trusco Nakayama Corporation / Nagoya Railroad Co., Ltd. / Sumitomo Mitsui Banking Corporation / Yahoo Japan Corporation / Yamaha Motor Co., Ltd.	68
2003	Distinguished Doctoral Program of Platforms	Kyoto University	HARADA Hiroshi	Jichi Medical University / The Institute of Statistical Mathematics / Toyota Motor Corporation / NTT Communication Science Laboratories / Meteorological Engineering Center / Agricultural and Rural Development Information Center / The Research Institute for Humanity and Nature / Mitsubishi UFJ Research and Consulting / RIKEN / Yahoo! JAPAN Research / System Platform Research Laboratories / Advanced Telecommunications Research Institute International / Nippon Telegraph and Telephone West Corporation / KDDI Research, Inc. / KADOKAWA ASCII Research Laboratories, Inc. / Ruby Association / Anritsu Corporation / Institute for Health Economics and Policy / National Institute of Information and Communications Technology / National Fisheries University / Japan Agency for Marine-Earth Science and Technology / The National Agriculture and Food Research Organization / wenovator LLC / Mitsubishi Electric Corporation Information Technology R&D Center / Sony Group R&D Center / University of Chicago / University of Illinois / Vienna University of Technology / University of Potsdam / Delft University of Technology / Technical University of Berlin / Aalborg University / Huazhong Agricultural University / National Chung Hsing University / National Taiwan University / University of Florida / Technical University of Munich / Sorbonne University / The French National Centre for Scientific Research / Institute for Infocomm Research, Agency for Science, Technology and Research (A*STAR)	70
2004	Graduate Program of Mathematics for Innovation	Kyushu University	SAEKI Osamu	The Institute of Statistical Mathematics / RIKEN (Center for Advanced Intelligence Project / Interdisciplinary Theoretical and Mathematical Sciences Program) / Fujitsu Research, Fujitsu / Beautiful Mind / Mazda Motor Corporation / Sumitomo Electric Industries, Ltd. / The National Institute of Advanced Industrial Science and Technology / Itoshima City (A planning department, Regional Promotion Division) / NIPPON TELEGRAPH AND TELEPHONE CORPORATION / Department of Mathematics, University of Illinois at Urbana-Champaign / Department of Mathematics, University of California, San Diego / Department of Mathematics and Statistics, La Trobe University / Department of Mathematics, National University of Singapore / Department of Mathematics, National Taiwan Normal University / Mathematical Institute, Leiden University (The Netherlands) / Zuse Institute Berlin	72



Programs selected in FY 2018
Programs selected in FY 2019
Programs selected in FY 2020

WISE Program for One Health Frontier Graduate School of Excellence

[Program Coordinator] HORIUCHI Motohiro (Professor, Faculty of Veterinary Medicine · Dean, Graduate School of Infectious Diseases, Hokkaido University)
[Fields of diplomas] Ph.D. (Infectious Diseases), Ph.D. (Veterinary Medicine)
 Name of the program to be noted: One Health Frontier Graduate School of Excellence
[URL] <https://onehealth.vetmed.hokudai.ac.jp/en/>



Message from the President



HOUKIN Kiyohiro
President of Hokkaido University

Foster professionals in the field of One Health for addressing public health issues at the human-animal interface.

In this program, multisectoral activities with universities, private companies and international organizations are involved. It ensures practical and quality education for the program participants. Although we have experienced a tough time during the global pandemic, it let us reacknowledge the importance of One Health approaches where people from various fields work together. Gaining advanced knowledge on One Health, participants are expected to contribute to solving One Health issues as true experts. We are also promoting the WISE program as good practice in Hokkaido University for further innovation in graduate school education.

Aim for One Health

Zoonosis and emerging and re-emerging infectious diseases, such as influenza, Ebola hemorrhagic fever, tuberculosis, and antimicrobial-resistant bacterial infections appear one after another and threaten public health. In the past 30 years, more than 30 new pathogens have emerged and a million people die each year from mosquito- and tick-borne infections. Transboundary animal infectious diseases, such as foot-and-mouth disease and classical swine fever, cause severe economic damage once they enter.

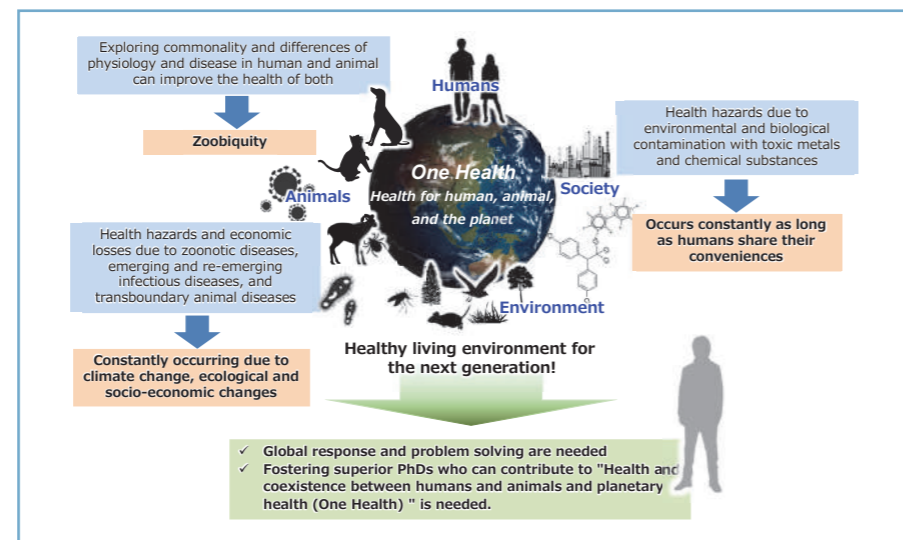
Hazards chemicals discharged into environment that include poisonous metals, pollutants such as dioxin, and persistent organic pollutants, are known to have caused global-scale contamination and threaten the health of humans and animals. Environmental pollution, rather than disease, is the leading cause of death in developing countries, with one-sixth people estimated to die.

There are many diseases such as cancer, urological and neurological disorders, which are commonly observed in humans and animals, other than infectious diseases. Based on the concept

that researches on physiological difference and similarity of diseases greatly contributes to both human and animal health, "Zoonotic", which proposes the reinforcement of collaboration

between medicine and veterinary medicine, is recently drawing international attention.

Health and socio-economic problems by infectious diseases and hazardous chemicals are



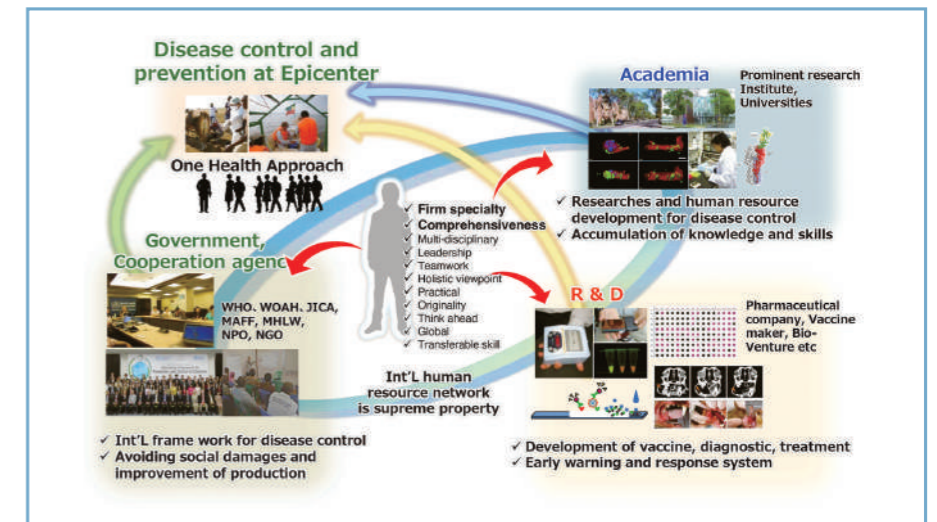
The human resources that we aim to foster is superior PhDs who will be able to contribute to the achievement of "One Health" to pass soundness and integrity of living environments to the next generations.

continuously occurring. Contemporary humans, who have been receiving lives of convenience, are obliged to pass soundness and integrity of living environments on to the next generations. Zoobiquity also aims to further improve the health of people and animals.

"Health and coexistence between humans and animals and planetary health" is the critical concept of this program "One Health" with the aim of fostering experts who can contribute to its achievement.

The Human Resources Network fostered by PhDs is a supreme property of world society.

To ensure "One Health", multi-disciplinary collaboration such as medicine, veterinary medicine, and environmental science, and trans-sectoral cooperation with human and animal health sectors, education, research and development institutions, and risk management authorities, in other words, "One Health Approach", is essential. In this program, we promote advanced researches using excellent research and human resources and outstanding experiences on infectious diseases, chemical hazard, and animal and life sciences for contributing One Health. Additionally, PhDs will gain a variety of experiences of international collaborative research with reliable counterparts, cooperative activity with international organization such as WHO, WOA, and JICA, and/or development research in collaboration with public



The abilities of PhDs fostered by this program, a wide range of fields in which they play active roles, and social contributions.

institution and company. This program aims at fostering superior PhD who will be able to tackle and resolve problems related to One Health, with a definite idea for disease control and prevention, a holistic viewpoint, a well-balanced international sense, and a comprehensive competence for decision-making and problem-solving. They show their great expertise in the field of administrative and international cooperation to help to prevent disease spread. In the R&D fields, they contribute to innovations essential for disease prevention, such as the development of new vaccines, diagnostic and treatment methods, and early detection

systems of anomalies. They also play a key role in fostering human resources and the accumulation of scientific knowledge in universities and institutes, through education to help prevent and overcome diseases as well as basic and applied research to bring about novel innovations. The network fostered by PhDs who share the philosophy of One Health is a supreme property in a global society. With them, this program, and related organizations with the shared aim of One Health, we hope to accelerate the creation of One Health, a social benefit that should be shared by human society.

Good Practice



SaSSOH International symposium provides cutting-edge knowledge and networking in the field of One Health.

We are holding an international symposium planned and implemented by students and young faculty members to cultivate students' independence, communication skills, and planning ability every year. This event allows students to gain cutting-edge knowledge and network with overseas guests who are leading experts in One Health fields, as well as providing a training opportunity to play a role on the global stage. Also, the symposium includes the Active Discussion Session and the Student Session to hold workshops to develop planning and operating abilities. For example, in this year's Student Session, students organized and practiced a special board game related to Covid-19 which required meticulous planning and teamwork. The aim of this event is to produce experts who can exercise their leadership at the site of a zoonotic or chemical hazard.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]

20 (FY2019), 19 (FY2020), 22 (FY2021), 27 (FY2022), 20 (FY2023)

[Number of people engaged in the program] 50

[Students' affiliated schools and departments]

2 graduate schools, 2 departments
 (Graduate School of Infectious Diseases) Infectious Diseases

[Number of program graduates (including anticipated graduates)] 1 (FY2021), 17 (FY2022)

[Career paths after graduation (including anticipated paths)] 1 to public research institute (overseas), 1 to university (overseas), 1 to private enterprise, 1 to public research institute

(Graduate School of Veterinary Medicine) Veterinary Medicine

[WISE Cooperating Institutions]

2 universities, 2 companies, 3 international organizations
 Obihiro University of Agriculture and Veterinary Medicine Graduate School (National Research Center for Protozoan Diseases) / Rakuno Gakuen University Graduate School / Shionogi & CO., LTD. / Fuso Pharmaceutical Industries, LTD. / World Health

Organization (WHO) / The World Organisation for Animal Health (WOAH) / Japan International Cooperation Agency (JICA)

(As of November 2022)

Message from WISE Cooperating Institution



TODA Mikihiko

Director of Board and General Manager, Corporate Planning Office / International Business Development Office, Fuso Pharmaceutical Industries Ltd.

The program for the future global leaders in the field of One Health

I have a decade of experience working in East African countries through a JICA technical cooperation project. Based on my experience there for human resource development in health, I have delivered collaboration skills workshop where the WISE students learn how to facilitate group to complete their mission. This WISE Program offers collaborative environment for students to exercise solid leadership through communication and intercultural understanding. I expect my students would effectively lead their teams for addressing global challenges.

Student's Voice



RETENG Patrick

Graduate School of Infectious Diseases DC4

One test to detect them all: developing sequencing-based platforms

I have always been interested in infectious diseases. So I believe that this Graduate School and WISE program provide me with the skills and knowledge to further pursue my interest which is why I chose to study here. Currently, I am involved in the development of infectious disease surveillance systems. The research also makes use of international experiences supported by WISE program such as internships abroad. Once I graduate, I plan to keep pursuing a career in academia, continuing my watch on the host vs pathogens war.

[Office and section in charge] Educational Planning and Graduate Schools Unit, Academic Affairs Department, Academic Affairs Planning Division.
[Inquiries] 011-706-5252

Advanced Graduate Program for Future Medicine and Health Care

[Program Coordinator] NAKAYAMA Keiko (Professor, Graduate School of Medicine, Tohoku University)
[Fields of diplomas] Doctor of Philosophy (Medical Sciences) / (Disability Sciences) / (Nursing) / (Health Sciences) / (Dental Science) / (Pharmacy) / (Pharmaceutical Sciences) / (Life Sciences) / (Information Sciences) / (Economics) / (Management) / (Letters) / (Education) / (Biomedical Engineering), Doctor of Philosophy

Name of the program to be noted: Advanced Graduate Program for Future Medicine and Health Care

[URL] <https://www.fmhc.tohoku.ac.jp/>



Message from the President



OHNO Hideo
President, Tohoku University

Fostering leaders who will drive future medicine and health care, based on co-creation with society, developing HR to lead the transformation of future society

In addition to conventional discipline-based degrees offered by its graduate schools, Tohoku University aims to build a graduate school that is appropriate for a world-class research university by enhancing various "degree programs" that transcend the boundaries of disciplines, national borders, and organizations such as industry and academia, and by developing a world-class research environment and financial support, centered on the Advanced Graduate School. In this context, the WISE Program plays a major role in the "creation of new value" through co-creation with industry and other sectors of society.

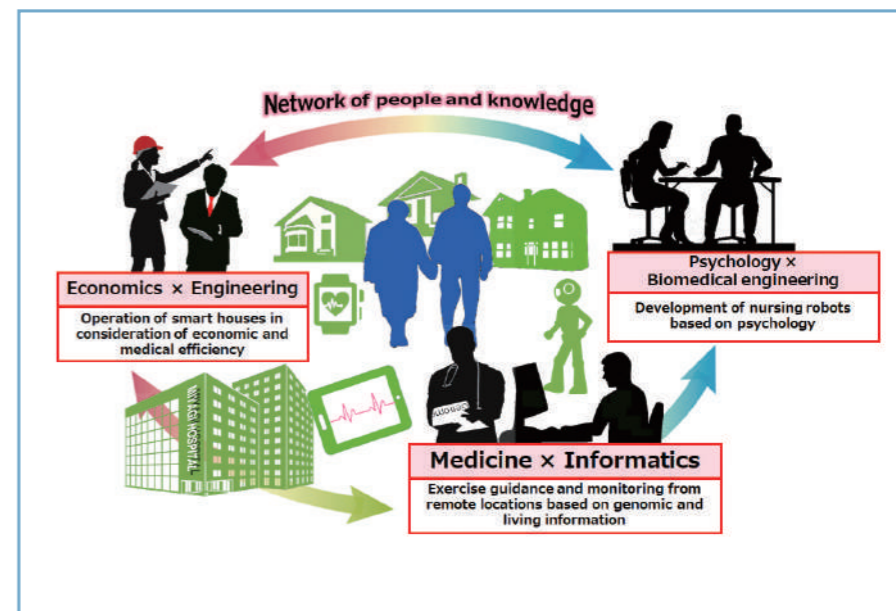
Now in its fifth year of operation, this program is making progress in fostering human resources to lead the future of medicine (medicine that realizes health, prevention, and treatment through data science, technology, and social infrastructure) based on co-creation with society.

differences, and incarnating the solution, students understand their own roles in the group and play their roles. Furthermore, the opportunity to reflect on their own knowledge and ways of thinking leads them to broaden the scope of their research activities, resulting in greatly contribution of the promotion of their research.

Expanding Opportunities

Our program is particularly focused on two initiatives in addition to the training. The first is to provide opportunities to interact with people who are currently innovating in society. We ask for one-to-some or one-to-one mentoring with students with innovative people who are active on the front lines of various companies. Their comments on the students' current research and plans for the future are a great stimulus for the students, which they could not have encountered at university. Such mentoring fosters a sense of camaraderie of students as they realize they share similar questions with other students and lead to express their thoughts. The second is the multiple faculty advisor system. Faculty members named Facilitator accompany the training and the mentoring sessions and encourage awareness by students and support activities in a challenging manner. Program offers Facilitators training sessions for coaching methods.

We have been able to continue this approach even in the midst of the Corona Disaster. As a result, students not only discover issues on their own, but also learn what activities are needed



Graduates of this program play an active role as professionals with broad knowledge and deep expertise, who are able to draw synergy among expertise, and to quickly and accurately identify and solve the needs of various fields in society.

to solve them and push each other to initiate activities. Beyond the boundaries of expertise and graduate school, the various groups of students born from the sharing of issues have further involved others and are working hard to solve the issues as a larger group. Although it will take some time before practical application is realized, it is highly anticipated that the issues discovered from a

young perspective will be solved in the near future with the help of the students in the program.

What is required for future medical care and welfare?

Bringing happiness to people through medical care and welfare, that is the goal of students enrolled in Advanced Graduate Program for Future Medicine and Health Care. This program fosters professionals in the fields of Data, Technology, and Society who can go beyond their expertise and contribute to

develop medical care and welfare as well as quickly solve society's problems. The Tohoku region is moving toward a super-aging society more than any other region in Japan, and as a result, a variety of issues that will probably arise in the future of Japan are already evident. Students in this program, while learning Design Thinking, visit local medical and welfare sites to discover medical and welfare needs and seek solutions from the students' perspectives.

At the on-site training, students form a back-cast training group with three or four students. Since the members of this group have different research specialties, they gather valuable experience. For examples, even if students see the same thing, they interpret it differently, or even if they notice similar issues, they propose completely different solutions. In the process of learning about the differences, searching for a better solution from among the



Students visit university hospitals, regional hospitals, and biobanks for backcasting training to see first-hand what is going on in the field, to embody social needs, and to cultivate the ability to find solutions.

Good Practice



Supporting students through coaching

We ensure a multiple supervisor system by assigning a facilitator teacher to each group of students. Facilitator faculty members engage in continuous dialogue with students and play a role in helping students improve their initiative and achieve their goals. They motivate, encourage, and provide tips and challenges to students who are carrying out their assignments. The program provides training on coaching to prepare facilitator teachers. Facilitator teachers play a major role in keeping the students from diverse backgrounds together and working in a stimulating environment.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]

15 each (FY2018- FY2023)

[Number of people engaged in the program] 94

[Students' affiliated schools and departments]

9 graduate schools, 20 departments

<Graduate School of Medicine> Medical Sciences, Disability Sciences, Health Sciences, Public Health

<Graduate School of Dentistry> Dental Sciences

<Graduate School of Pharmaceutical Sciences> Molecular

Pharmaceutical Science, Life and Pharmaceutical Science, Pharmacy

<Graduate School of Life Sciences> Integrative Life Sciences,

Ecological Developmental Adaptability Life Sciences, Molecular and

Chemical Life Sciences

<Graduate School of Information Sciences> Applied Information

Sciences, Computer and Mathematical Sciences, Human-Social

Information Sciences

<Graduate School of Economics and Management> Economics and

Management

<Graduate School of Arts and Letters> Japanese Studies, Global

Humanities, Integrated Human Sciences

<Graduate School of Education> Educational Sciences

<Graduate School of Biomedical Engineering> Biomedical Engineering

[WISE Cooperating Institutions]

6 universities, 18 companies, 3 local public bodies

Miyagi Prefectural Government / South Miyagi Medical Center / Katta

General Hospital / National Institutes of Health (USA) / National University

of Singapore / University of Sydney / Tropical medicine, Philippines /

Peking University / Norwegian University of Science and Technology / ONO

PHARMACEUTICAL CO., LTD / GC Corporation / J. MORITA CORP. / Tokuyama

Dental Corporation / Canon Medical Systems Corporation / Philips Japan, Ltd.

/ SHIMADZU Corporation / OMRON HEALTHCARE Co., Ltd. / NTT DOCOMO,

INC. / Yakult Honsha Co., Ltd. / Kagome Co., Ltd. / TOPCON CORPORATION /

Kajima Corporation Technical Research Institute / FRACTA, INC. / Allm Inc. /

Olympus Corporation / ClayTech, Inc. / Sumitomo Pharma Co., Ltd.

[Number of program graduates (including anticipated graduates)] 1 (FY2021), 4 (FY2022)

[Career paths after graduation (including anticipated paths)] 2 to universities, 1 to government agency, 2 to medical practitioner

(As of October 2022)

Message from WISE Cooperating Institution



YOKOTA Kyoichi

Senior Director, MarTech Strategy Office, Sumitomo Pharma Co., Ltd.

Hope of human resources with intellect & emotion for future medicine

"I want to live a happy and healthy life forever." This is the earnest wish of people in the age of 100 years of life. While people's awareness of health is changing dramatically, there is a need to develop more innovative pharmaceuticals and the social implementation of more revolutionary medical digital solutions. We hope that the opportunities for highly specialized human resources with flexible and multifaceted perspectives fostered through this program will expand more and more in the future.

Graduate's Voice



YOSHIDA Naoki

Tohoku University Graduate School of Medicine, Rehabilitation Science

Gain new perspectives on your own research

I participated in this program because I wanted to gain knowledge in various fields other than my own. I was able to deepen my thinking through a variety of experiences that I would not have had in my normal graduate school life, and I also received a lot of stimulation through exchanges with my classmates and juniors. I learned a lot from enthusiastic discussions with people of the same age in other fields, and at the same time, I genuinely enjoyed them.



WISE Program for AI Electronics

[Program Coordinator] KANEKO Toshiro (Professor, Division of Electric Engineering, Graduate School of Engineering, Tohoku University)
[Fields of diplomas] Doctor (Engineering), Doctor (Information Sciences), Doctor (Biomedical Engineering), Doctor (Science), Doctor (Arts and Letters), Doctor (Economics)
 Name of the program to be noted: WISE Program for Artificial Intelligence Electronics
[URL] <https://www.aie.tohoku.ac.jp/english/>



Message from the President

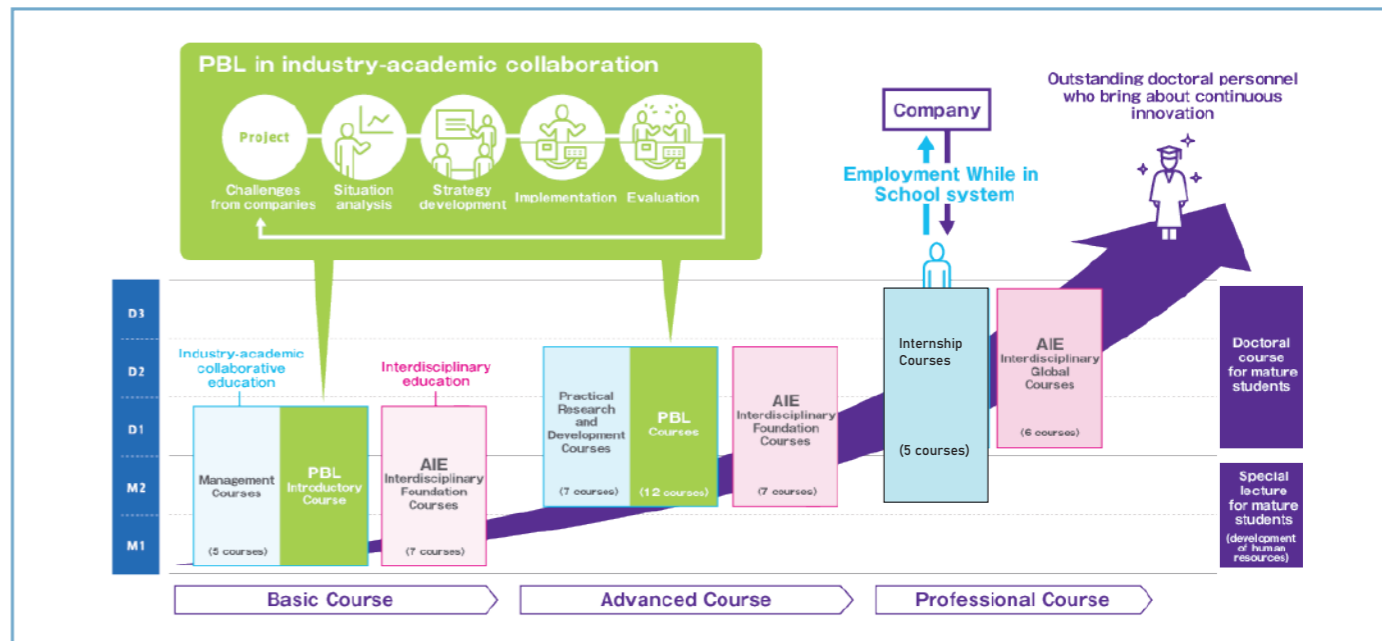


OHNO Hideo
President, Tohoku University

Fostering leaders with the ability and vision to realize a super-smart society based on co-creation with society, developing HR to lead the transformation of future society

In addition to conventional discipline-based degrees offered by its graduate schools, Tohoku University aims to build a graduate school that is appropriate for a world-class research university by enhancing various "degree programs" that transcend the boundaries of disciplines, national borders, and organizations such as industry and academia, and by developing a world-class research environment and financial support, centered on the Advanced Graduate School. In this context, the WISE Program plays a major role in the "creation of new value" through co-creation with industry and other sectors of society.

Now in its fifth year of operation, this program is making progress in fostering human resources capable of "continuous innovation" involving technologies from different fields, based on co-creation with society, toward the realization of a super-smart society.



Fostering outstanding human resources to create innovations

For realizing the fourth industrial revolution and an ultra-smart society (Society 5.0), it is essential to fuse real and cyber space in every aspect of society to create new value and bring it to society, our life and industries.

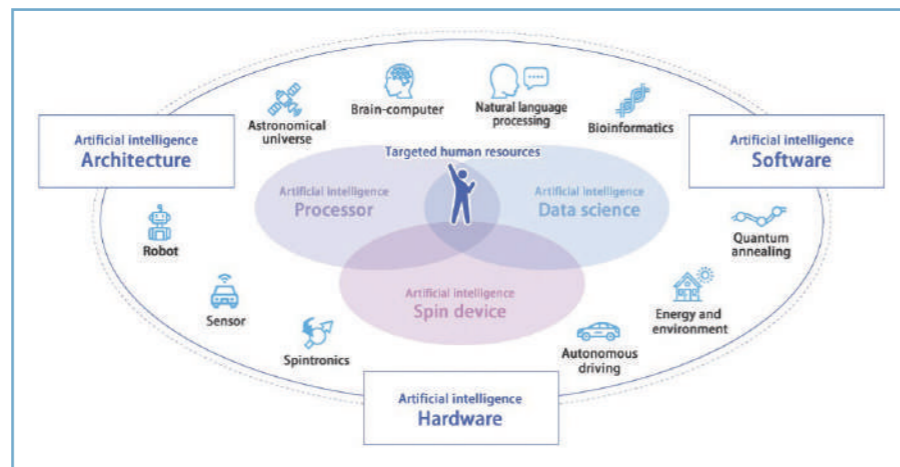
Research and development are required not only in algorithms and computer programs to process big data, but also in spintronics and electronics to develop devices and in computer architecture for designing processors that realize low-power consumption and high-performance computation.

The WISE program for AI Electronics aims to develop outstanding human resources for continuous innovation by providing educational courses to learn algorithms and computer programs for the AI and architecture, centering on spintronics and research on spin devices, ultra-sensitive sensors, and other high-speed/low-power devices.

Education with industry-academia and social collaboration

The WISE program for AI and Electronics (AIE) places the highest priority on areas that contribute toward new value creation. The program builds

a five-year integrated graduate school education system consisting of "interdisciplinary education" and "industry-academic collaborative education". The interdisciplinary education is constructed by highly specialized researchers in diverse academic fields to develop student's abilities to take a bird's



Fostering outstanding human resources who have a bird's-eye view and practical ability in the new field of AI electronics and create continuous innovations involving technologies from different fields

An education system consisting of "interdisciplinary education" constructed by highly specialized researchers in diverse academic fields and "industry-academic collaborative education" by researchers in industry and faculty members

eye view to penetrate real and cyber space, and a multidimensional interconnection in Society 5.0. The industry-academic collaborative education is for students to develop practical skills to resolve social issues cooperating with industries and society.

The five-year integrated education is divided in three courses: basic course, advanced course, and professional course. In the basic course, leader seminars are held with industry-academia

collaboration. PBL (Project Based Learning) subjects are built up in the advanced course with collaborations between researchers from partner companies and faculty members. The students in the program can take up to four PBL subjects. They are expected to acquire the ability to solve problems and to become leaders who can play an active role in the industrial world. In the advanced and professional courses, the AIE program prepares an international internship program to

foster outstanding doctoral students who will play a central role on the international stage, and a long-term corporate internship program aiming for further development of practical skills necessary in industry.

In addition, "Employment System in School" is formed, which allows students to get a job at a company even while they are still in school. This system will pave a new path to build diverse career paths.

Good Practice



PBL achievement symposium

Every year, we hold a symposium on outcomes from Project Based Learning (PBL) subjects, which produce and implement learning content in collaboration with partner companies. In the subjects, 4 or 5 students are researching, proposing solutions and verifying the issues presented by each company to develop bird's-eye view and practical skills. Each subject has its own characteristics in setting and approaching issues. At the symposium, all students who attended PBL subjects devised their own presentations, and many students addressed and solved social issues such as exercise management in aged society, prediction of COVID-19 cases and detection of small children left in vehicles from a broad perspective. They showed their ideas for the future and learned that research and technological development are important in relation to society.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]

25 (FY2019), 30 (FY2020), 40 (FY2021), 30 (FY2022), 30 (FY2023)

[Number of people engaged in the program] 71

[Students' affiliated schools and departments]

6 graduate schools, 15 departments

<Graduate School of Engineering> Electronic Engineering, Electrical Energy System, Communication Engineering, Applied Physics, Technological Social System

<Graduate School of Information Sciences> Computer and

Mathematical Sciences, System Information Sciences, Applied Information Sciences

<Graduate School of Biomedical Engineering> Biomedical Engineering

<Graduate School of Science> Physics, Mathematics

<Graduate School of Arts and Letters> Japanese Studies, Global Humanities, Integrated Human Sciences

<Graduate School of Economics> Economics and Management

[WISE Cooperating Institutions]

13 private enterprises, 1 public research institute

NEC Corporation / TOSHIBA CORPORATION / CANON MEDICAL SYSTEMS CORPORATION / Hitachi Solutions East Japan, Ltd. / Keihin Corporation / E&M Corporation / AISIN SOFTWARE Co., Ltd. / KDDI Research, Inc. / Mitsubishi Electric Corporation / SHOWA DENKO K.K. / ALPS ALPINE CO., LTD / TDK Corporation / KPIT Technologies Ltd. / National Institute of Information and Communications Technology

[Number of program graduates (including anticipated graduates)] 10 (FY2021), 8 (FY2022)

[Career paths after graduation (including anticipated paths)] FY 2021: 6 to universities, 4 to private enterprises
 FY 2022: 5 to private enterprises, 3 to others

(As of October 2022)

Message from WISE Cooperating Institution



YODA Satoru

Senior Manager, Engineering Planning Office, Engineering Headquarters, ALPSALPINE Co., Ltd.

New value Creation from University and Industry Collaboration

We feel that the AIE program has immense potential as a place for the university and partner companies to collaborate and take on the challenge of creating new value. We hope the collaboration will make the distance between the university and companies shorter and make it easier to understand the characteristics of research and development in academia and industry. This will lead to a productive industry-academia collaboration.

Graduate's Voice



KIMURA Kosuke

Researcher, Scalable Optical Transport Research Group, Transport Innovation Laboratory, NTT Network Innovation Laboratories

Environment that trains our ability to think, discuss and act on our own

It is challenging for Ph.D. students to work on the curriculum of the AIE program in addition to their doctoral program, where they pursue their research and develop their expertise. Participating in the AIE program puts them under a higher burden but is worthwhile for Ph.D. students. The challenge would increase their ability to raise important issues and tackle them.

Ph.D. Program in Humanics

[Program Coordinator] YANAGISAWA Masashi (Professor, Director of International Institute for Integrative Sleep Medicine, University of Tsukuba)

[Fields of diplomas] Doctor of Philosophy in Medical Sciences, Doctor of Philosophy in Science, Doctor of Philosophy in Engineering

Name of the program to be noted: Ph.D. Program in Humanics

[URL] <https://www.phd-humanics.tsukuba.ac.jp/en/>



Message from the President



NAGATA Kyosuke
President of the University of Tsukuba

Creating a new paradigm ~ Developing outstanding talents who can challenge “ZERO to ONE” ~

The Humanics program is a Ph.D. program that ensures interdisciplinary, leading-edge, world-class standards of education by combining top-tier national and international instructors and students with academic, industry, and governmental circles across disciplines.

As student-led new initiatives, the “double-mentor system” and “reverse mentor system” are adopted. Basic study of biomedical sciences is given to students having studied in physical sciences/ engineering/ informatics fields, and vice versa. Until now, an educational course, where students having graduated from a 6th-year medical course can learn physical sciences/ engineering/ informatics such like the Humanics program, was hard to be established in Japan, so that this is a true educational course for MD-Ph.D. students.

Under these new initiatives, we develop outstanding talents who can challenge “ZERO to ONE”.

Anticipated Ph.D. talents

To create a new paradigm by integrating different disciplines of biomedical sciences and physical sciences/ engineering/ informatics, it is necessary to develop leaders who can talk with each other using the languages of both fields, understand both deeply, and integrate them in order to make it a reality. For example, da Vinci, a surgical support robot, was developed from the idea of a surgeon entrepreneur with an engineering background, and the robot suit HAL was inspired and implemented in the real world by an engineer who had studied human physiology. Optogenetics, a leading candidate for the Nobel Prize, that manipulates neuronal activity with light was founded by a psychiatrist who was well versed in optical technologies and genetic engineering. However, the educational system to develop such talents did not exist in our country.

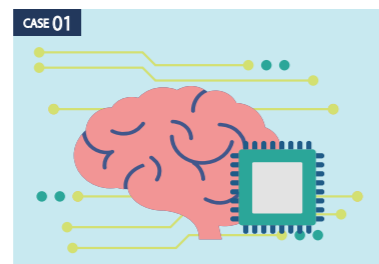
This graduate program sheds light on the fundamental principles of physiology and pathology of the human, defines “Humanics” as a discipline that generates new science and technology to

achieve a healthy and comfortable life of human beings in the society, and is designed to nurture the Humanics talents. The Humanics talents should

be doctoral-level professionals with knowledge and skills in the fields of both biomedical sciences and physical sciences/engineering/informatics,

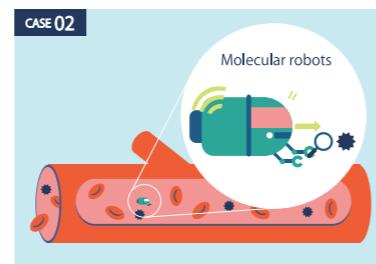
Humanics Aims for Fusion Research

Humanics aims at integrated research that creates a new qualitatively different paradigm that goes far beyond the common sense of biomedical science and science, engineering and informatics.



Development of artificial neural network devices that can be linked to the brain, and understanding of sensibility, motivation, and thoughts, etc.

Improvement of cognitive function and mental health



Development of molecular robots to intervene in cell functions based on the understanding of molecular pathogenesis and to control infectious diseases and cancer.

Overcoming intractable diseases by molecular robots

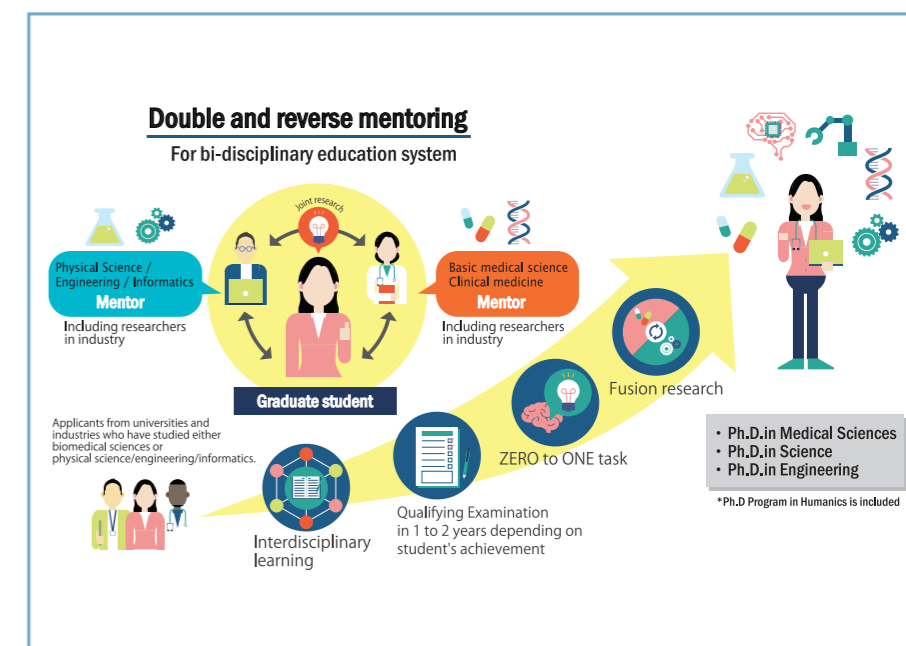
Creating the “Humanics” by integrating biomedical sciences and physical sciences/engineering/informatics, and cultivating outstanding talents who can overcome intractable challenges to life and health

and have the expertise to combine these bi-disciplinary knowledge and skills. They should also have flexible, multifaceted creativity which can be applied to the unpredictable future, based on the expertise. Through the development of expertise and applied skills, this Ph.D. program cultivates individuals capable of independently uncovering basic principles of human life, creating systems to reconstitute and assess the validity of discovered principles, and building new theories of life.

The program aims to develop outstanding talents who can challenge to create a qualitatively different paradigm that goes far beyond the common sense of biomedical sciences -- that is, ZERO to ONE -- by always incorporating the knowledge and technology from different fields.

Outstanding features

This program 1) has a remarkable characteristic of creating a new dimension of study, termed “Humanics,” under the cross-sectoral collaboration among internationally competitive, outstanding research institutions which are specialized in biomedical sciences and physical sciences/ engineering/informatics, respectively, both inside and outside of the University of Tsukuba. In addition, the program 2) cultivates individuals’ bi-disciplinary expertise with doctoral-level knowledge and skills by a full “double mentor system” in which each student is guided by two faculty members, one from the field of biomedical sciences and the other from physical sciences/engineering/



Under the bi-disciplinary education system with a pre-admission program toward a graduate school, cultivating a comprehensive view of individuals with professional knowledge and skills in multiple fields and capability of integrating them

informatics, in their respective laboratories in the course of pursuing joint research projects, and 3) offers prospective students an opportunity to have an interdisciplinary background of the program before enrollment as a pre-admission program in their undergraduate years, which creates a seamlessly integrated system for transition to

graduate education. Furthermore, the program 4) aims at a self-sustainable operation in collaboration with enterprises after the period of governmental funding.

Good Practice



Career Platform for Humanics: CPx, an originally developed portfolio-based competency achievement assessment system

Ph.D. Program in Humanics has developed the Career Platform for Humanics (CPx) as a system to assess the competency achievement of each student. CPx provides the evidence-based, quantitative assessment of the experiences obtained from lectures and research activities through evaluating tangible and diverse “skills” that constitute the each competency. There are 12 different skill sets that can be selected according to the future image of students. CPx allows students to self-reflect and set their own learning goals.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)] 15 each (FY2019 -FY2023)

[Number of people engaged in the program] 84

[Students' affiliated schools and departments]

4 graduate schools, 10 programs (2018FY-2019FY)
2 graduate schools, 4 degree programs, 9 programs (2020FY-)
<Graduate School of Pure and Applied Sciences> Physics, Chemistry, Materials Science and Engineering
<Graduate School of Systems and Information Engineering> Computer Science, Intelligent Interaction Technologies
<Graduate School of Life and Environmental Sciences>

Biological Sciences, Life Sciences and Bioengineering
<Graduate School of Comprehensive Human Sciences>
Biomedical Sciences, Clinical Sciences, Kansei, Behavioral and Brain Sciences
(After restructuring of schools and programs in April, 2020)
<Graduate School of Science and Technology> (Degree Programs in Pure and Applied Sciences) Physics, Chemistry, Engineering Sciences (Degree Programs in Systems and Information Engineering) Computer Science, Intelligent and Mechanical Interaction Systems (Degree Programs in Life and Earth Sciences) Biology, Life and Agricultural Sciences
<Graduate School of Comprehensive Human Sciences> (Degree

Programs in Comprehensive Human Sciences) Neuroscience, Medical Sciences
[WISE Cooperating Institutions]
4 universities, 2 national institutes, 5 companies
University of California, Irvine / University of Bordeaux / National Taiwan University / The University of Edinburgh / National Institute for Materials Science / National Institute of Advanced Industrial Science and Technology / TOYOTA MOTOR CORPORATION / Hitachi, Ltd. / Shimadzu Corporation / CYBERDYNE, Inc. / Astellas Pharma Inc.

[Number of program graduates (including anticipated graduates)] 4 (FY2022)

(As of November 2022)

Message from WISE Cooperating Institution



SANKAI Yoshiyuki
President and CEO, CYBERDYNE Inc.; Executive Research Director, Center for Cybernetics Research, Director, F-MIRAI / Professor

Changing society with “Humanics” x “Cybernetics”

CYBERDYNE, a publicly listed venture company originating from the University of Tsukuba, is a research institute designated by MEXT whose researchers all have their own government-issued Researcher Number. Our business involves the research and development, production, and sales of medical devices and technology, and our simultaneous investment in basic research and societal implementation allows for the promotion of a positive Medical Innovation Cycle. Join us in our challenge to shape the future with Medical Cybernetics + Humanics!

Student's Voice



EZAKI Seioh
4th year, Ph.D. Program in Humanics

Beyond Engineering and Medical Sciences

I graduated from College of Engineering Systems of the University of Tsukuba and obtained medical licenses in both China and Japan after graduation. In my undergraduate years, I was involved in the research of gait sensation presenting devices for hemiplegic patients. Now I am working on the research supervised by Prof. Yamazaki in Orthopedics and Prof. Suzuki in Intelligent Informatics under the double-mentor system.

I think this program is best for challengers who are willing to integrate the different research fields.

[Office and section in charge] Office of School of Integrative and Global Majors **[Inquiries]** 029-853-7076

World-leading Innovative Graduate Study Program for Life Science and Technology

[Program Coordinator] KIKKAWA Masahide (Professor, Graduate School of Medicine, The University of Tokyo)

[Fields of diplomas] Doctor of Medical Science, Doctor of Engineering, Doctor of Philosophy

Name of the program to be noted: The World-leading Innovative Graduate Study Program for Life Science and Technology

[URL] http://square.umin.ac.jp/wings-lf/index_en.html



Message from the President



FUJII Teruo
President, The University of Tokyo

Fostering leaders who will contribute to human health by exploring the truth of life science with deep insights outside the boundaries of existing fields

The World-leading Innovative Graduate Study Program for Life Science and Technology (WINGS-LST) is now in its fifth year of operation, intending to develop "talents who will significantly contribute to human health from a long-term perspective" with deep insights outside the boundaries of existing fields. The program covers a wide range of life science and technology research fields, from the elucidation of basic principles to applied technologies that lead to clinical practice. WINGS-LST will cultivate doctoral students with a global perspective, high ethical standards, and tenacious practical skills, who have high expertise in their own fields and create new academic fields and technologies. By further accelerating the reform of education in graduate school through this program, we hope to meet the university's social mission of fostering outstanding researchers who will address the resolution of global challenges faced by human society.

Human talents who can create new academic fields and contribute to human health

The World-leading Innovative Graduate Study Program for Life Science and Technology (hereinafter "this program") aims to develop talents who will significantly contribute to human health from a long-term perspective. For this reason, it covers a wide range of life science and technology research fields, from elucidation of basic principles to applied technologies that lead to clinical practice.

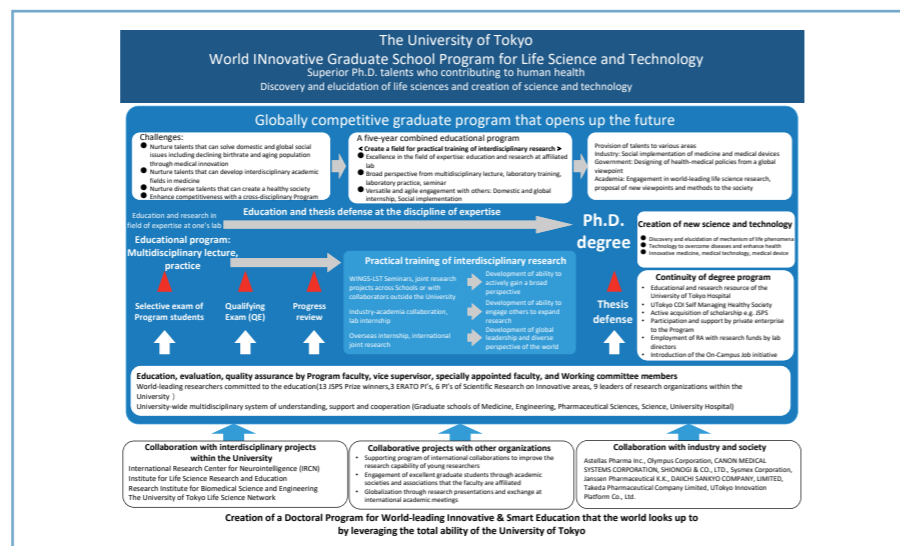
In this program, we aim to foster human talents who can create new academic fields in the future by co-developing excellence in three assets: expertise in specialized disciplines, broadness of scientific perspective, and agile engagement with others to develop new opportunities.

(2) Development of human talents at the frontiers of life science and technology

In this program, we aim to foster human talents at the cutting edge of life science and technology disciplines: we promote discoveries and elucidation of mechanistic insights in all phenomena of life

using new technologies, while we also develop novel and advanced technologies based on scientific principles and theories of life. Innovative

areas in academic disciplines and technologies do not arise spontaneously. We believe that they are created by enhancing expertise, broadening



We provide a globally competitive graduate school education program that will open up the future. It will nurture Ph.D. talents who can create new academic fields and technologies, through practical interdisciplinary training.

perspectives through development of big picture thinking skills and meeting with experts in a variety of fields, and developing interdisciplinary research by engaging others.

Specialized expertise : Specialist capability that makes an individual second to none with regard to a particular purpose or area of knowledge.

Broader perspective : Based on the expertise above, ability to survey various academic fields and identify fundamental cross-disciplinary problems. Faculty members who will provide guidance to the program students are leaders conducting cutting edge research in their own discipline, while remaining flexible and open to methods and ideas of other fields.

Agile engagement: Ability to think about the way research should proceed based on the big picture, and to develop research by building collaborative relationships with researchers in appropriate fields. Communication skills, capacity for understanding, information gathering ability, etc., are also included.

Integrate technology and mechanistic elucidation, and take initiative in the development of academic disciplines and industries that contribute to human health.

A unique feature of this program is that students are able to learn about both the elucidation of life phenomena (related to basic medical sciences and



At the Colloquium, all members of the Program got together to enjoy lectures by guest speakers, students group work, and discussion with Cooperating Institutions.

life sciences) using state-of-art technologies, and the technologies (related to clinical practice and engineering) that contribute to human health based on the elucidated principles and theories.

Life science has made tremendous progress and has been able to elucidate new phenomena thanks to many technical developments, such as recombinant DNA technologies based on biochemistry or microscopy based on physics. In parallel, new principles have revealed the target molecules for drug discovery, and new treatment techniques have been created. In other words, in order to elucidate life phenomena and create

technologies, an ecosystem where both are performed at a highest level as two halves of a whole is necessary. Therefore, this program aims to promote knowledge professionals who can integrate both technology and mechanistic elucidation, as well as contribute to the development of academic disciplines and industries that contribute to human health.

Good Practice



WINGS Journal Club – with young first authors of cutting-edge papers as advisers and role models –

WINGS Journal Club is a research training session where students study about cutting-edge papers in various research fields related to life science and technology. Program students present and discuss a cutting-edge paper in front of a young first author of the paper, sometimes a graduate of the Program, who will serve as adviser. It may be a bit intimidating to present in front of the author, but the best adviser, who is just a bit ahead of your time, will answer your questions on the spot! After the seminar, we have a mini get-together, where students can talk about their career path with the advisers, who are their role models, in a relaxed atmosphere. Since 2020, the sessions are held online, making it possible to invite graduates from afar, including those who have set up their businesses abroad, to participate as advisers.

DATA

<p>[Number of students recruited (For FY2023, number of students to be recruited)] 86 (FY2018), 40 (FY2021), 40 (FY2022), 40 (FY2023)</p> <p>[Number of people engaged in the program] 90</p> <p>[Students' affiliated schools and departments] 4 graduate schools, 22 departments</p> <p><Graduate School of Medicine> Molecular Cell Biology, Functional Biology, Pathology Immunology and Microbiology, Radiology and Biomedical Engineering, Neuroscience, Social Medicine, Internal Medicine,</p> <p>[Number of program graduates (including anticipated graduates)] 72 (FY2020), 36 (FY2021), 42 (FY2022)</p> <p>[Career paths after graduation (including anticipated paths)] 6 to universities, 25 to private enterprise, 1 to public research institute, 1 to government agency, 6 to medical practitioner</p>	<p>Reproductive, Developmental and Aging Sciences, Surgical Sciences</p> <p><Graduate School of Engineering> Bioengineering, Mechanical Engineering, Electrical Engineering and Information Systems, Precision Engineering, Materials Engineering, Applied Chemistry, Chemical System Engineering, Chemistry and Biotechnology, Nuclear Engineering and Management</p> <p><Graduate School of Pharmaceutical Sciences> Pharmaceutical Sciences, Pharmacy</p>	<p><Graduate School of Science> Biological Sciences</p> <p>[WISE Cooperating Institutions] 9 companies</p> <p>Astellas Pharma Inc. / Olympus Corporation / CANON MEDICAL SYSTEMS CORPORATION / SHIONOGI & CO., LTD. / Sysmex Corporation / Johnson & Johnson Group / DAICHI SANKYO COMPANY, LIMITED / Takeda Pharmaceutical Company Limited / Utokyo Innovation Platform Co., Ltd.</p>
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(As of November 2022)

Message from WISE Cooperating Institution



KIMURA Hiromichi
Astellas Venture Management LLC, Investment Director

Follow current trends, or find essential problems and pursue solutions?

The term INNOVATION reduced to mere formality. Defining a word is important, however what is the essential problem? What to do first, and what to solve now? The importance to keep thinking in an environment blessed with knowledge: the university. Look straight at one's thoughts, utilize them as stepping stones, and with the enriched intelligence, keep challenging after graduation. That is what I expect of the graduates. My contribution would expose you to the momentum of cutting-edge life science business in Europe and the USA.

Student's Voice



Yui Sakurai
1st year Doctoral Student, Department of Bioengineering, Graduate School of Engineering, The University of Tokyo

To become a leading scientist in life sciences

WINGS-LST offers a great opportunity to acquire a broad knowledge in life sciences and to interact with other graduate students who are active in various fields of life sciences. I decided to join this program with the aim of becoming a leading scientist in life sciences who can contribute to human health. The twice a year events include research presentations and group discussions. The interactions with other program students at the events are always inspiring to me.

Excellent Leader Development for Super Smart Society by New Industry Creation and Diversity

[Program Coordinator] OHTSU Naoko (Director of Organization for WISE Program, Professor, Graduate School of Agriculture, Agricultural Production Sciences course, Tokyo University of Agriculture and Technology)

[Fields of diplomas] Doctor of Philosophy (Agriculture), (Engineering), (Philosophy), (Life Sciences), (Veterinary Medicine)

Name of the program to be noted: Doctoral Program for World-leading Innovative & Smart Education

[URL] <http://www.wise.tuat.ac.jp/en/>



Message from the President



CHIBA Kazuhiro
President, Tokyo University of Agriculture and Technology

Moving forward with the Concept of Excellence

Sustainability of the earth is in a critical condition and it is uncertain even in 2050. In it, abilities beyond conventional concepts are required for the human resources in order to lead the future society. It is important to act toward the common goal with strong will and courage, and with mutual dialogue together with people of diverse backgrounds even if we have difficulty. We need to identify what should we achieve in the next stage, not merely promoting cutting-edge research. If we pioneer a new world and attract people even it has not yet been focused on from them, we can naturally establish an outstanding figure of the world and it will be recognized in the near future. I hope you will challenge with all your conviction, without sticking to formality.

Driving Super Smart Society by New Industry and Diversity

The TUAT-WISE Program bases on agriculture and engineering and fosters excellent doctoral human resources who has acquired skillsets of bold vision for the future and steady implementation. They are expected to create new fields by their cutting-edge researches; "Creation of New Industries".

The engineering education in TUAT includes artificial intelligence (AI), machine learning, advanced measurement and sensing, IoT, human-assisting robots, smart mobility (automatic driving), energy control (storage batteries, device materials), etc. as its strength. While that in agricultural education are food production, plant factories, animal husbandry and veterinary medicine, forest biomass, environmental conservation (sea, water, air, soil), infectious diseases, plant genomics, breeding, microbes, environmental monitoring etc. The goal is to create innovation through "agriculture-engineering collaboration" by mutual understanding of diverse fields and exchanging their knowledge and technologies.

In the first step of the curriculum, we aim

to improve students' understanding of diversity, internationality and English debate skills across gender, nationality, and specialty for acquiring

research conceptualization, team formation and leadership. In the second step, students try to launch joint projects and construct joint research



The TUAT-WISE Program bases on agriculture and engineering and fosters excellent doctoral human resources who can execute "Creation of New Industries"; new fields creation by their cutting-edge researches.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)] 27 (FY2019), 30 (FY2020), 24 (FY2021), 23 (FY2022), 25 (FY2023)

[Number of people engaged in the program] 97

[Students' affiliated schools and departments]

4 graduate schools, 16 departments (Graduate School of Engineering) Biotechnology and Life Science, Applied Chemistry, Mechanical Systems Engineering, Computer and Information Sciences, Industrial Technology and Innovation, Electronic and Information Engineering, Joint Doctoral Program for Sustainability Research (Graduate School of Agriculture) Agriculture, Veterinary

Sciences (United Graduate School of Agricultural Science) Biological Production Science, Symbiotic Science of Environment and Natural Resources, Agricultural and Environmental Engineering, Agricultural Economy and Symbiotic Society (Graduate School of Bio-Applications and Systems Engineering) Food and Energy Systems Science, Bio-Functions and Systems Science, Cooperative Major in Advanced Health Science

[WISE Cooperating Institutions]

8 universities (including 7 foreign universities), 6 companies, 1 general incorporated foundation, 1 public interest incorporated

association, 2 general incorporated associations, 1 research institute (including 1 foreign institute) KUBOTA Corporation / AEON AGRI CREATE Co., Ltd. / SHIMADZU Corporation / Japan Automobile Research Institute / Japan Agricultural Corporations Association / Greater Tokyo Initiative / Leave a Nest Co., Ltd. / Recruit Co., Ltd. / Tokyo Electron Ltd. / AgVenture Lab / Jissen Women's University / Cornell University / University of California, Davis / University of Oxford / The Leibniz Centre for Agricultural Landscape Research (ZALF) / University of Bonn / Vietnam National University of Forestry / Gadjah Mada University / The University of North Carolina at Chapel Hill

[Number of program graduates (including anticipated graduates)] 6 (FY2021), 13 (FY2022)

[Career paths after graduation (including anticipated paths)] 3 to universities, 2 to private enterprises, 1 to public research institute

(As of November 2022)

Year of selection FY 2018



team through the "Joint Project of Agriculture and Engineering" fund. In the third step, students will develop an action plan to effectively apply their own research achievements to society.

In cooperation with the 19 partner institutions in Japan and abroad, we will produce highly skilled "knowledge professionals" who have comprehensive perspective, originality, and high-level specialization, and who will bring new ideas and new developments to academia, industry, international organizations, and other fields.

Leaders for Academia, Industry, International Organization

To foster excellent leaders, education in global perspective is indispensable. We have the world top-class universities in North America, Europe and Asia as our partner institutions. Foreign researchers from those top-class institutions commit in the education in this program. They are responsible for the global lectures and "international workshop" in which students from TUAT and the partner institutions engage in group discussions. They help students improve their internationality and English discussion skills. We will also be in charge of encouraging students for overseas training and study abroad, and will activate international joint research. For this purpose, we support their "Overseas Activity Expenses". In addition, students' research activities are supported by "RA expenses". Furthermore, research project teams of students from both agriculture and engineering backgrounds

Excellent Leaders who can lead the Super Smart Society by New Industry Creation and Diversity					
Step	School grade	Goals	Courses on Creation of New Industries	Courses on Diversity	Supporting systems
3rd	P5	Develop an action plan to make the most of the research skillsets in society	Special Seminar for Creation of New Industry Special Project for Creation of New Industry		QE 2
	P4		Overseas Internship I Overseas Internship II		
2nd	P3	Launch projects, establish joint research systems, and obtain external funding		Diversity Business Management	Career support (Mainly P3-P5)
	P2		Seminar for Creation of New Industry	Outline of Life Science	
1st	P1	Conceptualize research idea and plan Understand social issues Understand diversity for leadership and teams Acquire English language skills and international mindset	Outline of Creation of New Industry	Diversity Communication	Joint Project of Ag & Tech (P2-P5) RA expense (P1~P5) Proposal Based Project (P1-P5) Overseas activity support (P1~P5) Seminar for JSPS application (P1-P4)
			Outline of Global Leadership International Workshop		

Basis: Outstanding research ability in the field of expertise

The curriculum has three learning steps, in which respective goals are set to foster excellent leaders who drive super-smart society. Support systems have also been established to enhance the learning.

are financially supported by the Joint Project of Agriculture and Engineering Fund.

The Consortium for the Creation of New Industries, consisting of companies and public research institutions, is also committed to the curriculum, and industry and academic sectors work together to develop human resources. In the first step of the curriculum, students learn about companies' research activities through lectures by practitioners from partner companies. In the final step, students present their own research seeds

to experts in companies and academia, receive feedback, and formulate an action plan to put their research achievements in practice in society.

To complete the program, students have to pass the Qualifying Examination (QE) by taking the courses provided by the WISE Program besides completing their department in graduate school. Students will take the QE in the last semester of the 2nd year of the master's course and in the 3rd year of the doctoral course.

Good Practice



Development of "Biofertilizer," a material that promotes plant growth by microorganisms

Biofertilizer "Yume-bio" has been developed by Tokyo University of Agriculture and Technology in cooperation with a public company. In order to realize sustainable agriculture, Japanese government has formulated the "Strategy for Sustainable Food Systems, MeaDRI" in 2021. One of the major issues is to depart from chemical fertilizers, which have a significant environmental impact. Yume-bio enables cultivation with 20-30% less fertilizer use when it is applied to rice. It is the mission for university to scientifically develop technologies that are required in society. The study and research in the WISE Program have contributed to the efforts for the implementation.

Message from WISE Cooperating Institution



Dr. IIDA Satoshi
Senior Technical Advisor, KUBOTA Corporation

Human resources development by field-based industry-academia partnership

Our company now promotes research and development with the keywords of "innovation", "field-based research and development", "smart agriculture" and "ICT agricultural machinery". We also promote diversification and globalization in our general business operation. The vision of the WISE Program fits with our policies, thus, we would like to cooperate with the creation of new industries and development of excellent leaders by applying the know-how which our company has cultivated to the education.

Graduate's Voice

To Learn Essential Attitudes for a Researcher



MIYASHITA Megumi
Assistant Professor, Division of Advanced Information Technology & Computer Science, Institute of Engineering, Tokyo University of Agriculture and Technology

I participated in this program because it is essential to broaden my horizons for becoming a researcher. Through international activities and lectures by partner institutions, I have become more conscious of mainly two things (1) proactively planning research with looking toward application and (2) maintaining considerable communication. I want to proceed with my research while utilizing the attitude I learned from the program.

[Office and section in charge] Educational Affairs Office **[Inquiries]** 042-367-5545

Creating sustainable societies through [Material×Information] multi-talented human resource development



[Program Coordinator] YAMAGUCHI Takeo (Professor, Institute of Innovative Research/School of Materials and Chemical Technology, Tokyo Institute of Technology)

[Fields of diplomas] Doctor of Engineering, Doctor of Science, Doctor of Philosophy

Name of the program to be noted: Tokyo Tech Academy for Convergence of Materials and Informatics (TAC-MI)

[URL] <https://www.tac-mi.titech.ac.jp/en/>



Message from the President



MASU Kazuya
President, Tokyo Institute of Technology

University-wide efforts to empower students to become multitasking individuals in materials science and informatics

As part of education reform, the University has created a system to provide joint education by removing the disciplinary walls among the six graduate schools, Institute of Innovative Research, and Institute for Liberal Arts. This program empowers students to become “multitasking individuals” who can capitalize on original ideas for social innovation in the converged fields of materials science and informatics. In addition to encompassing the entire University, the program provides specialized doctoral education in collaboration with private corporations, the National Research and Development Agency, and top-notch overseas universities. Under the leadership of the President, we established a University-wide integrated education curriculum that utilizes the strength of the University in materials science and informatics research, and values our ties to society to transform students into excellent “multitasking individuals”.

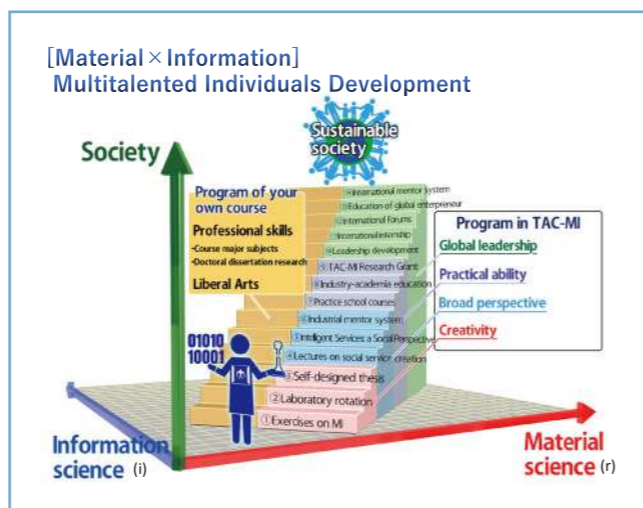
Fostering individuals who can create new industries

The program empowers students to become “multitasking individuals” who utilize informatics to conceptualize new ideas through multifaceted thinking and a broad perspective as well as contemplate new social services when approaching original research on materials and informatics. Multitasking individuals are expected to create new industries that link materials and informatics to build a sustainable society. Although the manufacturing industry in Japan (unique Japanese Monotsukuri industry) is very strong, industry growth necessary to continue to lead the world will be difficult using the conventional way of thinking.

Due to advances in informatics such as data science, simulation, and machine learning, the discovery and design of new materials are becoming possible. The era utilizing information technology has arrived, allowing market-specific optimization and production management of devices and processes as well as the creation of social services from consumer trends. However,

traditional materials research is conducted at a specific level such as the molecular material or device and process level. A broader perspective that encompasses the eventual social services has yet to be fostered. Consequently, graduate-level education must aim to converge materials science and informatics through a broad perspective from molecules to social services. Students develop the following abilities: 1) creativity to realize multifaceted ideas across the fields of materials science and informatics, 2) a broad perspective to identify social issues accurately by sifting through a vast amount of information,

3) initiative to take action to solve challenges by spiraling outward and expanding from the atomic or molecular level to social innovation towards



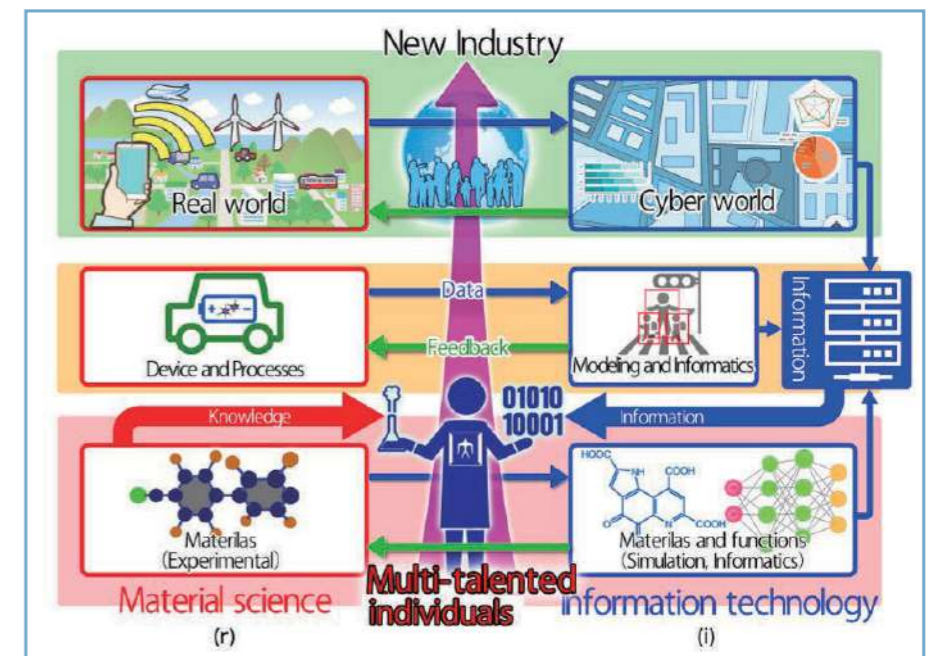
“Multitasking individuals” empowered by this program can freely move across complex space with axes of materials science, informatics, and social services. Due to diverse training, they flourish professionally.

attaining a sustainable society, and 4) global leadership ability to introduce new services to the world.

By working in a team of exceptional students from diverse backgrounds to tackle various challenges, students learn different viewpoints and foster a cross-disciplinary understanding to communicate effectively. The program is offered as a joint effort of all six graduate schools in charge of the program, the Institute of Innovative Research, and the Institute for Liberal Arts. The program education is provided in cooperation with private corporations, the National Research and Development Agency, and top-notch overseas universities.

Program characteristics and excellence

The program focuses on “new industry creation” and “new field creation”, which is the foundation of new industry. We aim to create new industry by advancing from materials-based industries to next-generation industries. Financial, trading, and software industries have incorporated with information technology and shifted into areas with higher information value. In contrast, materials-based industries have yet to fully utilize high information value. A path forward is to create industries with high information value built upon materials. Currently, no education program fosters talent who can create such industries. Although double-major programs in some countries allow



The program empowers students to think from a broad perspective free from a traditional classification as they can easily cross the boundaries of “materials science” and “informatics” and can move through information world.

students to study materials science and informatics independently, opportunities for cross-disciplinary interactions among students and faculties as well as to connect ideas from molecules to social innovation are woefully lacking. The characteristics and excellence of the program are to produce “multitasking individuals” who are unprecedented “knowledge professionals”. Knowledge professionals

are materials scientists systematically educated in state-of-the-art informatics or information scientists who understand and can systematically apply state-of-the-art materials research. Not only do they recognize the connection of materials to social services, but they are also passionate about creating new industries.

Good Practice



Tokyo Tech's original “Practice Schools” in Materials Informatics

Students propose solutions to companies' most pressing problems by utilizing material and information science

We implement “practice schools” at companies – as first-year doctoral program courses – at which faculty members and students work together for 6 weeks to access information throughout the company in large volumes and solve its pressing problems. This will be accomplished by applying students' knowledge and experience obtained during their studies at TAC-MI, which is a prerequisite to join. Practice schools in AY 2021 were conducted in cooperation with 2 sites : Asahi Kasei and AIST. Both institutions presented clear themes relating to their researched, and expected results such as direction for improvement and solutions. This work differs from students' usual doctoral research activities. However, even in the limited time frame of 6 weeks, they made remarkable achievements by effectively utilizing informatics and simulation techniques.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]

35 (FY 2019), 20 (FY 2020), 20 (FY 2021), 20 (FY 2022), 20 (FY 2023)

[Number of people engaged in the program] 89

[Students' affiliated schools and departments]

6 graduate schools, 13 departments

(School of Materials and Chemical Technology) Chemical Science and Engineering, Materials Science and Engineering

(School of Science) Chemistry, Physics

(School of Computing) Mathematical and Computing Science, Computer Science

(School of Life Science and Technology) Life Science and Technology

(School of Engineering) Mechanical Engineering, Systems

and Control Engineering, Electrical and Electronic Engineering, Information and Communications Engineering

(School of Environment and Society) Transdisciplinary Science and Engineering, Innovation Science

[WISE Cooperating Institutions]

2 public research institutes, 10 overseas universities, 34 companies

NIMS/AIST / Leiden University / McGill University / Max Planck Institute / Imperial College London / Cornell University / Sorbonne University / Tsinghua University / Beijing Normal University / Chulalongkorn University / Indian Institute of Technology Madras / AGC Inc. / ASAHI KASEI CORPORATION / ENEOS Corporation / FUJIFILM Corporation / Hamamatsu Photonics K.K. / Idemitsu

Kosan Co., Ltd. / JEOL Ltd. / JFE Steel Corporation / JX Nippon Mining & Metals Corporation / KANEKA CORPORATION / Kao Corporation / KYOCERA Corporation / LG Japan Lab Inc. / Mitsubishi Chemical Corporation / MITSUBISHI GAS CHEMICAL COMPANY, INC. / MITSUBISHI MINING&SMELTING CO., LTD. / NAGASE & CO., LTD. / NGK INSULATORS, LTD. / NGK SPARK PLUG CO., LTD. / Nissan Motor Co., Ltd. / Panasonic Corporation / SEIKO EPSON CORPORATION / SHOWA DENKO K.K. / Showa Denko Materials Co., Ltd. / Sumitomo Electric Industries, Ltd. / SUMITOMO CHEMICAL Co., Ltd. / TAIYO YUDEN CO., LTD. / TDK Corporation / TODA KOGYO CORP. / Toshiba Corporation / TOSOH CORPORATION / Toyo Seikan Group Holdings, Ltd. / TOYOTA MOTOR CORPORATION / ZEON CORPORATION

[Number of program graduates (including anticipated graduates)] 7 (FY 2021), 16 (FY 2022)

[Career paths after graduation (including anticipated paths)] 1 to universities, 16 to private enterprise, 1 to public research institute, 5 to others

(As of November 2022)

Message from WISE Cooperating Institution



HAMAKAWA Satoshi
Executive Officer and Director General of Department of Materials and Chemistry, National Institute of Advanced Industrial Science and Technology (AIST)

Developing Multitasking Individuals at Practice School

The National Institute of Advanced Industrial Science and Technology (AIST) has implemented to empower students to become multitasking individuals by the TAC-MI program with Tokyo Institute of Technology for five years. We would support the development of leaders having the practical ability through the discussion and suggestions toward the realization of a sustainable society at the Practice School.

Student's Voice



LEE Koomok
1st-year doctoral student, School of Materials and Chemical Technology, Department of Materials Science and Engineering

A Valuable Opportunity to Step up as a Professional Researcher

I research thin film growth and new multiferroic materials to develop magnetic memory devices with low-power consumption. This program's appeal is that we can learn versatile, cutting-edge research in a wide range of areas. By tackling concurrent practical issues through laboratory rotation and practice school, I can apply materials informatics to explore new materials effectively. From this valuable experience, I aim to broaden my research abilities and improve as a professional researcher.

Global Pro-Active Root Technology Program

[Program Coordinator] UMEDA Minoru (Executive Director · Vice President, Nagaoka University of Technology)
[Fields of diplomas] Doctor of Engineering
 Name of the program to be noted: WISE Program (Global Pro-Active Root Technology Program Course)
[URL] <https://www.nagaokaut.ac.jp/e/wise/>



Message from the President



KAMADO Shigeharu
President, Nagaoka University of Technology

Establishing a world-class base for applied root technology instruction

A variety of students participate in this outstanding graduate program, including those with corporate experience, those from other higher learning institutions, as well as international students. We believe that it is extremely important for students with such diverse backgrounds to actively engage with equally diverse faculty in various regions of the world in the pioneering of new academic fields. In addition, the application of "Root Technology" combining IT, power electronics, and materials science provides many solutions for new lifestyles. Numerous overseas universities, domestic and foreign enterprises, and local governments who support the idea of developing knowledge professional human resources are newly participating in the program. We look forward to your continued support.

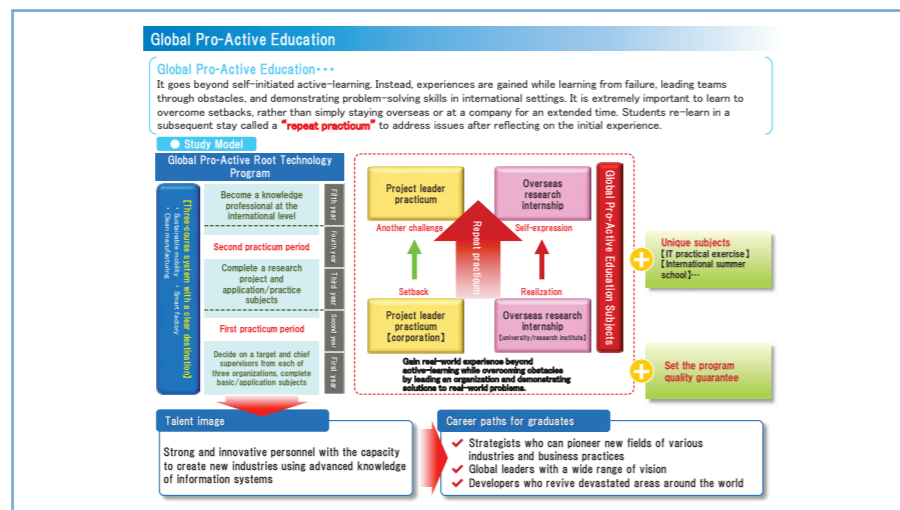
Development of human resources for root technologies able to contributing to the realization of SDGs

Our University was appointed as a World Hub University for the United Nations Sustainable Development Goals (SDGs) Goal 9 ("Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation") of the United Nations Academic Impact program (only one institution in the world appointed for each of the 17 SDG initiatives) as a university serving as a model for innovative efforts related to the SDGs. This is a testament to the recognition that the University and its graduates are contributing to infrastructure development, innovation, and sustainable industrialization globally. Our University is the only institution selected from the East Asia region, including Japan.

This program brings together the world's highest level of research capabilities and pioneering educational methods, to which the University has continuously made contributions. Specifically, the "Root Technology" that forms the basis of all industries and that integrates "IT," "materials

science," and "electrical engineering" contributes to the realization of the SDGs in collaboration with domestic and overseas industries and the world's leading research facilities. This is a five-year integrated education program for doctoral

candidates geared towards training knowledge professionals. In this program, the following four competencies will be honed to the "world-class level" through "Global Pro-Active Education": 1. Ability to pioneer innovative academic fields to

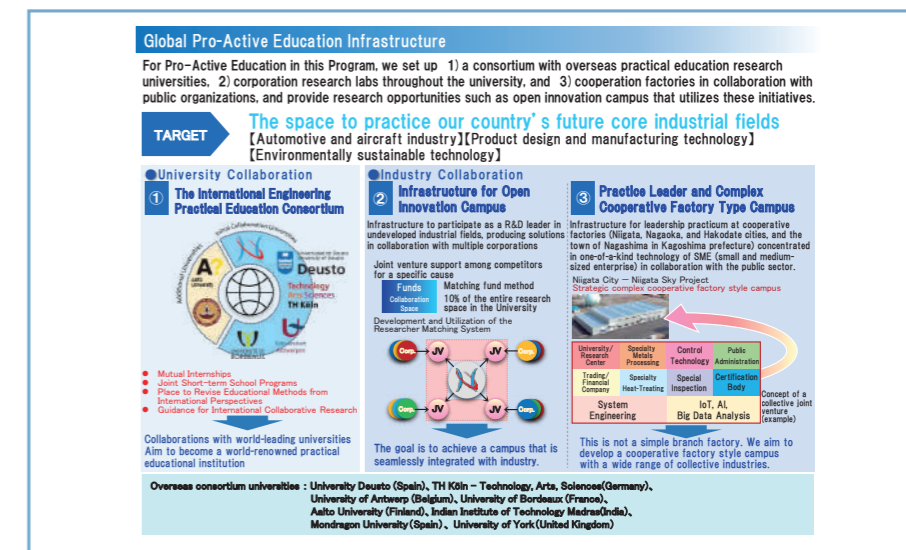


Characteristics of the teaching curriculum in global pro-active education, vision for human resources to be cultivated, and the professional career path of graduates

form the basis for a career as a doctorate-level human resource; 2. Advanced IT capabilities in AI, IoT, and data science that can continuously adapt in concrete ways without pretensions; 3. Human-driven pioneering able to open up unexplored areas while building and utilizing a diverse human resources network; 4. Design thinking and implementation capacities enabling the effective planning and proposal (production) of strategies demanded in the Society 5.0 era.

Features of a "Global Pro-Active Education" and Establishing a Suitable Environment

Since its foundation, our University has adopted pioneering teaching methods, such as requiring on-the-job training (long-term internships) at companies in Japan and overseas for approximate half-year terms. The world's top research achievements in the fields of materials science and power engineering, as well as unique practical competencies form the source of graduates empowered to play an active role as leaders. This program demonstrates pioneering teaching methods that can only be achieved through a long-term program of five years of master's and doctoral degree-focused instruction. That is what we refer to as "Global Pro-Active Education." "Global Pro-Active Education" incorporates a collaborative education method (dual system) in which advanced European industry members and academia collaborate, and share experiences to



Establishing an environment for realizing global pro-active education

foster leadership in various aspects of business and research. Students have already experienced a number of setbacks and difficulties while engaging in advanced work at their home and overseas destinations. After returning to the University, the students share their experiences and continue to work with their academic advisors and mentors to overcome these obstacles while studying during their second dispatch. This is a teaching method referred to as repetitive training, which serves to provide the experience of re-learning what was lacking in the university environment and

tackling challenges in the field. In addition, as the human resources who will lead the next generation of Society 5.0 must constantly incorporate new IT technologies, all students enrolled in this program will build proficiency with the latest IT technologies such as AI, IoT, and data science. In order to maximize the effectiveness of such learning, we will promote the establishment of a suitable learning environment together with collaborating universities, research institutes, members of industry, and government agencies in Japan and abroad.

Good Practice



Idea Development Dojo to strive and train together with corporate employees

The Idea Development Dojo opened in October 2019 as an education program for human resource development focused on producing ideas for new innovation. Its activities are carried out using the SPRIX Dome that was built thanks to the generosity of SPRIX. At the Dojo, students and young R&D personnel of companies have been working together to hone their ideas with "the eight key skills for idea development," using these ideas to develop and carry out the productization and branding of new products with many successful results. We look forward to the participation of more companies who wish to carry forward projects with us.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)] 15 (FY2019), 15 (FY2020), 15 (FY2021), 15 (FY2022), 15 (FY2023)
[Number of people engaged in the program] 62
[Students' affiliated schools and departments]
 1 graduate school, 4 departments
 (Graduate School of Engineering) Science of Technology Innovation, Master's Program in Engineering (Mechanical Engineering / Electrical Electronics and Information Engineering / Information and Management Systems Engineering / Materials Science and Bioengineering / Civil

and Environmental Engineering / Nuclear Technology), System Safety Engineering, Doctoral Program in Engineering (Energy Engineering / Information Science and Control Engineering / Materials Science / Civil Engineering and Bioengineering)
[WISE Cooperating Institutions]
 13 universities, 13 public research institutes, 4 local public bodies
 Aalto University / Mondragon University / University of York / Bristol University / University of Sheffield / University of Leeds / University of Deusto / Indian Institute of Technology Madras / University of Antwerp / University of Bordeaux / TH Köln-

Technology, Arts, Sciences / Friedrich-Alexander Universität Erlangen-Nürnberg, FAU / Universität Bielefeld / Swiss Federal Laboratories for Materials Science and Technology / Sankyo Tatemaya, Inc. / Sumitomo Electric Industries, Ltd. / Nagaoka Power Electronics Co., Ltd. / Unipulse Corporation / Fuji Electric Co., Ltd. / SANKI ENGINEERING CO., LTD. / Japan Business Create Co., Ltd. / IBSYSTEM CO., LTD. / Japan Fine Ceramics Association / Niigata Industrial Creation Organization / The Institute of Applied Energy / National Institute of Advanced Industrial Science and Technology / Niigata City / Nagaoka City / Sado City / Shibata City

[Number of program graduates (including anticipated graduates)] 5 (FY2021), 1 (FY2022)
[Career paths after graduation (including anticipated paths)] 2 to private enterprise, 1 to public research institute, 1 to government agency, 2 to others (As of November 2022)

Message from WISE Cooperating Institution



Dr. Sebastian Vaucher
Swiss Federal Laboratories for Materials Science and Technology - Researcher

Research internship curriculum for promoting world-class international joint research

I feel that the students of the WISE Program understand their strengths very well and have the abilities to demonstrate them. It is because of this that we can entrust them with creative work. Switzerland and Japan have very similar mentalities for approaching engineering and other forms of craft. Switzerland is more conservative in this respect, although that is what has distinguished its industries and tradition. I look forward to our intercultural exchange that is sure to bring about innovation.

Graduate's Voice



Tran Phuong Thao
The National Institute for Environmental Studies (PI)

Real feeling of growth through experiences in different environments

What was most inspiring for me was my experience at The National Institute for Environmental Studies, where I was dispatched under a research internship. I acquired more recent perspectives and concepts through research guidance from people other than my supervisor. I was also able to gain an understanding of where I stand as a researcher and consider my future career path. I want to produce research outcomes that are truly useful for promoting the SDGs, based on the concepts I learned through this program.

Graduate Program of Transformative Chem-Bio Research

[Program Coordinator] YAMAGUCHI Shigehiro (Professor, Institute of Transformative Bio-Molecules, Nagoya University)
[Fields of diplomas] Doctor of Science, Doctor of Engineering, Doctor of Agricultural Sciences, Doctor of Pharmaceutical Sciences
 Name of the program to be noted: Graduate Program of Transformative Chem-Bio Research
[URL] <https://www.itbm.nagoya-u.ac.jp/gtr/en/>



Message from the President



SUGIYAMA Naoshi
President, Nagoya University

Breakthrough in challenges confronting society and technology in chemistry and biology Developing researchers who will advance interdisciplinary frontiers and become future experts

The advancement of science and technology is rapidly changing the world. Achieving a breakthrough in the challenges confronting society and technology requires researchers who will not only promote existing areas of their individual studies but also daringly explore interdisciplinary frontiers and open up new horizons.

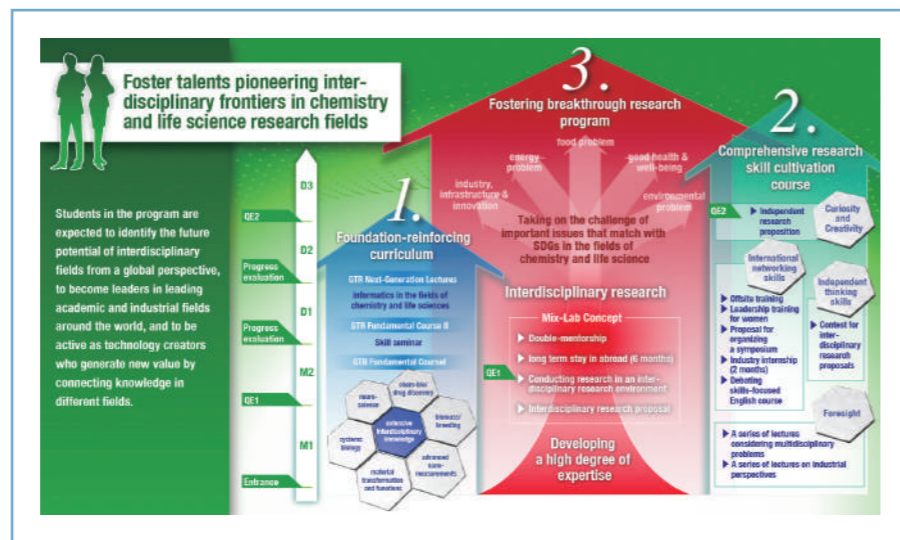
GTR intends to develop such researchers who will advance interdisciplinary frontiers and become future experts. For this purpose, GTR provides practical opportunities to help acquire genuine research power to open up interdisciplinary studies while conducting studies in different research environments and performing challenging innovative interdisciplinary research. GTR's mindset and its method of exploring interdisciplinary frontiers are spreading throughout the entire university and are closely reflected in its planning of doctoral education programs.

Beyond interdisciplinary frontiers to achieve breakthroughs

To achieve sustainable development of society, the human race must solve many challenges, including environmental and energy problems, stable food production, the development of materials leading to industrial and technological innovations, and life science research that contributes to the promotion of health. Accordingly, the roles of chemistry and life science research are expected to increase in importance. To make breakthroughs in these challenges confronting science and society, we need to pioneer interdisciplinary research fields that will open new horizons. To overcome the walls between conventional disciplines that stand in the way of such efforts, an excellent research power to break through is essential. The research power to break through consists of two elements: the power to overcome and the power to connect. The former involves a frontier spirit, power of execution, and confidence that can be developed only by taking the initiative in carrying out attractive and high-quality research. The latter involves connecting

different disciplines, leading to the creation of innovative ideas for solving problems through free and open-minded discussions. The Graduate

Program of Transformative Chem-Bio Research (GTR) intends to cultivate this research power to break through and train researchers who will



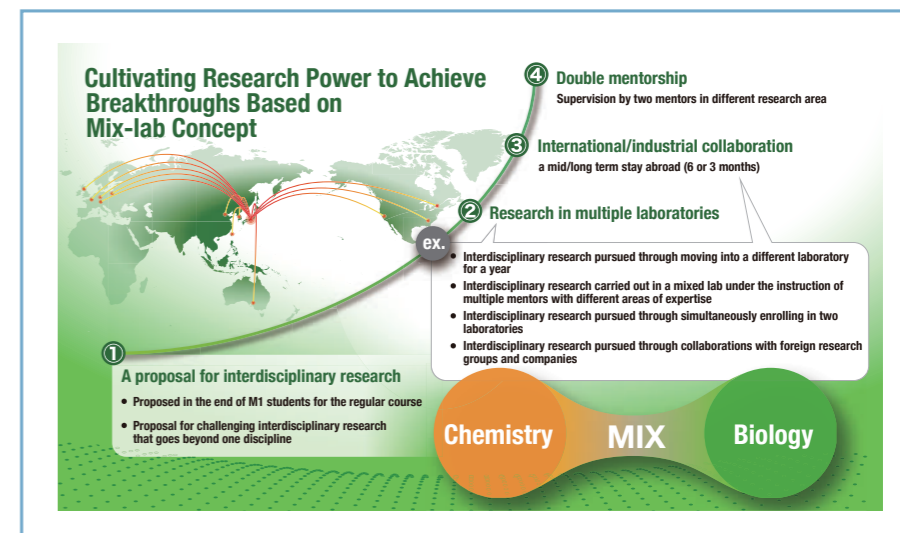
Three powers fostered by GTR: basic knowledge across chemistry and life science, comprehensive research power to advance, and research power to break through only acquired by active involvement in interdisciplinary research.

advance interdisciplinary frontiers and create the knowledge of the future. Each year, GTR trains around 30 researchers who have acquired an excellent research power to break through and who challenge themselves to create new knowledge that will aid in the development of society.

The "Mixed Lab" Concept offers optimal opportunities

GTR consists of three pillars of programs and courses. A high degree of expertise is required for conducting high-quality cutting-edge research, and a broad range of knowledge must be acquired with curiosity to launch into different fields of study. To achieve this, GTR provides a curriculum aimed at developing foundational strengths, covering a wide range of disciplines including material transformation/functions, advanced nano-measurement, chem-bio/drug discovery, systems life science, neuroscience, and biomass/breeding. GTR also offers a course for cultivating comprehensive research power. With a variety of activity plans, the course develops foresight, inventiveness, research creativity, ability to create personal connections and human networks, and an international mindset. The last and the most important of the three is the program for developing research power to break through.

The Institute of Transformative Bio-Molecules (ITbM), the parent organization of GTR, has produced many prominent findings that could have materialized only through interdisciplinary research

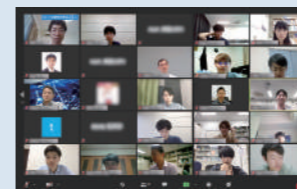


The research power to break through via the mixed lab concept involves four steps: early proposal of interdisciplinary study, research in a different environment, working in foreign organizations, and receiving guidance from two mentors.

in chemistry and biology. The key to success lies in the mixed lab concept, in which researchers of different disciplines work together to generate innovative ideas through daily discussions, and then collaborate to realize these ideas. The mixed lab, which allows world-class researchers to enthusiastically work on interdisciplinary studies, offers an optimal opportunity for researchers in training. The GTR program further expanded the mixed lab concept to develop research power to break through. This program encourages students to create a proposal for interdisciplinary research

at an early stage so that they establish a strong mindset for crossing boundaries. They are then required to do a joint study in an interdisciplinary environment (in multiple laboratories) with a foreign collaborating institution or a company. At the final stage, students complete their doctoral dissertation under the guidance of two mentors. Thus, GTR trains capable researchers who will play a pivotal role in the next generation, making full use of the know-how accumulated in ITbM in its realization of the mixed lab concept.

Good Practice



Original and Creative Planning on the Part of GTR Students Make the Program Even More Attractive

GTR screens and supports the events which students plan and execute themselves. The events conducted thus far include exchange programs among the students under COVID-19 pandemic conditions, lectures by students on different disciplines, projects to promote communication with foreign students, and tours of laboratories of different disciplines. In addition, some of the ideas for lectures by the Graduate School and the GTR Program that qualify for credits, have been initiated by students. The planning conducted by graduate students, therefore, embodies the spirit of the GTR Program, which intends to create an interdisciplinary frontier, and has become an excellent opportunity for creating and fostering cohesive and collaborative networks among the students.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)] 60 (FY 2018), 30 each (FY 2019 - 2021), 30 (FY 2022), 30 (FY 2023)
[Number of people engaged in the program] 62
[Students' affiliated schools and departments] 4 graduate schools, 12 departments (After restructuring of schools in April, 2022 : 4 graduate schools, 11 departments)
 (Graduate School of Science) Material Science (Chemistry) (After restructuring of schools in April, 2022 : Natural Science (Group of Chemistry)), Biological Science (After restructuring

of schools in April, 2022 : Natural Science (Group of Biology)), International Collaborative Programme in Science between the University of Edinburgh and Nagoya University
 (Graduate School of Engineering) Molecular and Macromolecular Chemistry, Materials Chemistry, Biomolecular Engineering
 (Graduate School of Bioagricultural Sciences) Forest and Environmental Resources Sciences, Plant Production Sciences, Animal Sciences, Applied Biosciences, International Collaborative Program in Agricultural Sciences between Nagoya University and the University of Western Australia

(Graduate School of Pharmaceutical Sciences) Basic Medicinal Sciences
[WISE Cooperating Institutions] 3 public research institutes, 1 university, 2 private enterprises, 1 organization
 Institute for Molecular Science, National Institutes of Natural Science / National Institute for Basic Biology, National Institutes of Natural Science / the Graduate University for Advanced Studies / Institute of Physical and Chemical Research / Kaneka Co. / Konica Minolta, Inc. / ITbM-GTR consortium

[Number of program graduates (including anticipated graduates)] 2 (FY 2020), 22 (FY 2021), 29 (FY 2022)
[Career paths after graduation (including anticipated paths)] 14 to universities, 28 to private enterprises, 1 to public research institute, 10 to others

(As of November 2022)

Message from WISE Cooperating Institution



SHINOZAKI Kazuo
Senior Advisor, RIKEN Center for Sustainable Resource Science

Jointly training researchers able to solve global environmental issues

Institute of Transformative Bio-Molecules (ITbM), the parent organization of Graduate Program of Transformative Chem-Bio Research (GTR), and RIKEN Center for Sustainable Resource Science (CSRS) have been holding joint workshops every year since 2015, pursuing a broad range of joint research and promoting personnel exchanges. Through our concerted efforts with GTR, CSRS intends to contribute to the production of excellent researchers who are capable of solving global environmental and resource-related problems.

Graduate's Voice



KAJIWARA Keiji
Future Creation Division, Advanced Core Technology Center, Technology Development Headquarters, Konica Minolta Inc.

Rare chance to see other areas of study to propose meaningful studies

I joined GTR as I thought hands-on experience in other fields would make my own studies more interesting and useful. The greatest advantage of joining GTR was that I could experience the importance of learning about the challenges and cutting-edge technologies in other disciplines which would not be possible if I stayed in my lab. As I now work for a company, what I learned in GTR is foundational to my mindset of "projects of value to both company and society."

DII (Deployer-Innovator-Investigator) Collaborative Graduate Program for Accelerating Innovation in Future Electronics

[Program Coordinator] AMANO Hiroshi (Professor, Director of the Institute of Materials and Systems for Sustainability Center for Integrated Research of Future Electronics, Nagoya University)

[Fields of diplomas] Doctor of Engineering

Name of the program to be noted: DII Collaborative Graduate Program for Accelerating Innovation in Future Electronics

[URL] <https://www.dii.engg.nagoya-u.ac.jp/en/>



Message from the President



SUGIYAMA Naoshi
President, Nagoya University

Fostering of diverse doctoral human resources who connect science and technology to innovation

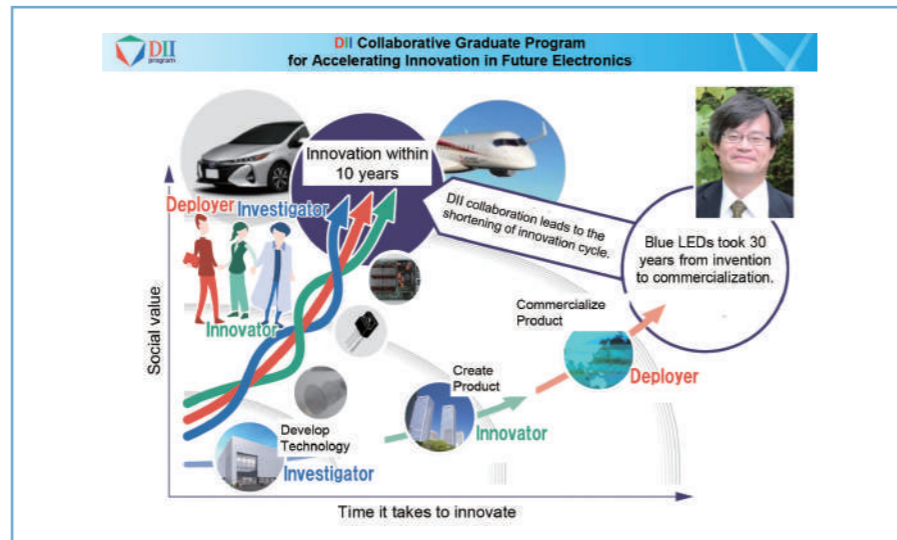
Making effective use of scientific discoveries in society is extremely difficult and takes time. It is also difficult to achieve on your own. To overcome these challenges, the DII (Deployer-Innovator-Investigator) program fosters leaders in the field of electronics from three types of perspective: human resources who explore challenges in this field to promote research, human resources who translate research results into specific products, and human resources who create social value and start businesses. To this end, we have developed a system of collaboration with industry, national research institutes, overseas research institutes, and universities and also launched the Doctoral Education Consortium. We will make every effort to promote the project with the hope that it will produce outstanding human resources needed by the world.

Accelerating product innovation from 30 years to 10 years

In this program, on the basis of his experience that it took 30 years from the start of research and development on gallium nitride crystal to practical use of blue LEDs, Prof. Hiroshi Amano (Program Coordinator) fosters three types of human resources who will play different roles in the rapid and continuous creation of product innovation in future electronics. Since the key to accelerating innovation is for the three types of human resources, we named this "DII collaboration," with DII standing for Deployer, Innovator, and Investigator. Based on this idea (DII), the program offers a curriculum to nurture excellent human resources according to the vision of the future imagined by each student while setting improvement of abilities in one's field of expertise and acquisition of experience and the ability to work collaboratively in teams with different types of human resources. This program accepts students with a keen interest in manufacturing and products. More specifically, in addition to students with the basic academic skills necessary to acquire high levels of expertise and comprehensive

capabilities, as well as the motivation to explore the frontiers of engineering and create new value, the following four items are added as qualifications for participating in the program: (1) a higher level of

basic academic capabilities; (2) strong motivation and enthusiasm to explore and practice leading-edge engineering and disseminate it in society; (3) the ability to discuss, disseminate information



To complete the acceleration of product innovation, which used to take 30 years, within 10 years through collaboration between the three types of human resources (DII)

DATA

[Number of students recruited (For FY2023, number of students to be recruited)] 15 (FY2018), 20 each (FY2019-FY2023)

[Number of people engaged in the program] 100

[Students' affiliated schools and departments]

1 graduate school, 13 departments
<Graduate School of Engineering> Electronics, Electrical Engineering, Information and Communication Engineering, Materials Physics, Applied Physics, Materials Process Engineering, Materials Design Innovation Engineering, Chemical System Engineering, Mechanical Systems

Engineering, Aerospace Engineering, Micro-Nano Mechanical Science and Engineering, Energy Engineering, Applied Energy

[WISE Cooperating Institutions]

3 universities, 3 overseas research institutes, 3 domestic research institutes, 18 companies
Innovation for High Performance Micro-electronics / Interuniversity Microelectronics Center / Office ATOQS / Japan Aerospace Exploration Agency / National Institute for Materials Science / National Institute of Advanced Industrial Science and Technology / KAPION Inc. / SCIOCS

COMPANY LIMITED / DENSO CORPORATION / TOSHIBA CORPORATION / TOYOTA CENTRAL R&D LABS., INC. / Hitachi, Ltd. Central Research Laboratory / FUJITSU LABORATORIES LTD. / MiraiProject Corporation / Sumitomo Electric Industries, Ltd. / National University of Singapore / TAIYO NIPPON SANCO CORPORATION / Tokyo Electron Ltd. / TOYODA GOSEI CO., LTD. / Nissan Motor Co., Ltd. / Furukawa Electric Co., Ltd. / Mitsubishi Electric Corporation / Nanjing University / Japan Venture Capital Association / NC State University / Forschungszentrum Jülich / MIRISE Technologies Corporation

[Number of program graduates (including anticipated graduates)] 10 (FY2022)

[Career paths after graduation (including anticipated paths)] 2 to universities, 4 to private enterprises, 4 to others

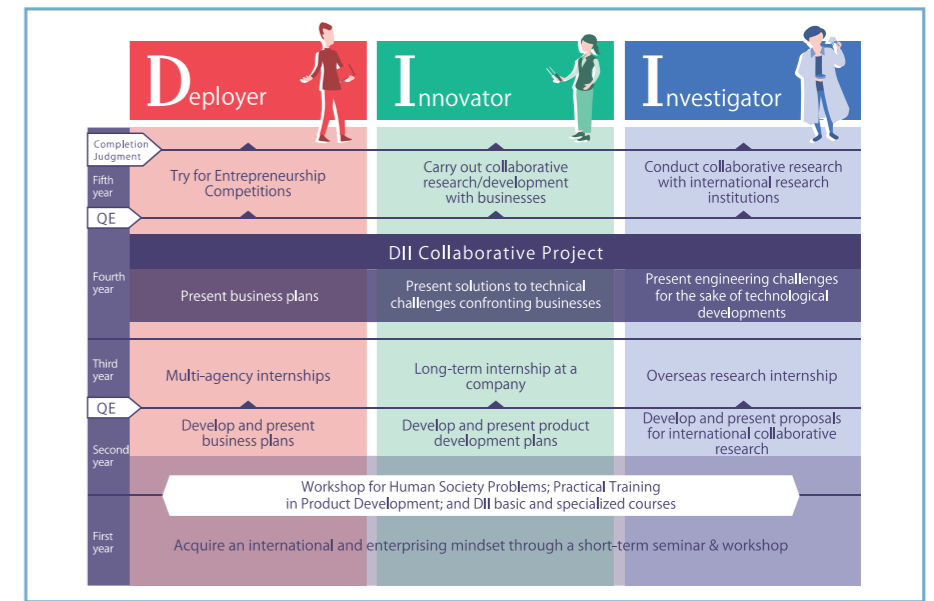
(As of November 2022)

and practice in the international arena; and (4) the initiative to take proactive and independent actions.

Close guidance by industry-government-academic collaboration

In this program, researchers and engineers from companies, national research institutes and other institutions serve as mentors and provide students with direct guidance over a long period of time. All students participate in the short-term overseas internship immediately after the start of the program. In the second half of the second year, each student selects courses from among those aimed at each Deployer, Innovator, and Investigator type and works to acquire necessary skills. In the DII basic subjects, the environment for e-Learning will be enhanced to study anytime and anywhere. English-language education and transferable skills training will also be provided to improve international communication skills. In the Workshop for Human Society Problem Challenge, leading figures in a variety of industries are invited to give lectures to allow students to learn about the various challenges related to the creation of future electronics as well as ideas and technologies to solve them.

In Long-term Internship, students study in host organizations for six months. Deployer course students visit multiple organizations, such as venture companies, to establish a variety of personal relationships and develop their



Curriculum to acquire reliable basic skills to conduct the DII Collaborative Project and improve skills in fields of expertise according to the three types

international perspectives, foresight, and planning abilities. The Innovator course offers a long-term internship at a company where students learn about the key points for completing product development and aim to launch collaborative research. Investigator course students take up long-term residence and conduct collaborative research at overseas institutes. They deepen their studies, develop the foundation for international collaborative research, and write international co-

authored papers.

The DII Collaborative Project in the fourth year is the program's most ingenious initiative and aims to enable students to experience DII collaboration and understand the importance of cooperation. Teams of different types of DII students are formed based on the abilities, knowledge and experience they obtained through their internships, and they work together to solve challenges for future electronics in the real world.

Good Practice



DII Collaborative Project with external collaborators and cooperating institutions

In the "DII Collaborative Project," which takes place over a long time around the 2nd year of the doctoral course, students who are aiming to acquire each DII skill make teams and challenge to create products to solve social issues. In this collaboration with students, faculties, and society members of not only DII program but also outside the program, and with advice from mentors in industry and national institutes, team members share the roles of DII and work on market research, technology development, product creation, and social implementation. They have acquired knowledge and skills for the creation of future electronics, and have achieved prizes in off-campus business plan contests and obtain external funds by the students themselves.

Message from WISE Cooperating Institution

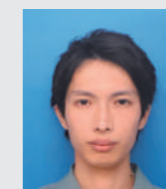


KASHIWAGI Yusaku
Vice President, S-Technology Development Center, Tokyo Electron Technology Solutions Limited

Fostering future colleagues to move forward through the trackless desert

Address social issues, create solutions, and to come up with implementable solutions. Deployer/Innovator/Integrator bring about innovation collaboratively in DII program. Experiencing this process should pave the way to survive the uncertain future. Semiconductor industry is anticipating a similarly uncertain future where existing ways of thinking are not viable. I hope that DII program will be effective in fostering our future colleagues so that we can pave our way and move forward through the trackless desert called future together.

Student's Voice



MORITA Tomoya
First degree of doctoral course student, Department of Micro-Nano Mechanical Science and Engineering, Graduate School of Engineering, Nagoya University

Valuable experiences for thinking about "creating innovation"

I joined this program because I felt that it is essential for researchers to have a perspective on how their research can be returned to society and how it can actually be useful. The experience of cultivating an entrepreneurial spirit and thinking about creating innovation with highly motivated colleagues has been extremely valuable to me. I have also been able to acquire a global perspective through international program activities, which has been very fulfilling.

[Office and section in charge] DII Office **[Inquiries]** 052-747-6985

Innovation of Advanced Photonic and Electronic Devices

[Program Coordinator] KIMOTO Tsunenobu (Professor Graduate School of Engineering, Kyoto University)
[Fields of diplomas] Doctor (Engineering), Doctor (Science), Doctor (Informatics)
 Name of the program to be noted: Innovation of Advanced Photonic and Electronic Devices
[URL] <http://www.e-takuetsu.ceppings.kyoto-u.ac.jp/en/>



Message from the President



MINATO Nagahiro
President, Kyoto University

Through the WISE Program, Kyoto University seeks to cultivate advanced “knowledge professionals” who will play key roles in industry, academia, and government

In 2021, Kyoto University established the Graduate School Education Support Office to enhance its liberal arts and general education courses, and centrally manage its diverse graduate degree programs. The new office promotes collaboration and cooperation among graduate schools in diverse aspects of education and research. It will ensure that the university continues to provide unique high-quality programs under the government’s Doctoral Program for World-leading Innovative & Smart Education (WISE Program). WISE programs are provided in close cooperation with leading companies and world-class research institutes in Japan and leading universities around the world with the aim of cultivating advanced “knowledge professionals” and promoting the reform of the university’s graduate schools.

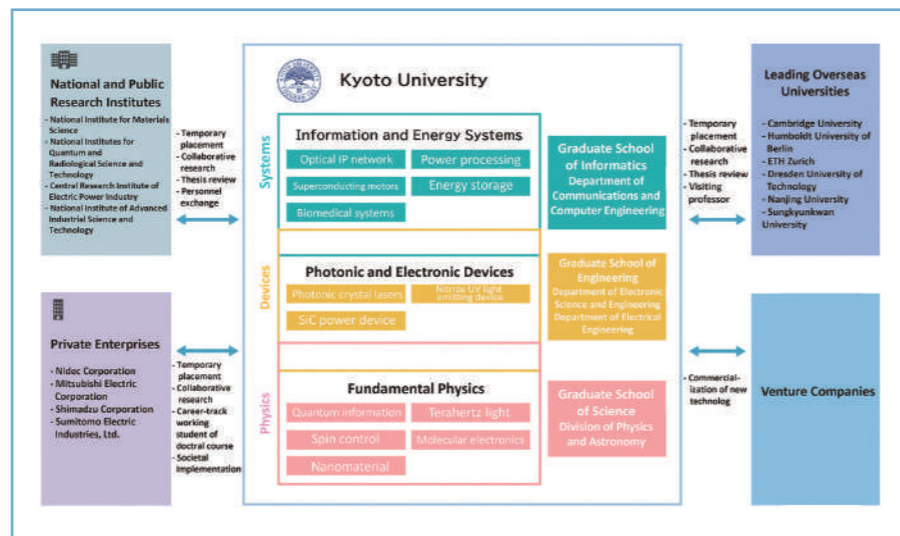
Objective

Human society is currently entering a period of significant transformations focused on electronics such as the IoT (Internet of Things) revolution, wearable information devices, self-driving and electric cars, and smart grid. In such a society, many high-performance photonic and electronic devices function as the core of the hardware while being integrated, and require further performance enhancement and creation of new functions in the future. On the other hand, the explosive expansion of knowledge, due to advances in science and technology in recent years, has given rise to the problem of a lack of comprehensive outlook as a significant subdivision of specialized fields was developed. In particular, it is considered that specialized education in a specific discipline is not enough to solve issues of a wide range of fields of human society such as advanced information-oriented society, environment, energy, and artificial intelligence. It is essential to nurture talents who can make right decisions while looking at everything, from fundamental theories to system application, with a holistic perspective, resolve challenging

issues, and lead the critical fields in the future.

At Kyoto University, we have our original scientific concepts and key technologies that should be called "Originated in Our University". This WISE program promotes combined and

vertically integrated education focused on the field of photonic and electronic devices, extending from deepening the understanding of fundamental physics and theory to the management and application of systems and information. Also, we



Scheme of Innovation of Advanced Photonic and Electronic Devices

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]

FY2019-FY2023 Master 15, Doctor 5 (each year)

[Number of people engaged in the program] 39

[Students' affiliated schools and departments]

3 graduate schools, 4 departments

(Graduate School of Engineering) Electronic Science and Engineering, Electrical Engineering

(Graduate School of Science) Physics and Astronomy

(Graduate School of Informatics) Communications and Computer Engineering

[WISE Cooperating Institutions]

6 universities, 2 organizations, 2 public research institutes, 4 private enterprises

University of Cambridge / Humboldt University of Berlin

/ ETH Zurich / Dresden University of Technology / Nanjing University / Sungkyunkwan University / National Institute for Materials Science / National Institutes for

Quantum and Radiological Science and Technology / Central Research Institute of Electric Power Industry / National Institute of Advanced Industrial Science and Technology

/ Nidec Corporation / Mitsubishi Electric Corporation / Shimadzu Corporation / Sumitomo Electric Industries, Ltd.

Quantum and Radiological Science and Technology / Central Research Institute of Electric Power Industry / National Institute of Advanced Industrial Science and Technology

/ Nidec Corporation / Mitsubishi Electric Corporation / Shimadzu Corporation / Sumitomo Electric Industries, Ltd.

[Number of program graduates (including anticipated graduates)] 2 (FY 2020), 13 (FY 2021), 12 (FY 2022)

[Career paths after graduation (including anticipated paths)] 5 to universities, 7 to private enterprise, 2 to public research institute, 2 to others

(As of October 2022)

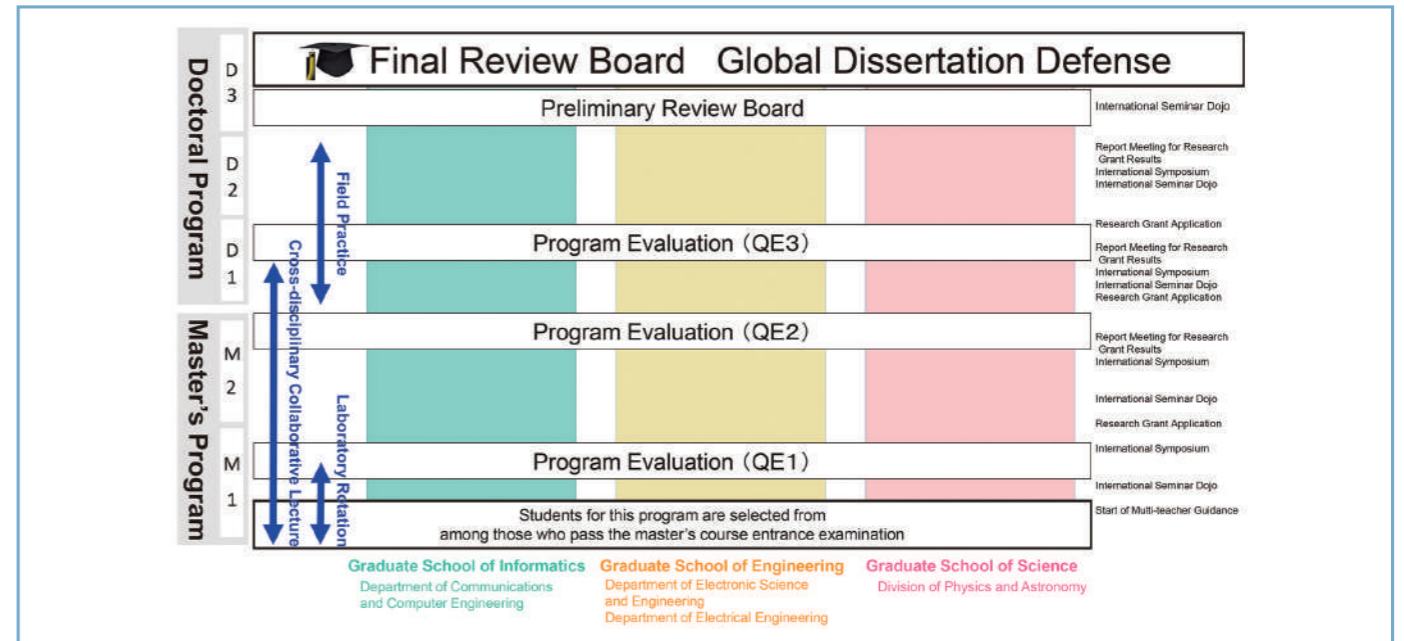


Image of Master's / Doctoral Education and Degree Examination

collaborate with private enterprises representing Japan around the world, national and public research institutes with the highest level of research capabilities, and top-class and leading overseas universities. Moreover we systematically implement education and quality assurance of a global standard and raise world-class professionals of knowledge who create "Advanced Photonic and Electronic Devices" through an integrated 5-year

doctoral degree program.

Nurture Talent

With the common philosophy of "Challenging the physical limits and developing an information-oriented and energy-saving society", the WISE Program (Doctoral Program for World-leading Innovative & Smart Education) aims at nurturing

international pioneers who can lead the field of advanced photonic and electronic devices as well as related academic fields, specifically, those with the following abilities.

1. Originality
2. Holistic perspective
3. Challenge ability
4. International mindedness
5. Self-dependence

Good Practice



"e-Wise Cafe", a place for students to interact with other research fields or faculty members, which is planned and operated by the students themselves

Since 2019, we have been holding the "e-Wise Cafe" as a place to promote the interaction among students from different fields as well as faculty members. The e-Wise Cafe is planned, operated, and lectured by the students themselves. In the lecture, they introduce their research contents to other students in different research fields in an easy-to-understand manner.

In addition, they introduce the hardships and ingenuity of their own studies, failure stories, and personal life or their hobbies. After the lecture, they have a round-table conference to further interact with each other.

Message from WISE Cooperating Institution

Contributing to human resource development at the WISE Program "Innovation of Advanced Photonic and Electronic Devices" with External Stimulation



OHSIMA Takeshi

Director, Quantum Beam Science Research Directorate/National Institutes for Quantum and Radiological Science and Technology

I am aware that the development of professionals of knowledge is steadily conducted by the multidisciplinary education and research beyond the framework of research fields, institutions and countries. As a researcher belonging to a collaborative institution that conducts research and development from basics to applications in the fields such as quantum beams, nuclear fusion, materials science, life science, and medicine, we would like to provide students with opportunities to gain various experiences, giving a good stimulus.

Student's Voice

New ideas come up through interaction with researchers in various fields



HARA Masahiro

Graduate School of Engineering, Department of Electronic Science and Engineering, 2nd year doctor's student

I decided to join this program attracted to crosscutting education, which is one of the features of this program. I've been engaging in fundamental research on semiconductor material and device. Even though my research interests mainly include basic material properties, I feel it is essential to always think about how my research will make practical devices or systems better. I believe this program will give me a valuable experience to get acquired such a wide perspective toward academic discipline not limited to my research field.

[Office and section in charge] Office of "Innovation of Advanced Photonic and Electronic Devices" Doctoral Program for World-leading Innovative & Smart Education
[Inquiries] 075-383-2494

Transdisciplinary Program for Biomedical Entrepreneurship and Innovation

[Program Coordinator] MORII Eiichi (Professor, Graduate School of Medicine, Osaka University)
[Fields of diplomas] Doctorate (Medicine), Doctorate (Health Sciences), Doctorate (Nursing), Doctorate (Dentistry), Doctorate (Pharmaceutical Sciences), Doctorate (Pharmacy), Doctorate (Frontier Biosciences), Doctorate (Science), Doctorate (Engineering)
 Name of the program to be noted: Completion of Transdisciplinary Program for Biomedical Entrepreneurship and Innovation
[URL] <https://www.med.osaka-u.ac.jp/pub/bei/en/>



Message from the President



NISHIO Shojiro
President, Osaka University

Offering a new program to train doctoral students with practical research and entrepreneurial (social implementation) skills to drive innovation in medical, dental, pharmaceutical, and life sciences

Osaka University has envisioned becoming a university dedicated to creating a society where each member leads a meaningful and fulfilling life. Based on this vision, we aim to cultivate individuals capable of tackling various societal issues through co-creation with society.

Our unique program fosters students' practical research skills to achieve internationally superior research results in the fields of medicine, dentistry, pharmacy, and life sciences, as well as entrepreneurial (social implementation) skills to effectively translate their research results for the benefit of the society and to make innovations. Total of 95 students are improving themselves through healthy academic competition to become PhD graduates who will contribute to the prosperity of our society, by such means as improving the quality of life (QOL) and eradicating the threat of various diseases.

We hope that this program will produce opinion leaders who are globally active in creating a society where everyone can enjoy a comfortable and happy life.

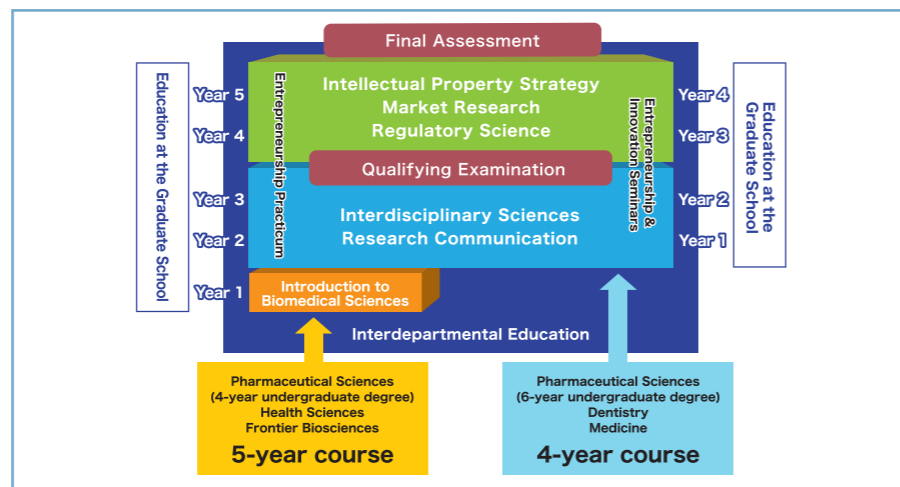
Professionals with research & entrepreneurial skills

Japanese biomedical research, despite producing various original and internationally superior research findings, is lagging behind that of other countries in translating the results of basic research for application to the society. At Osaka University, we have been developing doctorally qualified human resources with practical research skills to produce internationally superior research results and oversee biomedical science, as well as entrepreneurial skills to implement the research results in society. Such human resources will be the experts in knowledge that are needed in this society.

Students develop their practical research skills through discussion with our outstanding researchers regarding the techniques to overcome scientific challenges. Moreover, these discussions regarding the challenges they face in student-centered research, which is an education system

unique to our graduate school, strengthens their practical research skills. In addition, students develop an ability to examine their research by

interacting with researchers working in fields different from their own, making them aware not only of advanced scientific expertise but also of the



Students receive training for "practical research skills" and "entrepreneurial skills" in addition to the conventional education received in graduate school.

uniqueness of their own research.

To develop their entrepreneurial skills, we offer lectures to provide students with detailed knowledge about the market and needs analysis, intellectual property strategy, and regulatory science, which is later put into practice by students. Furthermore, by visiting the companies that participate in social implementation of research findings, students cultivate a bold attitude that involves taking high risks and learn social implementation through their experience.

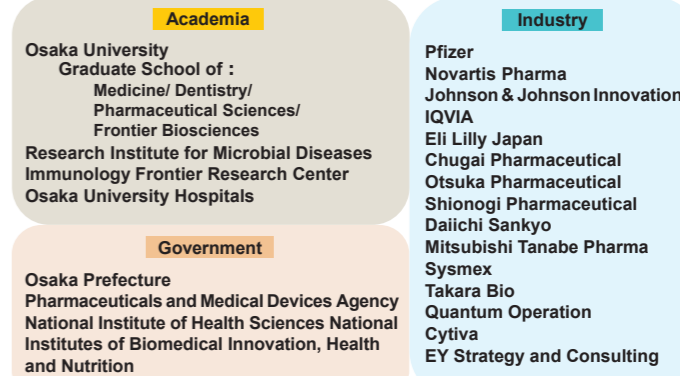
Quality Assurance of the Degree

At the end of the 3rd year of the 5-year program (the 2nd year of the 4-year program), students will take the Qualifying Examination (QE). In the QE, practical research skills acquired through practice will be assessed by examining originality and international competence in research that will lead to social implementation. At the end of the program, students will take the Final Assessment. In the assessment, entrepreneurial skills will be assessed. Students present own research for its implementation to society and its problem-solving plan. In addition, students defend their doctoral thesis at the graduate school of their affiliation.

Academia-industry-government network

To foster "experts in knowledge" who translate research results for application in the society based on their ability to investigate biomedical science, we must work with other graduate schools and introduce education that is linked to society, in

A global academia-industry-government network



We promote an education system in which industry, government, and academia together develop qualified doctoral human resources possessing both practical research skills and entrepreneurial skills.

addition to offering the conventional specialized education provided in graduate schools.

Therefore, our program promotes education through a global academia-industry-government network.

Osaka University has many scientists who lead cutting-edge research and produce internationally outstanding research results in areas such as immunology and autophagy. This provides students with an environment in which their practical research skills are strengthened through active cross-departmental research and education. In partnership with the Graduate School of Medicine, Dentistry, and Life Sciences, Research Institute for

Microbial Diseases, Immunology Frontier Research Center, Osaka University Hospital, and Dental Hospital, we encourage students to develop their "practical research skills," which is the ability to consider biomedical science and perform basic research. Furthermore, Osaka Prefecture, PMDA, National Institute of Health Sciences, National Institute of Biomedical Innovation, Health and Nutrition, and domestic and overseas large pharmaceutical companies participate in our education activities, providing students with various opportunities to develop their "entrepreneurial skills".

Good Practice



Familiarization with sites participating in societal implementation of biomedical science

Students visit companies and laboratories that foster societal implementation of biomedical science research findings, gaining workplace experience. While deepening their understanding of how companies are responding to society's unmet needs, and learning about open innovation and the corporate research environment and mindset, students will discuss their own research with corporate researchers, fostering connections between industry and academia. Students visit the National Institute of Health Sciences (photograph on the left), which is at the cutting edge of regulatory science, to gain insights into current research and development focused on scientific measures aimed at ensuring pharmaceutical safety and efficacy, and to learn how this research directly contributes to improving people's living conditions.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]

15 (FY2018), 30 each (FY2019-FY2023)

[Number of people engaged in the program] 116

[Students' affiliated schools and departments]

4 graduate schools, 6 departments
 (Graduate School of Medicine) Medicine, Health Sciences
 (Graduate School of Dentistry) Oral Science
 (Graduate School of Pharmaceutical Sciences)

Medical Pharmacy, Advanced Pharmaco-Science (Graduate School of Frontier Biosciences) Frontier Biosciences

[WISE Cooperating Institutions]

15 companies, 1 independent administrative agency, 1 national institute, 1 national research and development agency, 1 local public body
 Pfizer Inc. / Novartis Pharma K.K. / Johnson & Johnson Innovation / IQVIA Solutions Japan K.K. / Eli Lilly Japan K.K. / Chugai Pharmaceutical Co., Ltd. / Otsuka

Pharmaceutical Co., Ltd. / Shionogi & Co., Ltd. / Daiichi Sankyo Company, Limited / Mitsubishi Tanabe Pharma Corporation / SYSMEX CORPORATION / Takara Bio Inc. / Quantum Operation, Inc. / Cytiva / EY Strategy and Consulting Co., Ltd. / Osaka Prefectural Government, Department of Commerce, Industry and Labor / Pharmaceuticals and Medical Devices Agency / National Institute of Health Sciences / National Institutes of Biomedical Innovation, Health and Nutrition

[Number of program graduates (including anticipated graduates)] 0 (FY2021), 0 (FY2022)

[Career paths after graduation (including anticipated paths)] N/A

(As of September 2022)

Message from WISE Cooperating Institution



SHIMIZU Takeshi

EY Strategy and Consulting Co., Ltd., Health Sciences & Wellness, Partner

Core human resources through the transformation of healthcare industry

The healthcare industry is at a transformational stage and has new paradigms such as preventive, regenerative medicine, and digital treatment as well as uses new diagnostics, treatments, and compound-derived drugs. This program represents a valuable opportunity to develop a complex mindset for dealing with situations in which drastic changes in success models could occur, and for dealing with changes caused by financial pressure such as an increase in the elderly population or a higher cost of drug development.

Student's Voice



HIRATO Yumi

Second year in the Doctoral Course, Advanced Pharmaco-Science, Graduate School of Pharmaceutical Sciences, Osaka University

Bring our research results to society and build a wide network

I decided to join this program because I believe that not only research skills but also the skills and mindsets to return research findings to society are crucial for future researchers. The program provides an environment in which we can improve our ability to incorporate research results to society. Moreover, the wide network of faculty members in industry, government, and academia, and the interactions between students, have offered me valuable opportunities to broaden my horizons.

[Office and section in charge] Administrative Office for the Transdisciplinary Program for Biomedical Entrepreneurship and Innovation (WISE), Graduate School of Medicine
[Inquiries] 06-6210-8231

The Frontier Development Program for Genome Editing

[Program Coordinator] YAMAMOTO Takashi (Professor, Graduate School of Integrated Sciences for Life, Hiroshima University)
[Fields of diplomas] Doctor of Philosophy in Science, Doctor of Philosophy in Engineering, Doctor of Philosophy in Agriculture, Doctor of Philosophy in Medical Science, Doctor of Philosophy in Dental Science, Doctor of Philosophy in Pharmaceutical Science
 Name of the program to be noted: The Frontier Development Program for Genome Editing
[URL] <https://genome.hiroshima-u.ac.jp/en/index.html>



Message from the President



OCHI Mitsuo
President of Hiroshima University

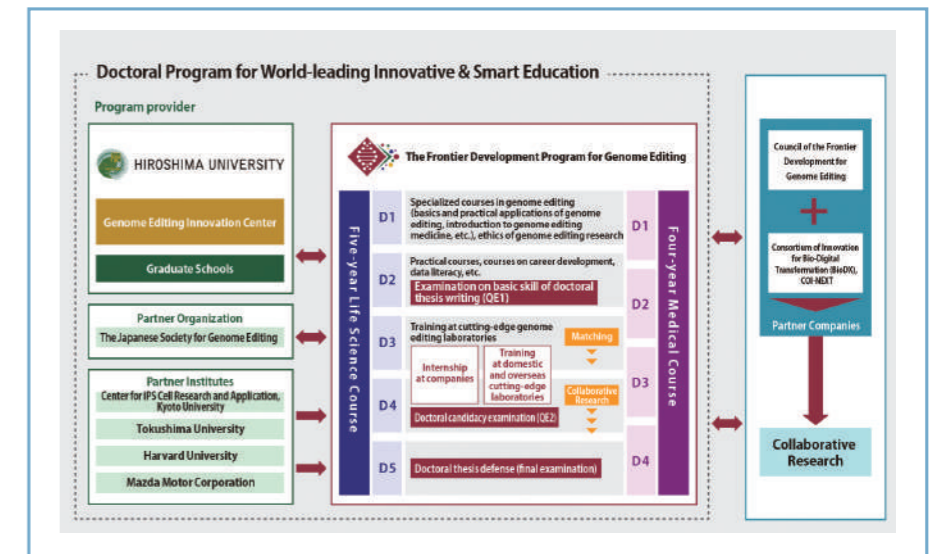
Welcome to Hiroshima University: 'The Frontier Development Program for Genome Editing' on the theme of 'Developing a Future Society with Genome Editing'

Genome editing is drawing attention worldwide as it is a biotechnology capable of modifying genomic information of various organisms by using artificial DNA-cutting enzymes; it is thought to bring a revolution to anything from selective breeding to medical applications.

Coupled with some of the top-class researchers in Japan in the field of genome editing, Hiroshima University has been promoting various projects as it intends to become one of the leading institutions in Japan for the education of genome editing. While making sure to take a reasonable care for implementing genome editing research in terms of clearing its safety and ethical issues, the program above focuses on developing researchers who will lead the future of genome editing research in the world with a view to successfully designing their career path. The university is hoping to attract well-motivated students who are capable of creating new industries that can unlock world's future.

applications.

Hiroshima University is one of Japan's leading universities in genome editing research and is affiliated with several core researchers who run The Japanese Society for Genome Editing. Moreover, Program on the Consortium of Innovation for Bio-Digital Transformation (BioDX), COI-NEXT has conducted with companies in a variety of fields for the project of developing the basic technologies to use industrial genome editing and also advanced the research and development, including human resources development and career path formation in collaboration between industry and academia. According to a curriculum conducted by top national and international genome editing researchers, this program develops human resources that can respond flexibly to industrial structure changes based on new industries and social trends to them.



The program aims to foster scientists and developers who play a role in creating new genome editing industries. (Industrial technology/ Basic technology developers, Drug discovery/ therapeutic scientists, Entrepreneurs of related ventures)

Courses offered: Life Science Course/ Medical Course

This program has two courses and after the third year under the organizational structure to experience the speed of cutting-edge research, features the development of advanced and practical research and development abilities by acquiring the ability to develop in society (the ability to implement in society) through collaborative research with participating companies and partner institutes of the Consortium of Innovation for Bio-Digital Transformation (BioDX), COI-NEXT.

① Overview of Life Science Course

This course is a five-year degree program (transfer students can also take this course from their third year). We develop the leading-edge human resources for future genome editing by teaching students the basic to advanced knowledge and skills of genome editing in the first and second year, from the third year with practicing research to utilize the acquired knowledge and skills through basic courses and internships for social implementation.

② Overview of Medical Course

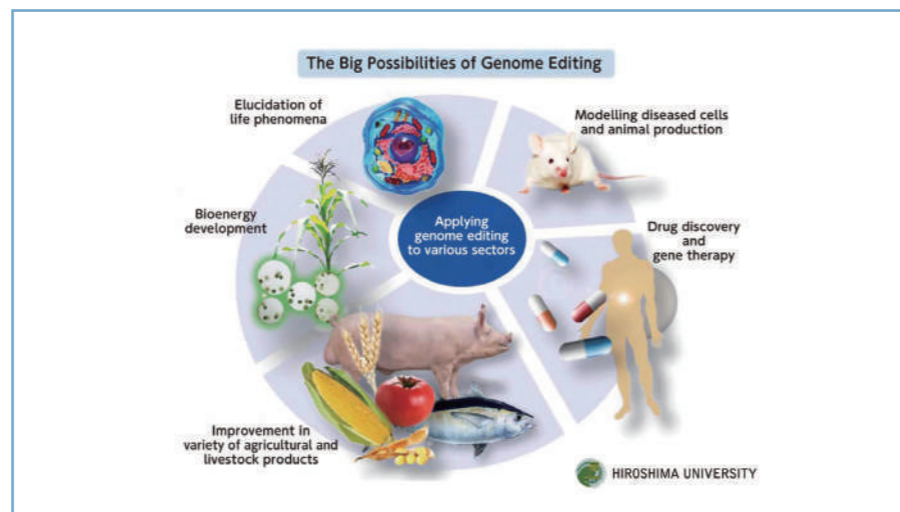
This course is a four-year degree program. We develop the advanced human resources for genome editing working in the field of related medicine through advanced training at partner institutions in Japan and abroad while practicing doctorate thesis research using the acquired knowledge and skills after systematically learning the basic to advanced knowledge and skills of genome editing in the first and second year.

What are the capabilities trained by the program?

Genome editing, which is a new technology to freely modify various organisms' genomic information by using artificial DNA-cutting enzymes (genome editing tools), has rapidly expanded in recent years. This is due to technologies that can be used in a wide range of applications, from microbes to animals and plants, as well as the fact that competition to develop the technologies has been intensifying. It is imperative to promote research and development in genome editing for industrial and medical applications such as selective breeding, drug discovery, and gene therapy, in addition to basic research with ethical considerations in mind in Japan. In particular, the cutting-edge research style has changed a lot with the development of CRISPR-Cas9, a new genome-editing tool introduced in 2012. While genome editing using CRISPR-Cas9 is becoming more popular in Japan at a constant speed due to its simplicity, there are only a few developers

and experts on Japan's unique genome editing technology. Despite this situation, genome editing technology's intrinsic value is its use in genetic

engineering and disease treatment in biological species that have been difficult to modify genetically up until now, and possibly for industrial



Genome editing is expected to be an available technique to use from basic research to various applicable fields (Development of biofuels from algae, improvement of useful species, drug discovery, and gene therapy)

DATA

[Number of students recruited (For FY2023, number of students to be recruited)] 11 each (FY2018-FY2023)

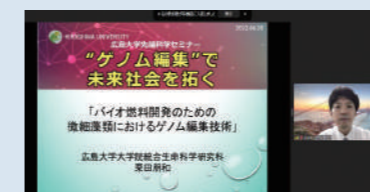
[Number of people engaged in the program] 58
[Students' affiliated schools and departments] 2 graduate schools, 2 departments
 (Graduate School of Integrated Sciences for Life) Integrated Sciences for Life
 (Graduate School of Biomedical and Health Sciences)

Biomedical Sciences
[WISE Cooperating Institutions] 3 universities, 1 company
 Center for iPS Cell Research and Application, Kyoto University / Graduate School of Technology, Industrial and Social Sciences, Tokushima University / Department of Molecular and Cellular Biology, Harvard University / Technical Research Center, Mazda Motor Corporation

[Number of program graduates (including anticipated graduates)] 4 (FY2021), 2 (FY2022)
[Career paths after graduation (including anticipated paths)] 3 to universities, 1 to private enterprise

(As of October 2022)

Good Practice



We hold regular series of advanced science seminars focusing on "Developing a Future Society with Genome Editing" to the public

We are holding a total of four seminars per year with the title "Developing a Future Society with Genome Editing," to give easy-to-understand explanations of the potential of genome-editing to the public. A wide range of people participate, from high schools, universities, companies, and other organizations. Past seminars have included a variety of themes, such as "Genome editing technology for the safety of biological products" and "Genome-editing technology for biofuel development in microalgae" Some examples of favorable comments from participants are as follows: "I obtained a lot of the latest information;" "the seminar opened my eyes and answered my questions about genome-editing technologies."
 *Seminars are held in Japanese only for the moment.

Message from WISE Cooperating Institution



TAKAMI Akihide
Supreme Principal Engineer, Technical Research Center, Mazda Motor Corporation

Genome editing technologies show great promise

To achieve carbon neutrality in the automobile society by 2050, Mazda Motor Corporation has been collaborating with Hiroshima University and the Tokyo Institute of Technology for studying bio-derived liquid fuel to produce renewable biomass (microalgae) as an alternative to fossil fuels. Genome editing technologies are innovative technologies which hold promise in dramatically improving microalgal productivity, which is an issue with microalgal bio-derived liquid fuel.

Student's Voice



MATSUDA Nagisa
2nd year student, Master's Course in the Graduate School of Integrated Sciences for Life, Hiroshima University

This program gives the opportunity to achieve high quality research

Genome editing technology has become indispensable in a wide range of research fields. This program provides opportunities to master this technology through the education by top-level researchers in Japan. In addition to lectures and practical training on the latest technologies, we get chances to interact with researchers who have experiences in various careers. I believe that this program is a valuable opportunity to improve not only my research but also myself.

Global Health Elite Programme for Building a Healthier World

[Program Coordinator] ARIYOSHI Koya (Professor, Department of Global Health, School of Tropical Medicine and Global Health, Nagasaki University)
[Fields of diplomas] Doctor of Philosophy, Doctor of Philosophy in Medical Science, Doctor of Philosophy in Dental Science, Doctor of Philosophy in Pharmaceutical Science, Doctor of Philosophy in Engineering, Doctor of Philosophy in Environmental Science, Doctor of Philosophy in Fisheries Science, Doctor of Philosophy in Marine Science, Doctor of Business Administration, Doctor of Public Health
 Name of the program to be noted: Global Health Elite Programme for Building a Healthier World

[URL] <http://www.wise.nagasaki-u.ac.jp/?lang=en>



Message from the President



KOHNO Shigeru
President of Nagasaki University

Promoting human health and peace, and pursuing research that contributes to the improvement of global health through the study of science

We believe that being selected as part of the WISE Program offers students an important opportunity to assist Nagasaki University (NU) in achieving its goal "to become a world-class center of "global health" education and research that contributes to human health on a global scale". In order to innovate graduate school education, it is important that this programme strives to become a driving force that can effectively strengthen the education systems of the university. Having the strong partnership between NU School of Tropical Medicine and Global Health and London School of Hygiene and Tropical Medicine as a foundation of our WISE Programme, we are committed to foster leaders in the field of global health through working in collaboration with both internal and external research institutions. We believe that the focus of the programme to train experts with hands-on experience is very important in addressing health challenges and improving health worldwide from a global perspective.

Train global health professionals who can build a healthier world

In the 21st century, the globalization of economy, industry and distribution has rapidly progressed. This rapid growth in globalization has caused both social and environmental issues to increase which requires global attention. In particular, emerging and re-emerging infectious diseases such as HIV/AIDS, Ebola virus disease and Malaria have become global health issues and cause for concern throughout the world. Hence, we believe there is an urgent need to promote global health and encourage international societies to work together to eliminate the problems we are facing on a global scale. In order to contribute to solving these global issues, Nagasaki University (NU) has launched a degree programme, NU WISE Programme through affiliation with internationally renowned institutions in global health, the London School of Hygiene and Tropical Medicine (LSHTM, UK). Having the NU School of Tropical Medicine and Global Health at its core, NU WISE Programme aims to foster leaders in global health with a mission to "train global health

professionals who can build a healthier world". Specifically, we focus on training leaders who have the ability to understand the health challenges

on a field level and are dedicated to addressing health issues utilizing their academic knowledge and practical skills in areas such as global policy



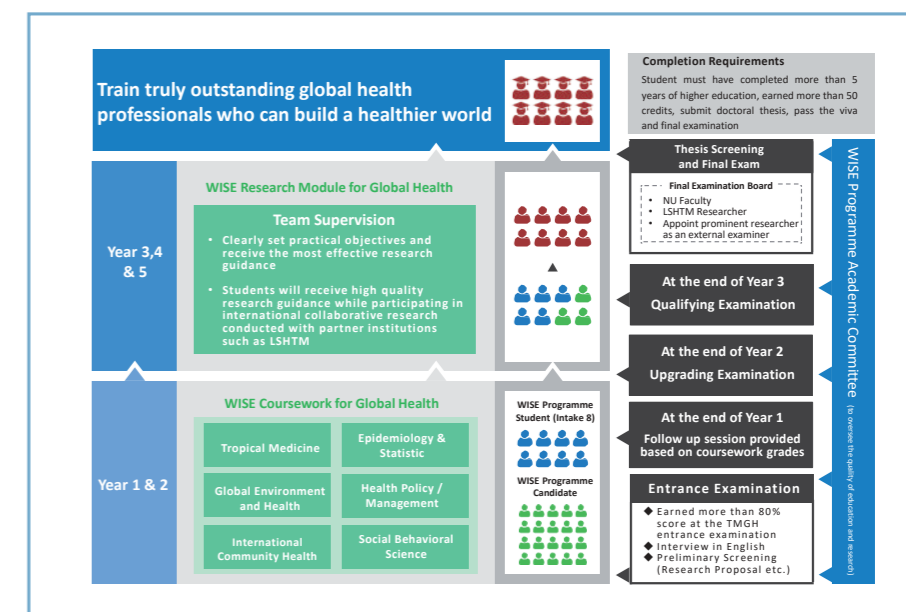
Having Nagasaki University's long history in infectious disease research and education as a foundation, the Nagasaki University WISE Programme was established based on a strong collaboration between TMGH and LSHTM

planning and implementation. In addition to strengthening our collaboration with accredited international institutions such as LSHTM, we are dedicated to training leaders and pursuing common goals throughout the various internal departments such as Nagasaki University Institute of Tropical Medicine (Nekken), Graduate School of Biomedical Sciences and overseas research stations in Kenya, Vietnam and the Philippines. With our 75 year history and proven success in educating professionals in the field of infectious disease, we are committed to expanding both our education and research areas.

Furthermore, our mission is also focused on further developing our collaboration with external organizations such as Hokkaido University Research Center for Zoonosis Control; National Research Center for Protozoan Diseases, Obihiro University of Agriculture and Veterinary Medicine; School of International Health, Graduate School of Medicine, the University of Tokyo; National Center for Global Health and Medicine; JICA; National Institute of Infectious Diseases; Sysmex Corporation; Shionogi & Co., Ltd.. Whilst strengthening relationships with our partner organizations, we aim to develop our programme so it functions as a hub in the field of global health in Japan.

Top-level education and research programme in global health

The Nagasaki University WISE Programme consists of a five-year doctoral programme. Up to the



The NU WISE Programme ensures superior education and research in the area of global health through developing quality curriculum and holding regular upgrade and qualifying examinations

second year of the Master's degree programme, the lectures are focused on the coursework and are taught by faculty staff including practitioners whose specialized areas are cross-disciplinary and innovative. In particular, the Epidemiology and Statistics modules are taught using LSHTM teaching materials by LSHTM faculty staff invited to teach in Nagasaki. Furthermore, advanced modules have been established for the NU WISE Programme in order to meet course requirements and facilitate

quality research. From the third year onwards, students will focus on their research work. Each student is assigned a supervisory team. By assigning faculty members specializing in different areas of research, the programme aims to maintain a diversity so students can set practical objectives and receive the most effective research guidance from their experienced supervisory team.

Good Practice



Establish "Highly Practical Professional Training Program" to foster professionals who can tackle pandemic and contribute to the public health policymaking and implementation

Students in this programme include medical doctors who participated in the medical humanitarian assistance at the San Lazaro Hospital in the Philippines and for the COVID-19 cluster on a cruise ship at the Nagasaki Port. These experiences have encouraged students to work on new research topics to enhance their knowledge in this field. Taking advantage of the experience we gained through living with the new disease in this unprecedented times, we have established a Doctor of Public Health Programme (DrPH) in October 2022 with aims to strengthen our programme for fostering professionals with high level leadership and management skills in public health, who can tackle the global issues regardless of the academic disciplines and contribute to policymaking by adapting scientific evidences, decision-making, and implementation of the policy.

DATA	
[Number of students recruited (For FY2023, number of students to be recruited)] 5 (FY2018), 23 (FY2019), 48 (FY2020), 49 (FY2021), 50 (FY2022), 50 (FY2023)	<Graduate School of Biomedical Sciences> Infection Research, Advanced Preventive Medical Sciences <School of Tropical Medicine and Global Health> Department of Global Health, Nagasaki University - London School of Hygiene and Tropical Medicine Joint PhD Degree Programme for Global Health
[Number of people engaged in the program] 80 [Students' affiliated schools and departments] 3 graduate schools, 5 departments <Graduate School of Fisheries and Environmental Sciences> Department of Environment and Fisheries Resources	[WISE Cooperating Institutions] 4 universities, 1 Incorporated Administrative Agency, 2 National Research and Development Agencies, 1 Corporate Company
[Number of program graduates (including anticipated graduates)] 1 (FY2020), 1 (FY2021), 1 (FY2022), 3 (Expected completion in FY2022)	London School of Hygiene and Tropical Medicine / Hokkaido University Research Center for Zoonosis Control / National Research Center for Protozoan Diseases, Obihiro University of Agriculture and Veterinary Medicine / School of International Health, Graduate School of Medicine, The University of Tokyo / National Center for Global Health and Medicine / JICA / National Institute of Infectious Diseases / Sysmex Corporation / Shionogi & Co., Ltd.
[Career paths after graduation (including anticipated paths)] 1 to medical practitioner, 1 to postdoctoral researcher, 1 to incorporated administrative agency (As of November 2022)	

Message from WISE Cooperating Institution

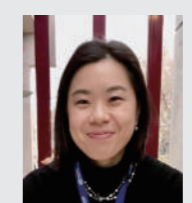


Liam Smeeth
Director of London School of Hygiene and Tropical Medicine

Addressing global health challenges through research, education and innovation

We are proud to have a long-standing partnership with Nagasaki University. Our partnership has flourished over the years through our joint PhD scheme as well as a programme of academic cooperation, staff secondment and research collaboration. We value our collaboration with Nagasaki University through the WISE Programme. Now more than ever, our doctoral students have a fundamental role in improving our knowledge and understanding of global health issues, and building the capacity and evidence base for actions to improve global health.

Student's Voice



NAKAMURA Tomoka
Nagasaki University - LSHTM Joint PhD Degree Programme for Global Health, Year 3

Bridging between Japan and the United Kingdom through COVID-19 research

My PhD focuses on understanding the impact of social contact and behavioral patterns on the transmission of SARS-CoV-2 in Japan and the United Kingdom using epidemiology and mathematical modeling techniques. As I conduct a comparative analysis between the two countries amid the COVID-19 pandemic, this joint PhD program funded by WISE has provided me a challenging but rewarding opportunity to work closely with professors from LSHTM, Nagasaki University and National Institute of Infectious Diseases public health professionals.



Graduate Program for Power Energy Professionals

[Program Coordinator] HAYASHI Yasuhiro (Professor, Faculty of Science and Engineering, Waseda University)

[Fields of diplomas] Doctor of Engineering, Doctor of Science, Doctor of Information Science, Doctor of Philosophy

Name of the program to be noted: Graduates will receive certificates of program completion, awarded jointly by all 13 universities.

[URL] <https://www.waseda.jp/pep/en/>



Message from the President



TANAKA Aiji
President of Waseda University

Waseda is leading an advanced graduate program in collaboration with 12 partner universities, producing Ph.D. holders who will make a positive impact on global carbon neutrality

Waseda University is promoting cutting edge research and innovative education based on its out-standing research outcome. In this program, Waseda plays a key role in collaboration with 12 partner universities, 58 leading corporations, and 9 international research institutions to develop international standards in interdisciplinary graduate programs. Also, even in the post/with COVID-19 society, we will continue to develop new educational methods, making the most of new digital technology for our students. Consequently, Waseda University will commit itself to paving the way for a carbon-neutral future and promote the development of highly-skilled professionals holding Ph.D. who will contribute to human society.

Fostering doctoral resources to innovate power and energy

The world has seen emerging global trends such as the shift to digital and AI, and a focus on global environmental protection for the realization of a sustainable society. In response, the industry sector related to electric power and energy infrastructure is entering a period of structural transformation. Many technological innovations have been achieved, such as renewable energy and systems for its management; electric vehicles; storage batteries; and IoT. As a result, the energy supply sector has begun a shift to small-scale distributed work. Now there is an urgent need for unconventional transformation and reconstruction of energy networks.

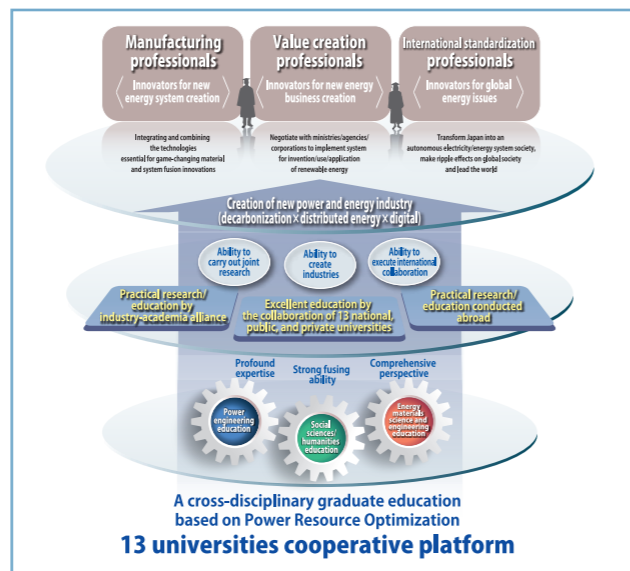
This program provides an inter-university platform for collaborative education and research among 13 national, public, and private universities to enable the creation of new industries that will contribute to Japan's future vision of achieving "Society 5.0" and 2050 carbon neutrality. The program promotes more practical education and research than usual, in collaboration with domestic

and overseas companies and research institutes spanning numerous energy fields.

We envision a new generation of advanced intellectual professionals who will design the future society, particularly: 1) manufacturing professionals who can innovate new energy systems; 2) business creation professionals who can innovate new energy business models; and 3) international standardization professionals who can innovate global energy practices.

We offer a five-year program to give students an integrated education and research experience to ensure that they acquire six pillars of deep expertise; bird's-eye view perception; strong fusion; joint research;

industrial creation; and international collaboration, all essential for new era intellectual professionals.

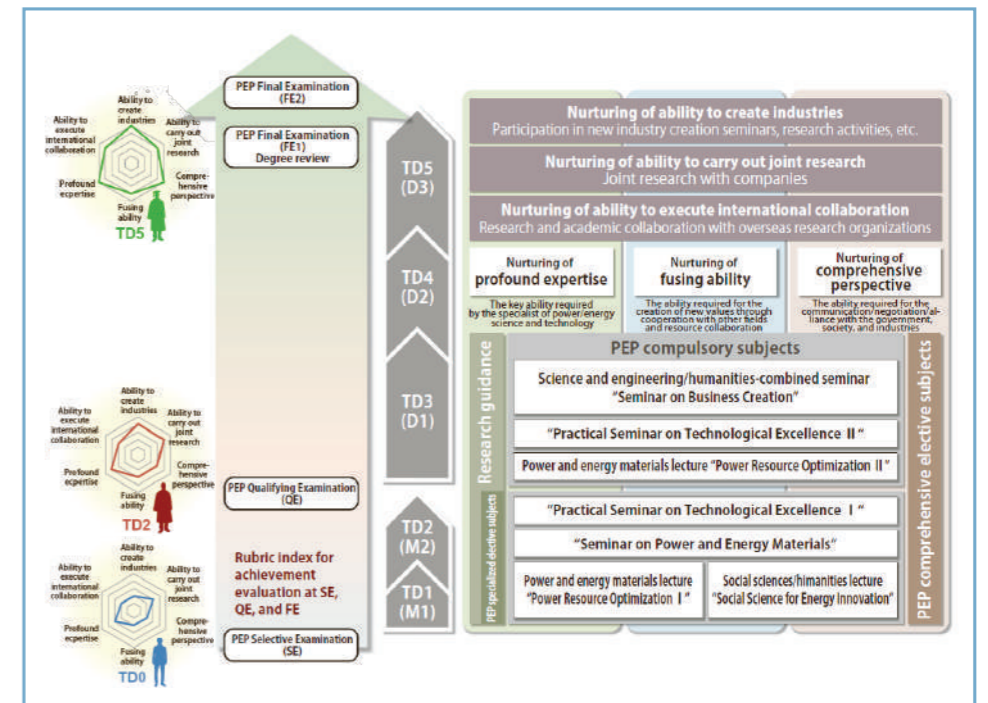


Graduate School Platform for 13-University Collaboration: A human resource development scheme that will contribute significantly to the creation of new electric power and energy industries.

Cross-disciplinary education and standardization education

This program sees the energy value chain of the future as ranging from the tiniest component, the electric charge, to huge power networks. With that vision, we have prepared a comprehensive curriculum that includes: the materials field, which produces highly functional distributed power resources; the power engineering field, for optimal integration, control and operation of resources; and the humanities and social sciences, to design an optimal society. Ten credits are required in seven courses, including: Power Resource Optimization, a multidisciplinary course in power engineering and energy materials; Social Science for Energy Innovation, lectures on the implementation of innovative energy infrastructure systems, intended to hone the students' skills and vision for business development; and Seminar on Business Creation.

The program also develops the students' capacity through: specialized elective courses that leverage the unique expertise of each university; panoramic elective courses including lecture courses on leadership development lectures and basic AI/IoT; multi-layered education and research guidance; and seminars on new industry creation—all in collaboration with a comprehensive group of research organizations. Furthermore, in coordination with Japan's power and energy system standardization measures, the EMS Shinjuku R&D Center, established at Waseda



Whole aspect of the PEP educational program: Providing education mixing different fields for designing a future society

University as a paragon of neutrality and fairness, has been partially opened to provide unparalleled international standardization education.

We ensure high quality of education with various types of examinations, including selective examination (SE); qualification examination (QE); final examination 1 (FE1) for evaluation of

advanced research expertise; and final examination 2 (FE2) to verify acquisition of 45 credits or more and publication of one or more papers co-authored in collaboration with institutions at international academic societies and the like. The PEP program will continue to foster "PEP-people", Ph.D. holders who will energize society.

Good Practice



PEP students can learn the essence of new business creation through 3 steps based on the wisdom of humanities and social sci. faculty to integrate energy, humanities, and science.

Humanities and Social Sciences faculties at Waseda University customize the essence of the knowledge and skills to teach knowledge and practical skills for creating new industries in the new age of energy, such as power and energy-related systems, economics, laws, and business models. PEP program takes a three-step approach to nurture students' knowledge and skills. 1) lectures: "Social Science of Energy Innovation" to acquire basic knowledge, 2) group work: "Practical Business Creation" and 3) serving as a judge of the annual "Business Idea Contest" to gain new insight from a different perspective.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]

49 (FY2018), 26 each (FY2019-2022)

[Number of people engaged in the program] 61

[Students' affiliated schools and departments]

Waseda University 4 graduate schools, 8 departments, Hokkaido University 1 graduate school, 1 department, Tohoku University 1 graduate school, 1 department, University of Fukui 1 graduate school, 3 departments, University of Yamaguchi 1 graduate school, 2 departments, Tokyo Metropolitan University 1 graduate school, 1 department, Yokohama National University 1 graduate school, 2 departments, Nagoya University 1 graduate school, 1 department, Osaka University 1 graduate school, 1 department, Hiroshima University 1 graduate school, 1 department, Tokushima University 1 graduate school, 2 departments, Kyushu University 1 graduate school, 1 department, University of the Ryukyus 1 graduate school, 3 departments, Waseda University (Graduate School of Advanced Science and Engineering) Advanced Science and Engineering, Applied Chemistry, Electrical Engineering and Bioscience, Nanoscience and Nanoengineering (Graduate School of Fundamental Science and Engineering) Applied Mechanics and Aerospace Engineering, Electronic and Physical Systems (Graduate School of Environment and Energy Engineering) Environment and Energy Engineering (Graduate School of Creative Science and Engineering) Department of Earth Sciences, Resources and Environmental Engineering Hokkaido University

(Graduate School of Information Science and Technology) Information Science and Technology (Course of Systems Science and Informatics)

Tohoku University (Graduate School of Engineering) Electrical Engineering

University of Fukui (Graduate School of Engineering) System and Infrastructure Engineering for Safe and Sustainable Society (Electrical System), Fundamental Engineering for Knowledge-Based Society (Electronic Material), Advanced Interdisciplinary Science and Technology (Electrical and Electronics Engineering)

University of Yamaguchi (Integrated Graduate School of Medicine, Engineering, and Agricultural Sciences) Engineering (Special Educational Program for Green Energy Conversion Science and Technology, Energy Materials Science Course, Green Energy Conversion Science and Technology Major)

Tokyo Metropolitan University (Graduate School of Urban Environmental Sciences) Applied Chemistry for Environment

Yokohama National University (Graduate School of Engineering Science) Chemistry and Life Science

Mathematics, Physics, Electrical Engineering and Computer Science

Nagoya University (Graduate School of Engineering) Electrical Engineering

Osaka University

(Graduate School of Engineering) Electrical, Electronic, and Infocommunications Engineering

Hiroshima University (Graduate School of Advanced Science and Engineering) Advanced Science and Engineering

Tokushima University (Graduate School of Science and Technology for Innovation) Science and Technology, Sciences and Technology for Innovation

Kyushu University (Graduate School of Information Science and Electrical Engineering) Electrical and Electronic Engineering

University of the Ryukyus (Graduate School of Engineering and Science) Engineering, Materials, Structural and Energy Engineering, Interdisciplinary Intelligent Systems Engineering

[WISE Cooperating Institutions]

18 universities, 2 companies, 2 research institutes, 1 industry-academia collaboration organization

Hokkaido University / Tohoku University / University of Fukui / University of Yamaguchi / Tokyo Metropolitan University / Yokohama National University / Nagoya University / Osaka University / Hiroshima University / Tokushima University / Kyushu University / University of the Ryukyus / The University of Tennessee, Knoxville / University of Chicago / University of Washington / Tsinghua University / Chubuokan University / Technical University of Munich/ENEOS Corporation / Tokyo Gas Co., Ltd. / Central Research Institute of Electric Power Industry / National Institute of Advanced Industrial Science and Technology / Power Academy

[Number of program graduates (including anticipated graduates)] 14 (FY2020), 19 (FY2021), 2 (FY2022, September)

[Career paths after graduation (including anticipated paths)] 10 to universities, 12 to private companies, 2 to general incorporated foundations, 2 to public research institutions, 1 to others

(As of September 2022)

Message from WISE Cooperating Institution



KONISHI Masako

Operating officer, Tokyo Gas Co., Ltd.

Hoping to develop advanced professional human resources that support a carbon neutral society

Realization of carbon neutrality in the electric power/energy industries is a global challenging issue. With "work toward achieving net-zero CO2 emissions" as one of our management policies, Tokyo Gas is working on various activities now. However, we believe that only advanced professionals having expertise in multiple fields can undertake this difficult mission. We expect much from this program because it will provide education/research experiences featuring an integration of arts/sciences and a mixture of academic-industrial fields as well as opportunities to meet different people.

Student's Voice



KANEKO Nanae

TD5, Department of Advanced Science and Engineering, School of Advanced Science and Engineering

Establishing energy infrastructures in society utilizing digital technologies

I am engaged in the R&D of medium- and long-term demand forecast methods for power supply systems using AI techniques. Implementing new technology in society requires a wide range of knowledge. I participated in this program to acquire knowledge of the government's energy policy, international standardization processes, and other related activities. I hope to gain wide perspectives and high communication skills by learning together with students of various nationalities/academic backgrounds through educational programs that mix different fields and studying abroad to become a researcher who can work competently in an international environment.

WISE program for Sustainability in the Dynamic Earth

[Program Coordinator] NAKAMURA Michihiko (Professor, Major of Earth Science, Graduate School of Science, Tohoku University)
[Fields of diplomas] Doctor of Philosophy (Science) / (Engineering) / (Information Sciences) / (Environmental Studies) / (Medical Sciences) / (Letters) / (Economics) / (Management), Doctor of Philosophy
Name of the program to be noted: WISE program for Sustainability in the Dynamic Earth
[URL] <https://www.syde.tohoku.ac.jp/english/>



Message from the President



OHNO Hideo
President, Tohoku University

Fostering leaders to respond to various risks with practical skills based on advanced knowledge, developing HR to lead the transformation of future society.

In addition to the conventional discipline-based degrees offered by its graduate schools, Tohoku University aims to build a graduate school that is appropriate for a world-class research university by enhancing various "degree programs" that transcend the boundaries of disciplines, national borders, and organizations such as industry and academia, and by developing a world-class research environment and financial support, centered on the Advanced Graduate School. In this context, the WISE Program plays a major role in the "creation of new value" through co-creation with industry and other sectors of society.

Now in its fourth year of operation, this program is making progress in fostering human resources to become knowledge professionals with practical skills based on advanced knowledge as an educational program in the fields of "environment and earth science" and "disaster science" based on co-creation with society.

scientific research results to society. This program aims to produce knowledge professionals who can seamlessly acquire and convey advanced knowledge for improving our understanding of issues related to Earth system science.

Study among diversity, on the job, from around the world

In this program, we will achieve these educational objectives through hands-on training by an integrated academic team with the participation of a wide range of departments. This style of training exploits the fact that students learn more from each other than from lectures.

As a second educational policy, we will invite private companies and organizations to build a "Sustainability Study Consortium." One of the consortium's purposes is to develop skilled scientists that are adept at working in the field through project-based learning. Students will learn the basics of risk management, which forms the basis of all industries.

The third policy of this program is to provide international joint education with director-class faculty members from overseas affiliated organizations. In collaboration with faculty members who have experience of United Nations organizations and the Japan International Cooperation Agency (JICA), we plan to collaborate with international organizations to conduct research education and achieve international contributions.

Through the three educational policies unique



PBL lab-courses (left: Drone flight test for evacuation support; upper right: mineral resource lab by an JOGMEC expert) and JICA expert's lecture on International trend and practical knowledge for disaster risk reduction & Sendai Framework

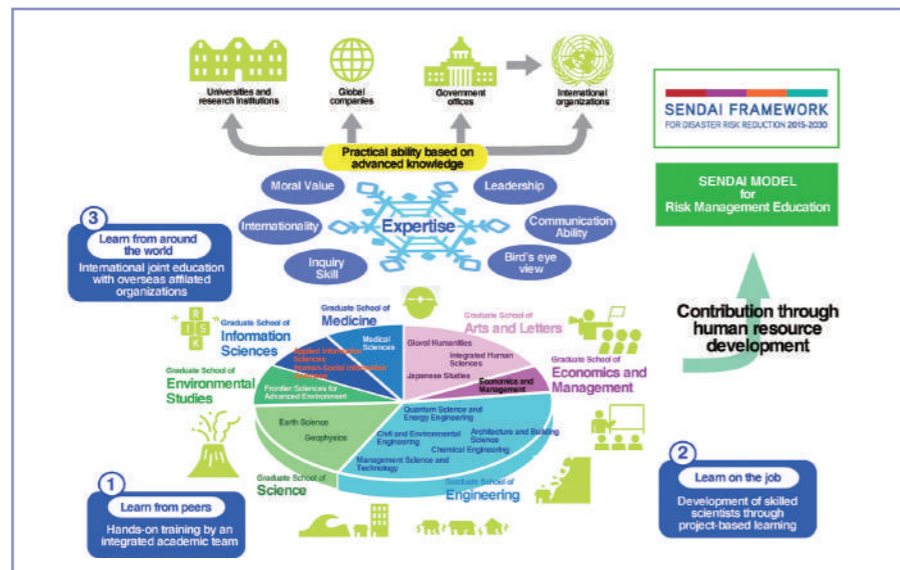
Study the Earth, Discover the future

Located in an orogenic belt, Japan is prone to natural disasters such as earthquakes, volcanic eruptions, and torrential rain, which has led to high demand from society for quality scientific research. With continued advances in our knowledge of Earth's structure, the field of Earth system science has evolved into a precise understanding of the mechanism of dynamic phenomena, which is seamlessly linked to disaster science. In addition, modern society faces new large-scale risks such as space environment disasters caused by fluctuations in the planetary space magnetic field.

Earth scientists in Japan have specialized in research into subduction zone phenomena such as earthquakes and volcanic eruptions. Now, these fundamental studies have progressed to the stage where they can directly lead to essential improvements in our disaster prevention capabilities. Moreover, many disasters are caused by both natural environmental factors and a combination of information, social, and economic factors. To build a society that can respond to

diverse and complex risks, we need to further elucidate the mechanisms governing natural phenomena and improve corresponding prediction

techniques. We must also urgently develop skilled scientists who have the practical ability to understand humans and society and communicate



We will develop "snow crystal-type human resources" with multifaceted abilities through hands-on education that integrates literary sciences, collaborative education with industry-government partners and international joint education.

to this graduate degree program: "study among diversity, on the job, from around the world," we will develop "snow crystal-type human resources" with multifaceted abilities. We aim to supply these human resources to a wide range of sectors, including industry, government, and academia.

In 2015, the United Nations adopted the "Sendai Framework for Disaster Risk Reduction," a framework for countries around the world to implement disaster prevention and mitigation.

Tohoku university has made a significant contribution to formulating this framework and will further contribute to achieving this goal through education. The Tohoku region is characterized by globally rare large-scale disasters and massive natural risks; thus, researchers visit this region from all over the world. By taking advantage of our location, this program aims to create digital teaching materials and disseminate them internationally via the Internet.

Good Practice



Visit to the United Nations Headquarters in New York and the World Bank in Washington, D.C., for overseas training

As an initiative to "Learn from the World," six program students and three supervising faculty members visited the United Nations Headquarters, United Nations Development Programme, and Permanent Mission of Japan to the United Nations in New York, as well as the World Bank and NHK Washington Bureau in Washington, D.C. In addition to receiving lectures from local staff members on daily work content and measures to deal with international issues, the program representatives participated in a question-and-answer session on career paths and other topics. Prior to the visit, they underwent pre-training on linking the local and international community in Rikuzentakata City, Iwate Prefecture, which is working on recovery from the Great East Japan Earthquake. After returning to Japan, they hold a session to report on their overseas training.

Message from WISE Cooperating Institution



MIYOSHI Nobuhiro
Deputy branch manager, Sendai Branch Office, Nippon Koei Co., Ltd.

To build a nation/community resilient to disasters

As a construction consulting firm, we are involved of planning, design, maintenance, and management of social structures. We are working on developing plans to prevent and mitigate natural disasters, emergency measures to be taken during a disaster, and permanent measures for regional development and the environment. In this program, we would like to cultivate human resources that can contribute to building a nation resilient to disasters and to fostering regional development by utilizing the expertise and experience.

Student's Voice



TOMIZAWA Takuma
2nd year of Doctoral program in Quantum Science and Energy Engineering, Graduate School of Engineering

International and interdisciplinary human resource development

I joined this program to attain a broad research experience. Students and professors from various research backgrounds exchange our opinions, knowledge, and perspectives in monthly meetings and numerous other events. In addition, this program provides us rich opportunities to study with international organizations, affording us the chance to conduct many experiments we would not be able to in our ordinary research lives and improving our ability to tackle challenging problems with a multidisciplinary approach and a broad perspective.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)] 35 (FY 2020), 20 (FY 2021), 15 (FY 2022), 15 (FY 2023)
[Number of anticipated program graduates] 15
[Number of people engaged in the program] 87
[Students' affiliated schools and departments] 7 graduate schools, 15 departments
<Graduate School of Science> Earth Science, Geophysics
<Graduate School of Engineering> Quantum Science and Energy Engineering, Chemical Engineering, Civil and Environmental Engineering, Architecture and Building Science, Management Science and Technology

<Graduate School of Information Sciences> Applied Information Sciences, Human-Social Information Sciences
<Graduate School of Environmental Studies> Environmental Studies for Advanced Society
<Graduate School of Medicine> Medical Sciences
<Graduate School of Arts and Letters> Japanese Studies, Global Humanities, Integrated Human Sciences
<Graduate School of Economics and Management> Economics and Management
[WISE Cooperating Institutions] 7 universities, 2 incorporated administrative agencies, 6 companies, 2 national institutes

Stanford University / Harvard University / University of Washington / University College of London / University of Indonesia / Sorbonne University / University of Hawaii at Manoa / JICA / Tokio Marine & Nichido Fire Insurance Co., Ltd / Nippon Koei Co., Ltd / Penta-Ocean Construction Co., Ltd / NTT DATA, Inc / Mitsubishi Electric Software Corporation / Japan Organization for Metals and Energy Security / Sumitomo Metal Mining Co., Ltd. / National Institute of Advanced Industrial Science and Technology / National Research Institute for Earth Science and Disaster Resilience

(As of November 2022)

Applied Humanities Program for Cultivating Global Leaders

[Program Coordinator] YONEMURA Chiyo (Professor, Graduate School of Humanities, Chiba University)
 [Fields of diplomas] Doctor of Philosophy (Philosophy), Doctor of Philosophy (Public Affairs)
 Name of the program to be noted: Applied Humanities Program for Cultivating Global Leaders
 [URL] <https://jinbun-takuetsu.chiba-u.jp/top/>



Message from the President



NAKAYAMA Toshinori
President of Chiba University

Fostering top management personnel who will lead the diversity society by utilizing humanities

Based on the philosophy of "Always Aim Higher", Chiba University promotes outstanding education and research that integrates humanities and science, intending to develop next-generation human resources who can play an active role as leaders in the global society. At the same time, we continue to take on constant challenges, such as reforming the structure based on our vision.

This program will cultivate flexible cultural imagination and a bird's-eye view of literacy through exploration activities for various issues in Asia-Eurasia, a pluralistic world, based on a distinctive educational and research base in the humanities field of our university and affiliated universities. In the future, the trained human resources will lead a diversified society in collaboration with industry. We hope that this program's graduates will serve as a bridge between the humanities and the community.

order to analyze the direction of a changing society, technology to visualize environmental changes and social space with GIS (Geographic Information System) or data science technology to forecast the trends of social movement by making utmost use of social research statistics and text mining (statistical analysis of text) is necessary. It is also an important focus of the program to localize data science in the application of analysis in Humanities to understand the social movement of Asia-Eurasia.

Excellent Educational Program Through a Cooperative Network

As stated above, the program aims to cultivate individuals to lead in the future diverse environment by comprehensively learn two realms: micro perspective and technology to move into the folds of culture and sensitivity; and macro perspective and technology to see from the perspective of data science (Digital Humanities).

This program to cultivate such individuals has structured a broad network in and outside of Japan. In Japan, we coordinate with Chiba University, Okayama University, Nagasaki University, Kumamoto University, The Graduate University for Advanced Studies, National Museum of Japanese History, AEON CO., LTD., JTB Tourism Research & Consulting Co., Chiba Bank, and Keiyo Bank. In addition, we have a network with institutions of higher education in China and Russia. Participating universities have accumulated innovative achievements in intercommunication in



Excellent educational program implemented within a wide-area network

Asia and Eurasia regions. Training in local offices of universities throughout China, Taiwan, South Korea, Thailand, Indonesia, Vietnam, and Myanmar is offered, and training opportunities are also planned at local branch offices of AEON and JTB. Graduate students participating in the program may receive guidance not only from the graduate

school they belong to but also from a diverse line-up of professionals in other affiliate institutions. Students will heighten their motivation for study and research in regular meetings for research reports and discussions to encourage one another and engage in friendly competition.

Asia-Eurasia × Digital Humanities: Challenge of Humanities

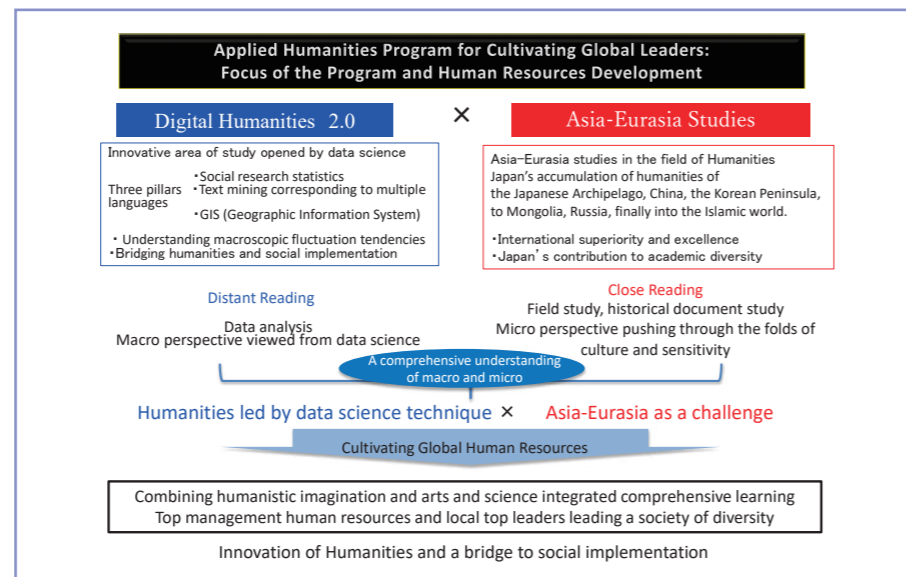
Humanities is the study of thoughts, words, behavior, ways and history of society that link people together. It is a seemingly roundabout way of gaining a fundamental understanding of people. Yet, what we see in front of us is a complex world in which people of increasingly diverse backgrounds move and come into contact with one another, which causes friction. Because we are in such a modern world, there is a need for a new study of humanities to move into the folds of diverse cultural backgrounds and sensitivity and ever-changing social dynamics to be able to identify guidelines for the resolution of issues.

The first focus of the program is Asia-Eurasia. This area covering East Asia, Southeast Asia, Russia in Northern Eurasia and the Islam world is not only deeply related to Japan's future direction, but it is an experimental site (developed areas facing challenges) where diverse issues of future society arise in a pluralistic world where multi-ethnic, multi-lingual, multi-cultural and multi-

religious elements are mixed. It is the region where the strength to deal with an ever-changing world is tested. The program aims to cultivate the capacity

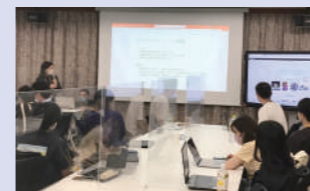
to closely analyze the pluralistic world of Asia-Eurasia on multiple levels.

The second focus is on Digital Humanities. In



Asia-Eurasia × Digital Humanities: Bridging Humanities and Social Implementation

Good Practice



Cross-institutional Collaboration and Digital Humanities

This program is a collaborative effort among five universities, each of which has graduate students affiliated with the program. So far, student exchange among the partner universities has been mainly online, but we convened face-to-face workshops and research presentations this year. In the workshop at the National Museum of Japanese History (Rekihaku), each team of several students, shuffled by university and field of study, acquired digital information from Rekihaku's diverse collection of objects and images according to the theme, curated them, and completed a virtual museum to exhibit.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]
 12 (FY2020), 12 (FY2021), 12 (FY2022), 12 (FY2023)
 [Number of anticipated program graduates] 2-12
 [Number of people engaged in the program] 78
 [Students' affiliated schools and departments]
 Chiba University 2 graduate schools, 4 departments, 1 program,
 Okayama University 1 graduate school, 3 departments, Nagasaki
 University 1 graduate school, 1 department, Kumamoto University
 1 graduate school, 3 departments, The Graduate University for
 Advanced Studies 1 graduate school, 1 department
 Chiba University
 (Graduate School of Humanities and Studies on Public Affairs)
 Humanities, Studies on Public Affairs and Social Sciences,

Humanities and Studies on Public Affairs
 (Graduate School of Science and Engineering) Mathematics and
 Informatics
 (Graduate Degree Program of Global and Transdisciplinary
 Studies)
 Okayama University
 (Graduate School of Humanities and Social Sciences) Japanese
 and Asian Culture, Human Socio-Culture, Socio-Cultural Sciences
 Nagasaki University
 (Graduate School of Global Humanities and Social Sciences)
 Global Humanities and Social Sciences
 Kumamoto University
 (Graduate School of Social and Cultural Sciences) Modern Social
 Human Studies, Cultural Science, Human and Social Sciences

The Graduate University for Advanced Studies
 (School of Cultural and Social Studies) Japanese History
 [WISE Cooperating Institutions]
 6 universities, 1 inter-university research institute corporation, 1
 public interest incorporated foundation, 4 companies
 Okayama University / Nagasaki University / Kumamoto University /
 The Graduate University for Advanced Studies / Zhejiang Gongshang
 University / Institute for Oriental and Classical Studies, National
 Research University "Higher School of Economics"(Russian) / National
 Museum of Japanese History / Aeon Environmental Foundation /
 AEON CO.,LTD / JTB Tourism Research & Consulting Co. / Chiba Bank
 / Keiyo Bank
 (As of November 2022)

Message from WISE Cooperating Institution



YAMAMOTO Yuriko
Director and Secretary General of
Aeon Environmental Foundation

Thinking of the World from Asia

AEON CO., LTD. has been working on glocal management to exist and prosper together with the local region centering on Asia. In order to develop business in the Asian market, it is necessary to learn about the lives of customers in the region, realize an environment of society for diversity, and pursue global values. We think that Takuetsu University's graduate program accepts the challenge of such an initiative by industry-academia collaboration.

Student's Voice



YAMAMOTO Kyosuke
Second Year Master's Course,
Graduate Degree Program of Global
and Transdisciplinary Program
Studies, Chiba University

WISE Program and Transdisciplinary Research

I am studying representation in children's film from the perspective of racialized gender. My focus is how representation of women are shifted in the past ten years in the same franchise. In addition, my research also analyze how the motif was pruned by the filmmakers, and how the gender issue that studio have affect what they depict on screen.
 I decided to enroll in this program because I wanted to enhance transdisciplinary trait of my research.

Innovative Medicine CHIBA Doctoral WISE Program

[Program Coordinator] SAITO Tetsuichiro (Vice President, Dean of Graduate School of Medical and Pharmaceutical Sciences, Professor, Department of Developmental Biology, Graduate School of Medicine, Chiba University)

[Fields of diplomas] Doctor of Philosophy (Medicine), Doctor of Philosophy (Pharmacy)

Name of the program to be noted: Innovative Medicine CHIBA Doctoral WISE Program

[URL] <https://www.m.chiba-u.jp/dept/imec/en/>



Message from the President



NAKAYAMA Toshinori
President of Chiba University

Fostering creators of new "medical knowledge" and innovators of world-leading innovative medicine

Based on the philosophy of "Always Aim Higher", Chiba University promotes outstanding education and research that integrates humanities and science, intending to develop next-generation human resources who can play an active role as leaders in the global society. At the same time, we continue to take on constant challenges, such as reforming the structure based on our vision.

This program will develop human resources with flexible thinking ability, challenging spirit, and resilience through education in collaboration with the world's top research institutes and familiar with multiple specialized fields. In the future, they will create new medical knowledge and medical innovation. We hope that this program's graduates will become world-leading human resources to develop modern medicine and medical care and realize a sustainable healthy society.

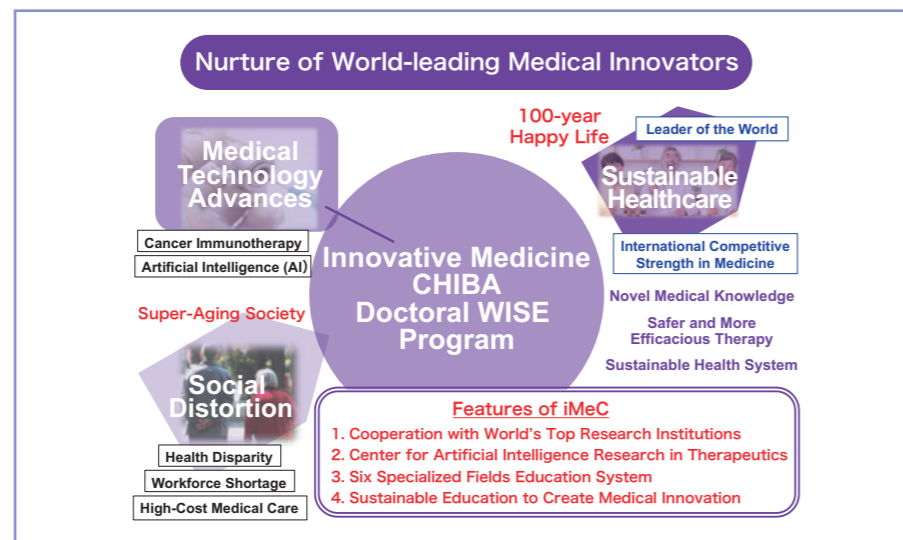
Nurture of World-leading Medical Innovators

The latest technologies including cancer immunotherapies and artificial intelligence are dramatically advancing medical care. Continuous creation of "novel medical knowledge" is imperative for Japan, which is a super-aging country, to lead the world as a future model to achieve a sustainable healthier society.

The Graduate School of Medical and Pharmaceutical Sciences takes a lead role in operation of Innovative Medicine CHIBA Doctoral WISE Program (iMeC-WISE), based on its more than 100-year history. iMeC-WISE implements the new graduate education system in cooperation with world-class academic and research institutions, including RIKEN and the University of California San Diego (UC San Diego), many companies and the Center for Artificial Intelligence Research in Therapeutics of Chiba University. Through innovative comprehensive training with a focus on multidisciplinary close mentoring to nurture high level of broader perspective, cooperativeness,

leadership and entrepreneurship, iMeC-WISE aims to foster the next generation of outstanding researchers and innovators who will contribute to

the development of medical sciences, pave the way to novel therapies and drugs, and develop sustainable healthcare systems.



iMeC-WISE nurtures world-leading medical innovators in cooperation with many world-class institutions and the Center for Artificial Intelligence Research in Therapeutics of Chiba University.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]
15 each (FY2020 - 2023)

[Number of anticipated program graduates] 5 - 15

[Number of people engaged in the program] 64

[Students' affiliated schools and departments]
4 graduate schools, 10 departments

[WISE Cooperating Institutions]
<Graduate School of Medical and Pharmaceutical Sciences> Frontier Medicine and Pharmacy, Medical Sciences, General Pharmaceutical Sciences
<Graduate School of Science and Engineering>

Mathematics and Informatics, Earth and Environmental Sciences, Advanced Science and Engineering, Creative Engineering, Fundamental Engineering
<Graduate School of Nursing> Nursing
<Graduate School of Horticulture> Environmental Horticulture

[WISE Cooperating Institutions]
4 universities, 3 public research institutions, 8 companies
University of California San Diego / University of

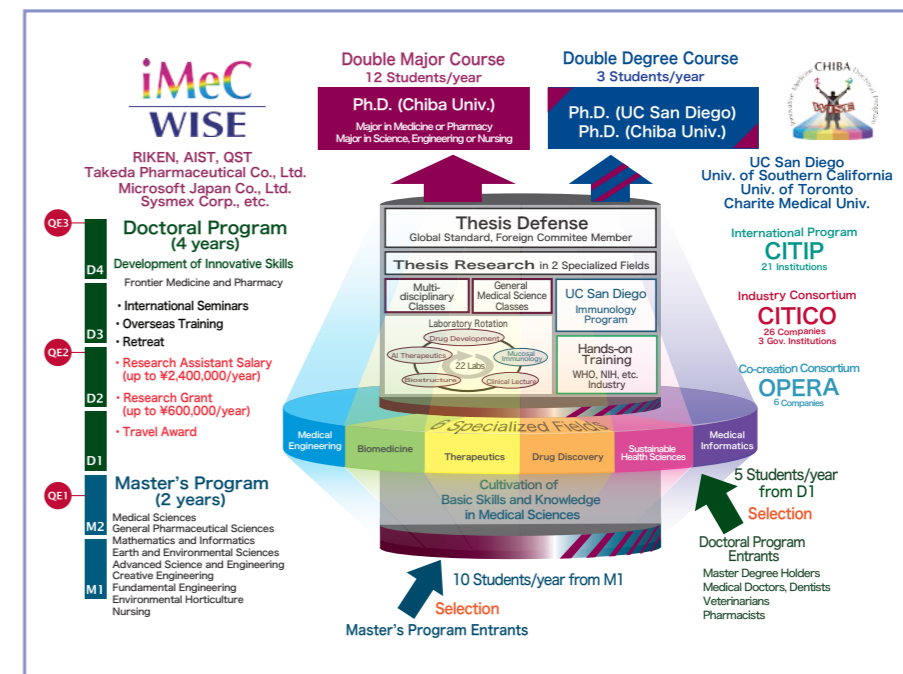
Southern California / Charité – Universitätsmedizin / University of Toronto / Institute of Physical and Chemical Research / National Institute of Advanced Industrial Science and Technology / National Institute for Quantum Science and Technology / Takeda Pharmaceutical Company Limited / Microsoft Japan Co., Ltd / Sysmex Corporation / Eli Lilly Japan K.K. / Olympus Corporation / DNA Chip Research Inc. / H.U. Group Research Institute G.K. / Genefrontier

(As of October 2022)

Sustainable Education System to Create Medical Innovation

Talented graduate students with different backgrounds will major in at least two out of the six specialized fields, which are organized beyond departments and institutions: Therapeutics, Medical Engineering, Biomedicine, Drug Discovery, Sustainable Health Sciences and Medical Informatics. The students are required to cultivate basic skills and knowledge on Medical Sciences studying in nine areas of the two-year Master's Program. Then they accomplish at least two projects in different fields, equivalent to double majors, in Frontier Medicine and Pharmacy of the four-year Doctoral Program. Each student is guided by professors from three fields and takes the curriculum to nurture multidisciplinary skills necessary for the creation of interdisciplinary innovation: rotation training, self-planned overseas training, self-directed retreat and others. The International Double Degree Course, in which students can earn Ph.D. degrees from both Chiba University and a foreign university such as UC San Diego is provided. The Chiba Innovative Therapeutics International Program (CITIP) for global education containing 37 visiting professors of 21 foreign institutions, and the Chiba Innovative Therapeutics Industry Consortium (CITICO) for industry-government-academia collaborative education consisting of 26 companies, and three government institutions are also engaged in this program.

Ten students for the Master's Program and five



Students cultivate basic skills and knowledge on Medical Sciences in the Master's Program and then take either the Double Major Course or the International Double Degree Course.

students for the Doctoral Program enter iMeC-WISE every year. Qualifying examinations (QEs) are conducted at three stages to assure the quality of the academic degree: QE1 in the 2nd year of the Master's Program, QE2 at the end of the 2nd year of the Doctoral Program, and QE3 at the end of the Program. Each dissertation committee includes

at least one foreign professor to ensure that the degree is based on the international standards.

iMeC-WISE provides students with financial support and the career development office as well as subsequent post-graduate employment positions to maximize each student's potential and build the foundation for career success.

Good Practice



"Advanced General Education" to nurture a global perspective

Innovative Medicine CHIBA Doctoral WISE Program provides "Advanced General Education", in which many eminent leaders in various fields deliver lectures so that students can develop critical thinking, analytical skills, problem-solving abilities and a moral compass from various angles. iMeC-WISE students determine and invite 15 leaders every year. Prof. Takaaki Kajita, Nobel Laureate in Physics 2015, talked in 2022.

Message from WISE Cooperating Institution



EBIHARA Takashi
GeneFrontier Corporation, COO

Be Sensitive, Active, and Creative

As the world is getting diversified, there are full of problems to be solved. Those problems are too complex to solve at once, and there might not be an absolute one answer. Here, what we can do is to think of as many solutions as possible. Based on advanced science, how would you answer? I'm expecting that this program will produce PhDs who can come up with unique answers for the bright future.

Student's Voice



RYOHEI Ono
D3, Frontier Medicine and Pharmacy, Graduate School of Medical and Pharmaceutical Sciences, Chiba University

iMeC WISE program with cluster-based educational system

I applied to this iMeC WISE program because I wanted to deepen my own research by studying a main major in medicine as well as a sub major in engineering. This program has a cluster-based educational system, which allows students to major in two or more clusters, and helps them develop their innovation skills and cultivate their foundations as researchers.

Based on this experience, my goal is to become an innovator who can lead the world's research.

Forefront Physics and Mathematics Program to Drive Transformation



[Program Coordinator] MURAYAMA Hitoshi (University Professor, Kavli Institute for the Physics and Mathematics of the Universe, The University of Tokyo)

[Fields of diplomas] Doctor of Philosophy, Doctor of Science, or Doctor of Engineering

Name of the program to be noted: Completed the Forefront Physics and Mathematics Program to Drive Transformation

[URL] <https://www.s.u-tokyo.ac.jp/en/FoPM/>



Message from the President



FUJII Teruo
President, The University of Tokyo

Creating the future through dialogue: Maximizing the potential of basic science specialists

The Forefront Physics and Mathematics Program to Drive Transformation (FoPM) aims to set a new standard for graduate-level education at the University of Tokyo and beyond. To achieve academic excellence, I believe that it is essential for diverse groups of people to come together to discuss, learn, and identify and share challenges and solutions. In this context, FoPM provides a diverse and inclusive place for curious and talented graduate students to come together and engage in an open and transparent dialogue with globally-minded scientists at various stages along a wide variety of career paths. This focus on diversity and dialogue, in addition to the acquisition of strong research skills, will foster graduates with both specialized knowledge in their chosen field and the skills required to transcend boundaries and lead the future of science and society.

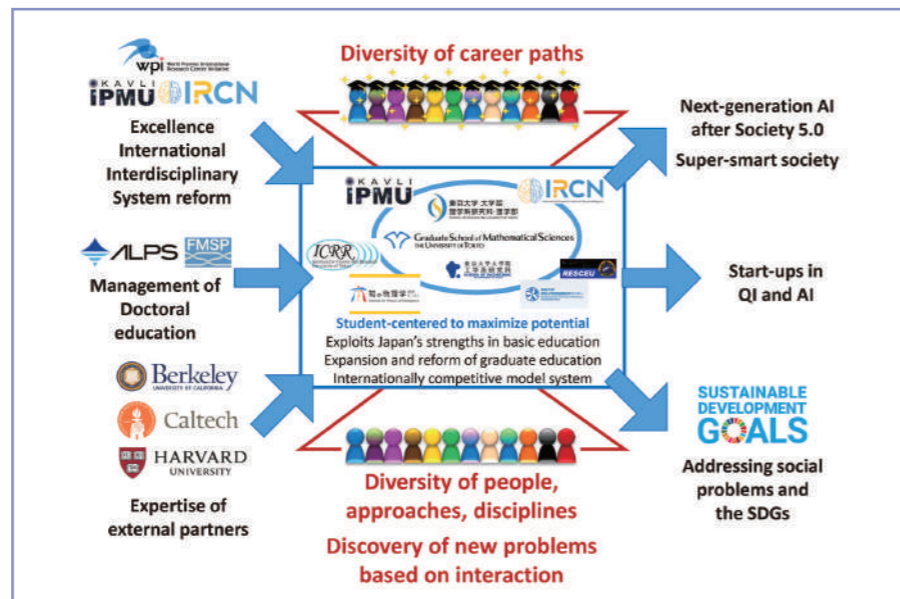
Advancing social innovation through basic science

Mathematics provides the quantitative basis of all academic disciplines and physics underpins the fundamental laws of all of the natural sciences. It thus follows that physicists, mathematicians, and other specialists in the natural sciences play an essential role in the current shift to a knowledge-based society. Basic science specialists do not simply contribute to academic research in their respective fields; their work can also have a great impact on society. For example, the discovery of the DNA double helix, the invention of blue LEDs, and even the development of the internet would not have been possible without their contributions. Physics and mathematics will also be instrumental in creating the academic knowledge essential for the technological innovation needed to resolve the global challenges facing our society today.

With this in mind, the "Forefront Physics and Mathematics Program to Drive Transformation" (FoPM) uses education in state-of-the-art physics and mathematics to cultivate logical, flexible, and non-biased thinking. The program aims to foster

specialists in the basic sciences who can exert a wide influence on science, technology, and social innovation. By challenging outdated customs and

long-held beliefs within the education system, we also aim to take advantage of Japan's fundamental strengths and develop a new



Connecting people and research beyond traditional boundaries

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]
40 each (FY2019-FY2023)

[Number of anticipated program graduates] 40

[Number of people engaged in the program] 116

[Students' affiliated schools and departments]
3 graduate schools, 6 departments

(Graduate School of Science) Physics, Astronomy, Earth and Planetary Science, Chemistry
(Graduate School of Engineering) Applied Physics
(Graduate School of Mathematical Sciences)

Mathematical Sciences
[WISE Cooperating Institutions]
13 universities, 4 public research institutes, 3 companies

Nippon Steel Corp. / NTT Corp. / Macromill, Inc. / École Polytechnique / California Institute of Technology / UC Berkeley / Korea Institute for Advanced Study / National Taiwan University / ETH Zurich / Tsinghua University / Seoul National University / Harvard University / Princeton University / Peking University / ENS de Lyon / HSE University /

CERN / Mathematical Sciences Research Institute / IHES / Paul Scherrer Institute

(As of November 2022)

internationally competitive model for graduate education in Japan.

Connecting science and society through educational reform

FoPM builds on the University of Tokyo's two World Premier International (WPI) Research Centers, the Kavli Institute for the Physics and Mathematics of the Universe (Kavli IPMU) and the International Research Center for Neurointelligence (IRCN), which have contributed greatly to the globalization and reform of research systems at UTokyo and beyond. The program offers a curriculum in which students come into contact, engage in dialogue, and work closely with a diverse range of people and research fields. We make use of the expertise of our external partner institutions, require all students to experience academic life outside of Japan, and have introduced a lab rotation system in which students spend time in a second research group within UTokyo. These activities provide our students with a global perspective and enable them to understand the wider scientific context of their research. Moreover, to ensure that research involving those from different backgrounds proceeds smoothly, we offer a new seminar given by an expert in diversity education and regular seminars in which students mix casually with those from other research groups.

Within this diverse and inclusive environment, we provide courses designed to foster an outstanding level of specialist knowledge, as well

	M1 Year 1	M2 Year 2	D1 Year 3	D2 Year 4	D3 Year 5
QA	PE	QE			FE
	Portfolio Management				
Diversity: Research Fields	Lab Rotation		International Research Experience		
	Regular Discussions with Secondary Supervisors				
	Introductory Courses & Contemporary Lecture Series				
	SDGs Course, Executive Program, Frontiers of Mathematical Sciences and Society				
Diversity: People	Web-based Admission				
	Diversity and Ethics Training				
Cross-interaction	Study Abroad in UTokyo				
	4PM Seminar				
Diversity: Career Paths	Academic Writing and Presentation				
	AI and Quantum Computing				
	Mathematics in Society Hands-on Course, Mathematics and Physics Entrepreneurship				
	International Career Seminar				
Support Systems	Diverse Instructors/All-English Curriculum/Financial Support				

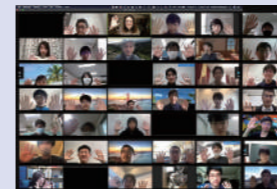
Coursework through which students develop skills for their future careers and our future society

as those in which students develop an awareness of how they could use this knowledge to solve complex global challenges. Through our "Academic Writing and Presentation" and "AI and Quantum Computing" courses, students acquire valuable skills for their future careers, regardless of the path they choose to take after graduation. We aim to further open students' eyes to the wealth of possibilities available to them outside of Japan

and outside of academia with the program's International Career Seminar.

By providing a place where students can refine their specialist skills, develop an awareness of the impact of their research, and grasp the multitude of career options available to them, FoPM aims to maximize students' potential through diversity and dialogue in today's uncertain world.

Good Practice



Diversity and dialogue

Diversity and Ethics Training: Students learn the importance of respectful interaction and collaboration with people of different genders and backgrounds from an expert in diversity education. In turn, they discover how this can give them a new perspective on their research.

Lab Rotation: Students spend 4-6 weeks in a host lab working in a different field of research to their own. Through this they experience a new culture and develop skills to initiate new interdisciplinary projects.

4PM Seminar: After a lecture by an invited speaker, students give short talks on their research for those working in other fields, then discuss and evaluate each other's presentations. In the second half of the seminar FoPM students interact freely in small groups chosen at random to break down the barriers between research groups.

Message from WISE Cooperating Institution



Dr. Stefan RITT

Group Head, Muon Physics Group, Paul Scherrer Institute, Switzerland

Student exchange through the WISE Program is a clear win-win situation

I have already hosted several FoPM students in the Muon Physics Group at the Paul Scherrer Institute in Switzerland, where we do basic research in fundamental particle physics. This gives them the opportunity to be immersed in foreign research customs and Swiss culture. The students also bring their traditions and skills to our group, which I have always enjoyed. We still have contact to some students even now. Student exchange through FoPM inspires me and my colleagues and is a clear win-win situation for both Japan and Switzerland.

Student's Voice



Ryota YAMBE

Graduate student (D2), Department of Applied Physics, Graduate School of Engineering

Diversity education opens up the possibilities of scientists

Collaboration with experts in various fields is important to solve social problems. FoPM provides us with a curriculum to not only enhance our expertise but also to learn about diverse fields and cultures. This curriculum develops our skills to understand diversity and work with people in different fields. Although our views tend to narrow in research life, the curriculum broadens our view and nurtures a spirit to take on issues in other fields and society through basic science.

World-leading Innovative Graduate Study: Advanced Business Law Program

[Program Coordinator] TAMURA Yoshiyuki (Professor, Graduate Schools for Law and Politics, The University of Tokyo)
[Fields of diplomas] Doctor of Laws, Doctor of Engineering, Doctor of Philosophy in the field of Information Science and Technology, Doctor of Medical Science, Doctor of Philosophy in Management, Doctor of Philosophy in the field of public policy
 Name of the program to be noted: The World-leading Innovative Graduate Study: Advanced Business Law Program
[URL] <https://ablp.j.u-tokyo.ac.jp/english>



Message from the President



FUJII Teruo
President, The University of Tokyo

Training interdisciplinary visionaries who shape policy concerning various business fields

The World-leading INnovative Graduate Study: Advanced Business Law Program (WINGS-ABLP) contains an ambitious curriculum promoting interdisciplinary education by fusing topics from the sciences, humanities, and liberal arts in order to produce human resources who can propose solutions to various problems businesses face in the age of technology. These problems arise as innovations in artificial intelligence, the Internet of Things, and biotechnologies progress. Before becoming an official part of the ABLP, the program that formed its basis was already equipping students to flourish as visionaries in various fields, such as academic, industrial, official, and legal circles. We expect that students who have completed the ABLP will shape policy in various fields in order to navigate the age of great change.

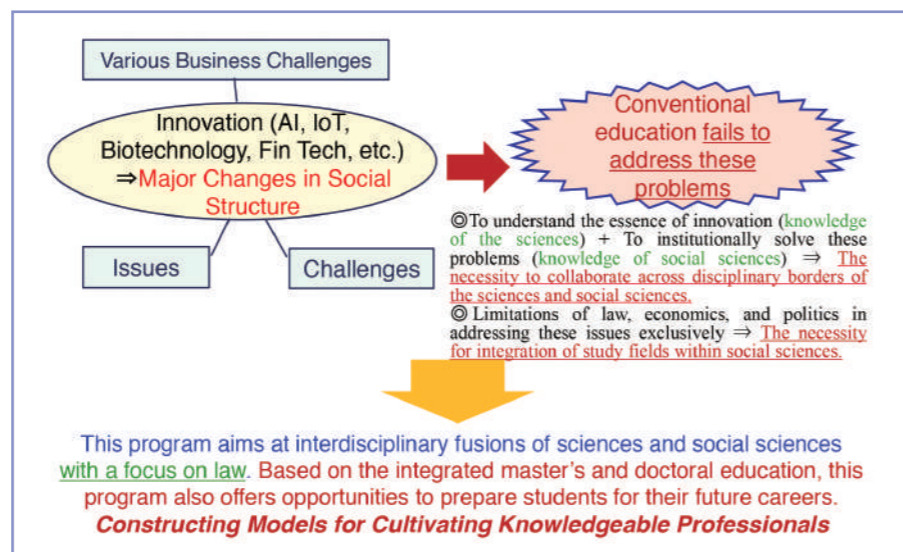
Coping with various business challenges

The Fourth Industrial Revolution represented by AI, IoT and big data, and innovations such as biotechnologies, have raised various new problems and concerns of business. Conventional education, which has been divided into different academic disciplines, fails to address these issues. First, to understand the essence of innovation, knowledge of the sciences is necessary, meanwhile, to institutionally solve these business problems, knowledge of social sciences is required. Thus, it is necessary to collaborate across disciplinary borders of the sciences and social sciences. Second, since the academic fields of law, economics, and politics each have their own limitations in addressing these issues exclusively and separately, there is also a necessity for integration of study fields within social sciences.

Even with the need of interdisciplinary fusions, problems occurring in the actual society are intricately intertwined, it is almost impossible to

develop and propose perfect solutions to these complex problems from scratch. For example, in considering whether to grant patent protection

on the discovery about the function of new gene segment, it is difficult to clearly determine which approach is better: to grant the patent in order



To propose specific solutions to various challenges businesses face as innovations advance, an interdisciplinary approach that integrates sciences and social sciences, fuses different topics from social sciences is indispensable.

to promote innovation by rewarding the scientific finding, or not to grant the patent because this discovery is basic research so as to encourage the development of subsequent innovation. Even though the determination is difficult, this problem can be legally reviewed. It could be understood with a conventional issue of granting pharmaceutical patent to chemical substance, which requires to consider whether chemical substance has comparable pharmacological effects. Taking the problem mentioned above as a question concerning the existence of effects, if the function of the new gene segment can be evaluated as having pharmacological effects, patent can be granted as a tentative solution to the problem. Meanwhile, law can justify it on an equal basis with other existing patented inventions, verify whether there are ethical issues from the perspective of justice.

Producing the elites

This program provides the Basic Seminar for master's students and the Progress Seminar for doctoral students as compulsory subjects in order to reflect the aforementioned interdisciplinary fusion with a focus on law in the educational program. Aiming at fostering interdisciplinary synergy effects, the program assembles students and professors specializing in natural science, economics, politics and law. This program will guide students to learn specific research methods of law where trial-and-error could be used as a

Law has the inherent characteristics that, even though new social problems have arisen, could use the existing legal system as a starting point, and deal with the issues by taking muddling through approach with gradual trial-and-error.

possible approach, and enlighten students with values such as freedom, equality, and justice that inherent in law.

We expect that students who have completed this program will flourish as elite practitioners,

researchers, and policy planners to lead industry, government, and academia in the fields of business law.

Good Practice



Interdisciplinary and integrative education led by legal studies in the field of advanced business law

In compulsory courses, the Basic Seminar and the Progress Seminar for Advanced Business Law, we invite lecturers from graduate schools and collaborative institutions outside of the Graduate Schools for Law and Politics, to cultivate students' knowledge for interdisciplinary studies. Besides, instead of teaching the means-ends thinking approach, we try to enlighten students to take a progressive trial-and-error approach by using inclusive models based on the concept of law, to incorporate inherent values of law—freedom, equity and justice—into the approach and therefore convince the public. In addition, students with diverse educational backgrounds have enrolled in and gathered for this program. By sharing and discussing the concepts of their master's or doctoral theses, we are exploring and engaging in the interdisciplinary studies.

Message from WISE Cooperating Institution



SATO Hideyuki

Vice President and COO, Legal & Risk Management Division, Corporate Unit, SoftBank Corp. / Attorney at Law (Japan, New York U.S.A.)

Be human capital using practical legal thinking in the age of VUCA

SoftBank, together with group companies such as Yahoo, LINE, and PayPay, is aiming to build a next-generation social infrastructure as a comprehensive digital platform that meets the challenge of digitalizing all industries. We strongly hope that by conveying our company's efforts through this program, many people will gain the skills to think practically and legally in the age of VUCA (volatility, uncertainty, complexity, and ambiguity) based on the evolution of society, politics, the economy, and technology.

Student's Voice



SHIDA Saori

School of Legal and Political Studies, Graduate Schools for Law and Politics, The University of Tokyo

Achieving interdisciplinary learning based on the study of jurisprudence

I sought to participate in this program because of its prominent characteristics, the cross-disciplinary education. Through support such as participation in seminars and conferences related to my study and the development of a variety of classes, the program has facilitated the pursuit of my degree in a motivating environment while gaining perspectives on not only jurisprudence but also economics and politics. Interacting with researchers and students in different fields has allowed me the opportunity to broaden my horizons.

Engineering Education Program for Super Smart Society based on Advanced Quantum Science

[Program Coordinator] SAKAGUCHI Kei (Professor, School of Engineering, Tokyo Institute of Technology)

[Fields of diplomas] Doctor of Engineering, Doctor of Science, Doctor of Philosophy

Name of the program to be noted: WISE (World-leading Innovative & Smart Education) Program for Super Smart Society

[URL] <https://www.wise-sss.titech.ac.jp/en>



Message from the President



MASU Kazuya
President, Tokyo Institute of Technology

Train "knowledge professionals" to lead a Super Smart Society through university-wide interdisciplinary education

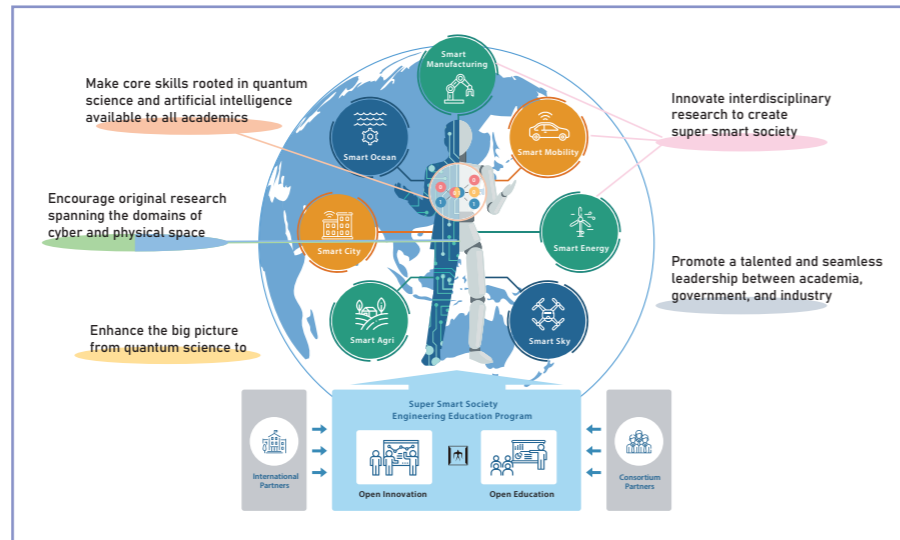
The University promotes pioneering education reform, which includes establishing a university-wide interdisciplinary education program and offers a consistent liberal arts education from the undergraduate to the doctoral program (interdisciplinary education of arts and science). In FY 2017, the University was selected as a Designated National University Corporation and has made strides in producing brilliant and captivating individuals with a doctoral degree by responding to social demand. With human resource and financial assistance from the Consortium partners and the university-wide support system, the program offers interdisciplinary education between cyber/physical space technologies with quantum science, which is an area that Tokyo Institute of Technology is leading the world. By offering such education, the University trains knowledge professionals, who can lead industry, government and academia in the forthcoming Super Smart Society.

Image of graduates: Who leads a Super Smart Society?

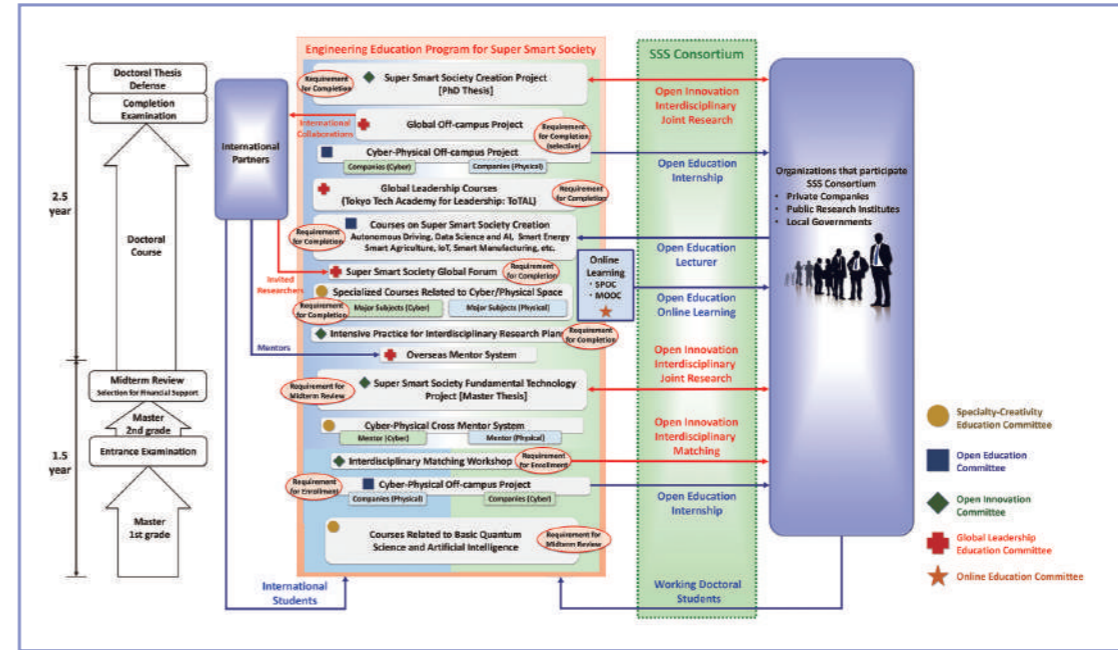
Leaders of the forthcoming Super Smart Society (SSS) must be able to integrate state-of-the-art quantum science with cyber and physical space technologies. For example, in SSS, sensor data collected via 5G/IoT is analyzed by AI to control robotics. In this process, sensors must be replaced with ultra-high sensitivity quantum sensors to allow real-time analysis of big data by executing AI on quantum computers. By integrating quantum science, it is possible to advance society into SSS. Against such a social background, the University established "the WISE Program for Super Smart Society", an integrated master & doctoral program. As shown in Fig. 1, the program trains individuals who lead SSS with 1) core skills rooted in quantum science and artificial intelligence, 2) ability to create original research spanning the domains of cyber and physical spaces, 3) ability to grasp the big picture from quantum science to SSS, 4) ability to solve social issues through innovative interdisciplinary research, and 5) talented

and seamless leadership between academia, government, and industry. The graduates from the program are expected to contribute in the domain of SSS engineering related to the future Earth such

as 1) smart agriculture, 2) smart city, 3) smart ocean, 4) smart manufacturing, 5) smart mobility, 6) smart energy, and 7) smart sky.



(Figure 1) Image of program graduates



(Figure 2) WISE Program for Super Smart Society

Features of WISE Program for Super Smart Society

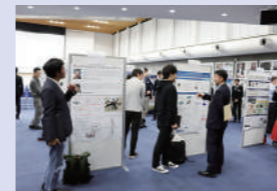
The program is the core of the University's SSS Promotion Project, and the main feature is to provide education with 71 faculty members collaboratively across six graduate schools and the Institute for Liberal Arts. Thus, interdisciplinary education is realized across the following fields:

physical space technology in the School of Engineering, cyber space technology in the School of Computing, and quantum science in the School of Science. This is an exceptional education program that fosters specialization and originality across these fields.

Furthermore, in the field of SSS, it is necessary to train talent through social collaborative education (open education) and interdisciplinary research

Consortium (green) acts as a bridge to realize open education (blue arrow) to cultivate a broad perspective and open innovation (red arrow) to develop problem solving ability. By providing global leadership education in collaboration with overseas partner institutions, training global leaders with specialized knowledge and high ambition is another feature of the program.

Good Practice



Interdisciplinary research team building to bring about super smart society -- Research in academia to meet social needs from industry

The interdisciplinary matching workshop of the Tokyo Tech Academy for Super Smart Society aims to link the needs of member organizations of the Super Smart Society Promotion Consortium with technology and talent from Tokyo Tech faculty and students to form interdisciplinary research teams. With help from team advisors, students will perform research activities for their super smart society innovation research project with the goal of realizing a super smart society. Interdisciplinary collaboration opportunities are increasing in research fields. One such example is combining technology of highly-sensitive quantum sensing with a study of protecting corrosion of steel bars inside reinforced concrete structures by applying an electric current to the structure.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]
35 (FY 2020), 25 (FY 2021), 25 (FY 2022), 25 (FY 2023)
[Number of anticipated program graduates] 10-25
[Number of people engaged in the program] 123
[Students' affiliated schools and departments]
6 Schools, 14 Departments
(School of Engineering) Mechanical Engineering, Systems and Control Engineering, Electrical and Electronic Engineering, Information and Communications Engineering, Industrial Engineering and Economics
(School of Science) Physics
(School of Computing) Mathematical and Computing Science, Computer Science
(School of Life Science and Technology) Life Science and Technology
(School of Environment and Society) Architecture and Building Engineering,

Civil and Environmental Engineering, Transdisciplinary Science and Engineering, Social and Human Sciences
(School of Materials and Chemical Technology) Chemical Science and Engineering
[WISE Cooperating Institutions]
6 public research institutes, 20 overseas universities, etc., 21 corporations, 2 local / public bodies, 1 administrative body, 1 incorporated foundation
National Agriculture and Food Research Organization / National Institutes for Quantum and Radiological Science and Technology / RIKEN Center for Advanced Intelligence Project / Japan Agency for Marine-Earth Science and Technology / NICT Wireless Networks Research Center / AIST Information Technology and Human Factors / JTEKT Corporation / NEC Corporation / NSK Ltd. / Yaskawa Electric Corporation / Azbil Corporation / Yokogawa Electric Corporation / Kodan Electronics Co., Ltd. / KDDI Corporation / SoftBank Corp. / Huawei Japan / SHO-BOND Corporation / Aritsu / DENSO Corporation / LG Japan Lab Inc. / Kawasaki

Heavy Industries, Ltd. / Kubota / Komatsu Ltd. / Panasonic Corporation / Mitsubishi Electric / Central Japan Railway Company / Rakuten Mobile / Kawasaki City / Ota City / Ministry of Agriculture, Forestry and Fisheries / Ocean Policy Research Institute / Google LLC / CEA Leti / National Taiwan University of Science and Technology / University of Twente / University of Rome Tor Vergata / The Ohio State University / Thammasat University Thailand / Univ. Glasgow / Technical University of Munich / Fraunhofer Heinrich-Hertz-Institute / University of Sydney / Institute for Infocomm Research / Cornell University / Yonsei University / RWTH Aachen University / Airgain / Japanese Chamber of Commerce & Industry of NY / the Henry Samueli School of Engineering, University of California, Irvine / Georgia Institute of Technology / University of Melbourne

(As of November 2022)

Message from WISE Cooperating Institution



KYUMA Kazuo
President, National Agriculture and Food Research Organization

Expectation for "knowledge professionals" towards realizing Society 5.0

In order to enhance the global competitiveness of Japanese industry through the realization of "Society 5.0" which the government advocates as a super smart society, it is necessary not only to harness the strengths of "Monozukuri manufacturing" but also to create innovative industries and services utilizing ICT and AI. I support this program in the hope that it fosters "knowledge professionals" who can recognize new needs, set goals, find solutions, and lead the smart society of the future.

Student's Voice



NOGUCHI Takahiro
The third year in the doctoral program, School of Engineering, Department of Electrical and Electronic Engineering

Towards a knowledge professional with interdisciplinary education

I was attracted by the wide range of state-of-the-art fields not only mechanical, electrical and information technologies but also quantum science and AI, which are necessary to realize a Super Smart Society. Furthermore, through practicums, it is possible to experience cutting-edge technology such as automated driving, which is expected to be ubiquitous in a Super Smart Society. I applied for the program because I believe broad knowledge and intelligence will be powerful weapons in the future Super Smart Society.

Development of WISE (World-leading Innovative & Smart Education) Program to foster AI (Artificial Intelligence) Professionals for Marine Industries

[Program Coordinator] SHOJI Ruri (Vice President, Professor, Tokyo University of Marine Science and Technology)

[Fields of diplomas] Doctor of Philosophy or Doctor of Engineering Degree

Name of the program to be noted: WISE program for the Development of AI Professionals in the Marine Industries.

[URL] <https://www.g2.kaiyodai.ac.jp/marine-ai/eng/>



Message from the President



ISEKI Toshio
President, Tokyo University of Marine Science and Technology

Fostering industry-ready professionals who will bring innovation to marine industries

TUMSAT's WISE Program is now in its fourth year. Members of first batch of students admitted in April 2020 have finally advanced to the doctoral course, and are gaining a wealth of valuable experiences and developing significantly in a new learning environment that includes working people returning to education. Internships and residencies in particular are highly effective for learning, and contribute significantly to carving out a career path. In that regard, I would like to express my deepest gratitude to the institutions that make up the Marine AI Consortium for their kind cooperation, I cannot thank everybody enough. In the future, I would like to make various reforms to the entire graduate school through concrete initiatives, such as organizing events that match student ideas with the needs of companies, further strengthening cooperation with marine-related industries, and putting the schemes we have created in the WISE Program to practical use.

Development of AI professionals for marine industries

It is important to enhance Japan's presence in global marine industries as the marine-related working population decreases in modern society by producing individuals who create diverse values and novel systems that contribute to the realization of "Society 5.0 (ultra-smart society)." TUMSAT fosters the development of Artificial Intelligence (AI) Professionals and innovators. We train highly skilled experts who are not only literate in big data (BD) analysis and machine learning (ML) but also can assess AI performance. Based on expertise and field experiences gained at TUMSAT, they will drive the social implementation of AI and marine-related policies.

The WISE Program is established as a 5-year integrated graduate school course at TUMSAT.

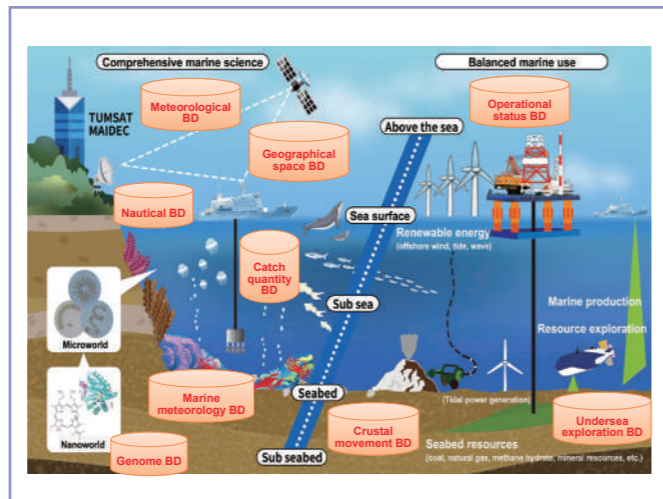
The master's program provides lectures on BD analysis and ML to develop students' technical literacy, while practical skills beyond the courses are gained at MAIDEC. At the end of the master's program, students' basic ability to conduct doctoral dissertation research is assessed (Qualifying Exam). Through these efforts, we strive to develop

specialists who can implement their knowledge and expertise gained at graduate school.

The doctoral program provides two introductory courses on AI and society. Since AI is expected to be highly reliable, the Course on Advanced Reliability Assessments focuses on performance evaluation methods for AI. The Course on Social Implementation Impacts Assessment discusses the impact of AI on society. In addition, the doctoral program cultures students' capabilities necessary to lead the social implementation of AI by providing opportunities to participate in real business projects at partner institutes (in-

residence projects) and fieldwork.

Through these efforts, TUMSAT aims to a cross-organizational degree program in 2026 as a follow up to the WISE Program.



Collect and analyze wide-ranging big data from the air to sub-seabed in a cross-sectional manner via industry-government-academia collaboration. Develop and provide an educational program on big data analysis and AI development assessments.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]

10 each (FY2019-FY2021), 15 each (FY2022-2023)

[Number of anticipated program graduates] 15

[Number of people engaged in the program] 51

[Students' affiliated schools and departments]

1 graduate school, 9 departments

(Graduate School of Marine Science and Technology)
Marine Life Sciences, Food Science and Technology,
Marine Resources and Environment, Marine Policy
and Management, Marine System Engineering,

Maritime Technology and Logistics, Safety
Management in Food Supply Chain, Applied Marine
Biosciences, Applied Marine Environmental Studies
[WISE Cooperating Institutions]

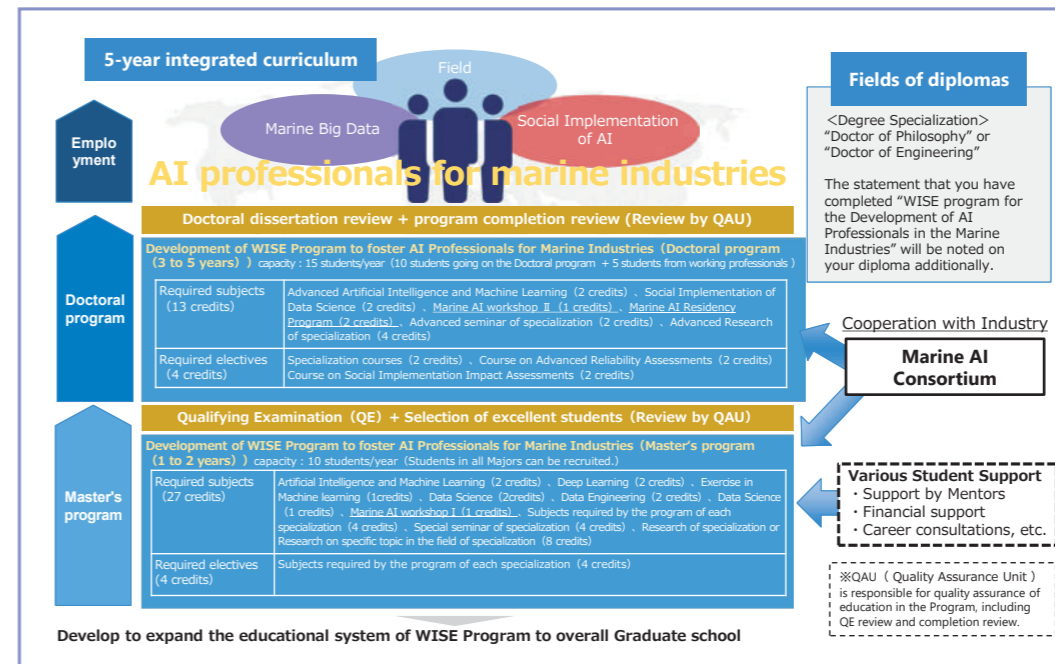
3 public research institutes, 1 university, 5
companies, 2 judicial foundations, 1 non profit
organization

Japan Agency for Marine-Earth Science and Technology
/ Japan Fisheries Research and Education Agency
/ National Institute of Maritime, Port and Aviation
Technology / Technical University of Denmark /

BEMAC Corporation / IDEA Consultants, Inc. / Innoqua
inc. / Maruha Nichiro Corporation / Nippon Suisan
Kaisha, Ltd. / Ocean Policy Research Institute of
Sasakawa Peace Foundation / Japan Weather
Association / NPO Marine Technologist

(As of November 2022)

Year of selection FY 2019



Educational system for the development of AI Professionals for Marine Industries

Education and research system to sustain excellence

TUMSAT has established an education and research system that spans wide-ranging fields such as marine, maritime, and fisheries. Students can learn about (1) the development of autonomous navigation vessels desired by the marine industry, (2) ocean observations using artificial satellites and Argo float data, (3) analysis of genomic information of aquatic

organisms, (4) management of marine resources, and (5) establishment of next-generation smart fisheries. On November 1, 2019, we established the Marine AI Development and Evaluation Center (MAIDEC) to fully utilize state-of-the-art nautical training vessels such as Shinyo-Mar, which is a strength of TUMSAT, the Field Science Center, and advanced navigation systems. In fiscal year 2020, we established a marine AI consortium with partner institutes to advance the WISE Program via

and ocean information systems.

Fostering AI experts in marine industry will improve our entire society by stabilizing the food supply while conserving natural resources and solving labor shortages. When social implementation of AI is realized, the achieved high valued services can be expanded overseas and contribute to Sustainable Development Goals (SDGs).

Good Practice



Promoting the enhancement of students' AI skills and research using AI in the marine field through Marine AI Student Study Sessions and internships at Marine AI Consortium partners

TUMSAT is implementing the following initiatives to promote the enhancement of students' AI skills and research using AI in the marine field.

- ① Marine AI Student Study Sessions Plus: The event is open to researchers and developers from related industries and research institutions to provide a forum for more active exchange on the latest knowledge and technologies related to marine AI.
- ② Internships at Marine AI Consortium partner institutes: Students are sent into the field to work on projects aimed at solving various marine issues by using AI. It is an opportunity for them to acquire insights that they could never experience on campus, such as processes and modeling in settings where AI is socially implemented.

Message from WISE Cooperating Institution

We train experts who transform society by leading the marine industry



TABATA Hideo
Chairman, IDEA Consultants, Inc.

Real business fields are eagerly awaiting flexible thinking that leads to innovation. Utilization of the sea for industrial purposes such as fisheries, logistics, and resource/energy production will accelerate the accumulation of diverse data. We hope that the WISE Program produces the next generation of professionals who can understand the scientific meaning of such big data and make full use of information sharing technology to solve marine-related problems. We hope to contribute significantly to the Program.

Student's Voice

Full speed ahead using problem solving in the marine industry



IMAI Ryota
Third year of doctoral program at Course of Applied Marine Environmental Studies

Currently, marine vessels are operated by the knowledge and skills of experienced crews. Machine learning and big data technologies are expected to complement inexperienced crews and to help solve issues, including marine accidents and industry-wide labor shortages. TUMSAT's WISE Program is appealing to me because it provides opportunities to interact with partner institutions and to participate in real business activities. Additionally, it helps broaden my views and skills to conduct practical research.

[Office and section in charge] WISE Program Promotion Support Office [Academic affairs division] [Inquiries] 03-5245-7660

WISE Program for Nano-Precision Medicine, Science and Technology

[Program Coordinator] HANAYAMA Rikinari (Professor, Nano Life Science Institute, Kanazawa University)

[Fields of diplomas] Doctor of Philosophy in Science, Doctor of Philosophy in Engineering, Doctor of Philosophy in Medicine, Doctor of Philosophy in Pharmacy, Doctor of Philosophy in Pharmaceutical Sciences, Doctor of Philosophy in Health Sciences, Doctor of Philosophy in Nano Science or Doctor of Philosophy

Name of the program to be noted: WISE Program for Nano-Precision Medicine, Science and Technology

[URL] <https://nano-wise.w3.kanazawa-u.ac.jp/en/>



Message from the President



WADA Takashi
President, Kanazawa University

Fostering innovative scientists who open up unexplored areas, and overcoming the challenges of the present and the future

Kanazawa University is promoting graduate school education reforms with a focus on fostering scientists who will lead academia and industry. Based on the world-leading research capabilities of the WPI - Nano Life Science Institute, the WISE Program for Nano-Precision Medicine, Science and Technology aims to train doctoral scientists who will create innovative preventive, diagnostic, and therapeutic methods based on nano-level understanding and control. Kanazawa University nurtures doctoral students to acquire interdisciplinary knowledge beyond the borders of their own specialty. Kanazawa University expects that the students supported by the Program will explore the challenges that humans face today and in the future and contribute to overcoming them.

Personnel who can develop for solutions to health issues

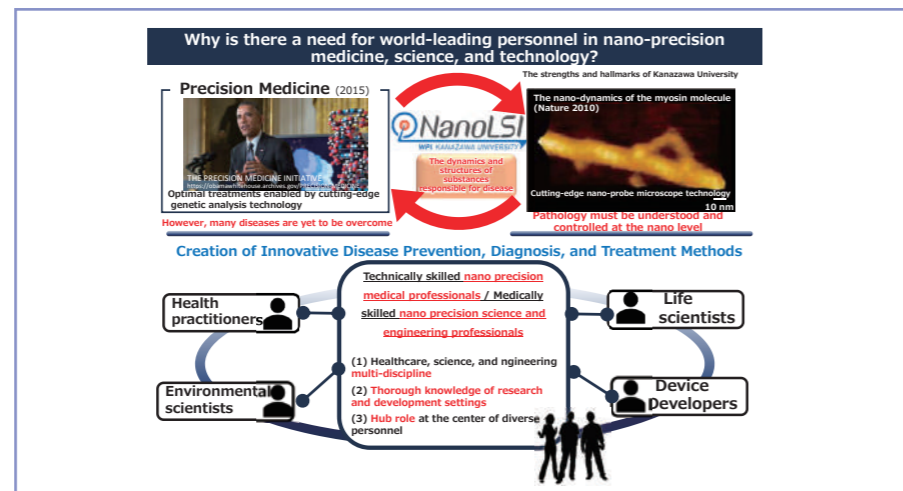
Cutting-edge technologies such as genetic analysis from the United States in 2015 have proposed a precision medicine that aims to deliver optimal patient-tailored treatment. While this has grasped the world's attention, many diseases are still not sufficiently controlled. We believe a major factor contributing to this is that the dynamics and structures of substances that cause disease within living organisms remain an uncharted territory at the nano level.

Therefore, this program focuses on five challenges to human society, namely, cancer, lifestyle diseases, neurological disorders, diseases from particulates, and diseases from nano materials, and draws fully on the research environment and results of the World Premier International Research Center Initiative (WPI) of the Nano Life Science Institute with its world-leading researchers. In doing so, the program enables our students to study nano-precision medicine, science, and technology through the question of how their own specialist fields, nano science,

and nano technology are applied to and used in medicine, science, and technology.

We educate PhD-qualified individuals who can bring about the innovation required to build a health infrastructure for humanity by applying these skills and knowledge. In other words, our program trains

technologically competent nano-precision medicine professionals and medically competent nano-precision science and technology professionals who will create innovative methods of prevention, diagnosis, and treatment through the understanding and control of pathology at the nano level.



Kanazawa University achieves world-leading research results in the understanding and control of pathology at the nano level and draws fully on this strength/status in training individuals to develop for solutions to health issues

DATA

- [Number of students recruited (For FY2023, number of students to be recruited)] 12 each (FY2020-FY2023)
- [Number of anticipated program graduates] 12
- [Number of people engaged in the program] 80
- [Students' affiliated schools and departments] 4 graduate schools, 18 departments
- <Graduate School of Natural Science and Technology> Mathematical and Physical Sciences, Material Chemistry, Mechanical Science and Engineering, Electrical Engineering and Computer

- Science, Environmental Design, Natural System, Frontier Engineering, Electrical, Information and Communication Engineering, Geosciences and Civil Engineering, Biological Science and Technology
- <Graduate School of Medical Sciences> Medical Science, Medicine, Pharmacy, Pharmaceutical Sciences, Health Sciences
- <Graduate School of Advanced Preventive Medical Sciences> Advanced Preventive Medical Science
- <Graduate School of Frontier Science Initiative> Transdisciplinary Sciences, Nano Life Science

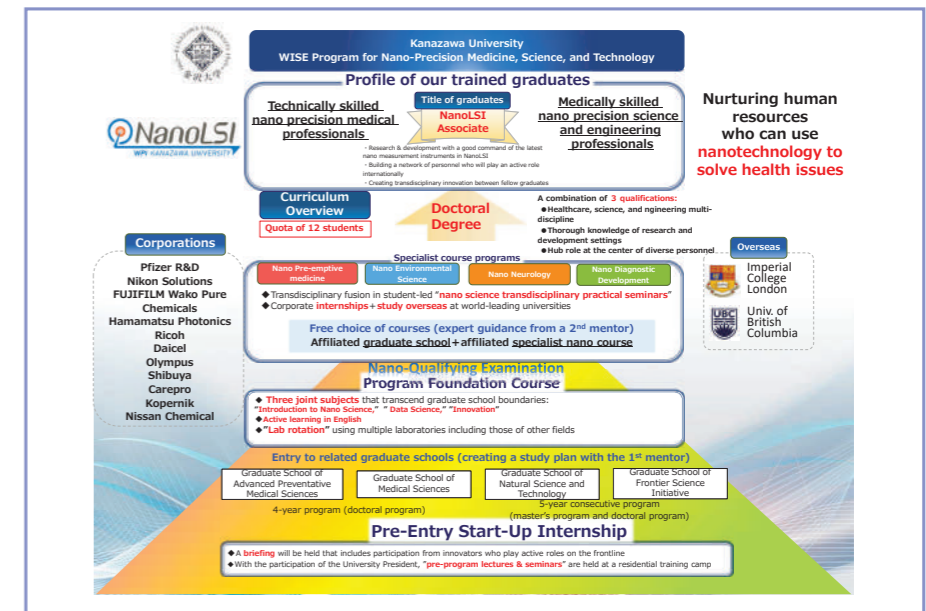
- [WISE Cooperating Institutions] 2 universities, 10 companies, 1 general incorporated association
- Imperial College London / University of British Columbia / Nikon Solutions Co., Ltd. / Pfizer R&D Japan G.K. / Ricoh Co., Ltd. / FUJIFILM Wako Pure Chemical Corporation / Olympus Corporation / Daicel Corporation / Hamamatsu Photonics K.K. / Shibuya Corporation / Carepro, Inc. / Kopernik Japan / Nissan Chemical Corporation

(As of November 2022)

Creating innovation that continues from pre- to post-program

This program is a trans-disciplinary degree program covering the four graduate schools. With the aim of creating innovative individuals, the program builds and develops a trans-disciplinary education in science, technology, and medicine with a focus on nano-precision medicine and nano-precision science and technology. Before they enter the university, we host pre-program lectures and seminars for applicants joining the program. The pre-program is operated in a residential training format and includes participation from students at other graduate schools, senior students, and representatives from our corporate partners as well as the academics responsible for the program. While on the residential pre-program, participants acquire a taste of the potential for trans-disciplinary fusion by sharing their visions for the future of the program and getting to know one another.

After entering the university, all students study the core subjects on the program's foundation course. These consist of mathematical data science and innovation management that are necessary to the realization of Society 5.0 and nanometrology and nano materials science, which serve as a basis for the program's transdisciplinary research. While on the foundation course, we cultivate a comprehensive perspective and creativity as students engage in a broad study of real-world cases in transdisciplinary and applied research. Thereafter, students advance to the four specialist



This program is consisted of a foundation course that develops a comprehensive perspective and creativity and specialist course programs that furnish students with a global view and advanced specialization, pre-entry and post-complication.

courses of Nano Pre-emptive Medicine, Nano Neurology, Nano Environmental Science, and Nano Diagnostic Development and study how nano science is applied to the field of their specialist course. The specialist course program is student-led, whereby students conduct a transdisciplinary research project under the supervision of an academic staff member.

Our program graduates are conferred with a doctor's degree and can also acquire a

qualification that enables them to perform research and development using the university's cutting-edge nano measurement technology. Through this, we aim to connect the program to corporate employment destinations, forge a personnel network, and create all types of transdisciplinary innovation, such as between fellow graduates, current students and graduates, and academic staff and graduates.

Good Practice



Pre-program for prospective students to learn about the program's vision and expose themselves to the expansive possibilities of inter-field research and development

In the pre-program lectures and seminars designed for prospective students, students of different fields of study will form a group, discuss solutions to health-related problems with instructors, and give a presentation. In addition, the president and representatives of collaborating companies will conduct a lecture on the qualities required for leadership and the professional skills that are currently in demand. Prospective students will also expose themselves to the technologies of different fields by operating cutting-edge, nano-precision analysis equipment or by using VR learning materials to experience professional healthcare situations. Through this experience, they will learn about the immense possibilities of inter-field research and development.

Message from WISE Cooperating Institution



ARAI Takashi
Principal Researcher, Biomass Innovation Center, Daicel Corporation (Professor, Kanazawa University)

We provide strong support to the development of innovative individuals!

Kanazawa University's WISE program, which aims to support corporate executives who will lead innovations and entrepreneurs who will implement a new knowledge society, has begun its fourth year. Our company Daicel is actively taking part in this program by sending lecturers and accepting interns. With the strong bond of industry-academia collaboration, we will support the development of talents who will contribute to society through their achievements.

Student's Voice



KOBAYASHI Kazuki
1st year Doctoral Program, Division of Electrical Engineering and Computer Science, Graduate School of Natural Science and Technology

Learning new perspectives and approaches through lab rotation

I joined this program to acquire research skills that would give me a strong edge in the future. I carried out neuroscience research through lab rotation that allowed lab students studying medicine and those studying science and engineering to experience each other's field of research. I was a complete novice in the field of neuroscience. The approach to research in this field is the opposite of that of engineering. This inspired me to come up with new ideas for my research on semiconductor engineering.

[Office and section in charge] WISE Promotion Office, Educational and Student Affairs Department [Inquiries] 076-264-5959

Convolution of Informatics and Biomedical Sciences on Glocal Alliances

[Program Coordinator] KATSUNO Masahisa (Vice Dean, Professor, Graduate School of Medicine, Nagoya University)
[Fields of diplomas] PhD in Medicine, PhD in Nursing Science, PhD in Radiological and Medical Laboratory Sciences, PhD in Physical and Occupational Therapy, PhD in Informatics, PhD in Pharmaceutical Sciences, PhD in Bioagriculture, PhD in Agricultural Sciences
 Name of the program to be noted: WISE Program, Informatics and Biomedical Sciences
[URL] <https://cibog.med.nagoya-u.ac.jp/en/>



Message from the President



SUGIYAMA Naoshi
President, Nagoya University

Expectations for the creation of new fields and the production of human resources for the safety and well-being of society as a whole

The increase in diseases such as cancer and dementia associated with the aging of society has become a worldwide social problem, including in developing countries. This is particularly serious in Japan, where the super-aging population and declining birth rate are pronounced, and the country is facing a critical situation of ballooning medical and nursing care costs and a shrinking working population. The key to solving these issues is to shift from personalized medicine to personalized prevention, and to realize the safety and well-being of society as a whole, it is necessary to analyze life science big data at multiple levels, from molecules to human society, and to create a new field that promotes understanding of pathological conditions and development of preventive methods for unmet diseases. The CIBoG program is making every effort to promote its goals, which are to promote research that integrates informatics and biomedical science, implement disease prevention methods in society, and produce human resources who can optimize social well-being.

From personalized prevention to social implementation

Currently, increases in cancer, dementia, and other diseases associated with a population aging have become a problem, and this includes developing countries. The situation is particularly serious in Japan, which between a super-aged society and a rapidly declining birthrate is facing a critical situation with ballooning medical and nursing care costs and a shrinking working population. The key to resolving these issues is to shift from personalized medicine to personalized prevention. To achieve this, life science big data must be analyzed at multiple levels from the molecules to human society itself and allow understanding of the pathogenesis of undiagnosed diseases and develop preventive methods. In order to achieve this goal, informatics and biomedical sciences must work in tandem. However, due to the high degree of specialization in both medical sciences and informatics the rapid pace of technological development, there is an overwhelming lack of people capable of conducting such integrated

research and applying the results of that research to society. Many of challenges we face in medicine today are no longer limited to national borders as

is evident from our struggles against global scale infectious diseases. Development on a global scale is essential to collect and analyze big data and



The CIBoG program create a research base for informatics and biomedical sciences by collaborating with regional institutes to develop a new field of biomedical sciences that aims to implement individual prevention on the global society.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]
 10 (FY2019), 23 (FY2020), 19 (FY2021), 25 (FY2022), 20 (FY2023)
[Number of anticipated program graduates] 15-20
[Number of people engaged in the program] 107
[Students' affiliated schools and departments]
 Nagoya University 4 graduate schools, 10 departments
 Gifu University 2 graduate schools, 2 departments
 Nagoya University
 (Graduate School of Medicine) Integrated Medicine, International Collaborative Program in Comprehensive Medical Science between Nagoya University and the University of Adelaide, International Collaborative Program in Comprehensive Medical Science between Nagoya University and Lund University, International Collaborative

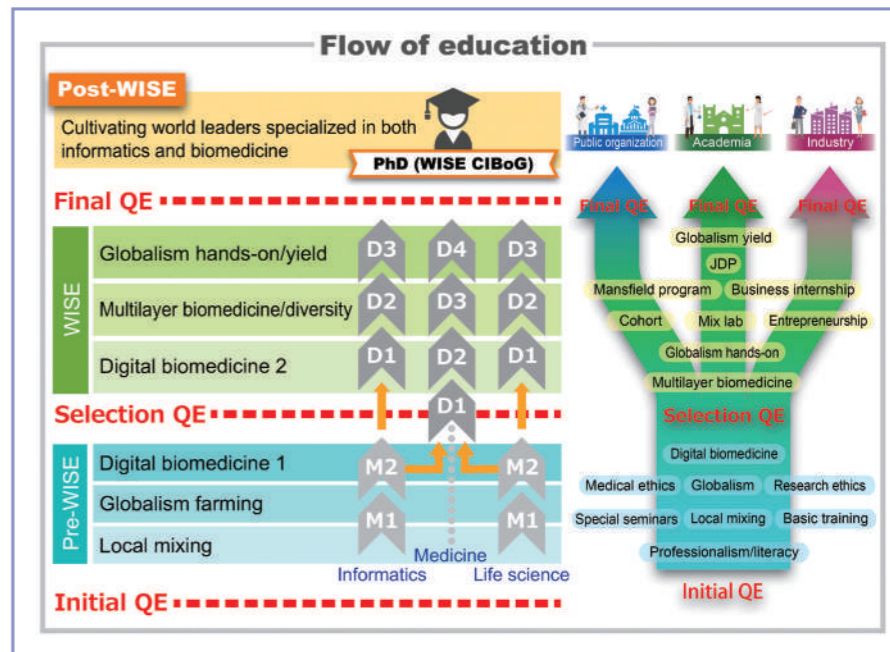
Program in Comprehensive Medical Science between Nagoya University and the University of Freiburg, Integrated Health Sciences, Medical Sciences
 (Graduate School of Bioagriculture) Applied Biosciences
 (Graduate School of Informatics) Computing and Software Systems, Intelligent Systems
 (Graduate School of Pharmaceutical Sciences) Basic Medicinal Sciences
 Gifu University
 (Graduate School of Natural Science and Technology) Life Science and Chemistry
 (The United Graduate School of Agricultural Science) Science of Biological Resource

[WISE Cooperating Institutions]
 11 universities, 5 public research institutes, 12 companies
 Gifu University / National Institute for Physiological Sciences / Aichi Cancer Center / National Center for Geriatrics and Gerontology / Aichi Developmental Disability Center Institute for Developmental Research / Institute of Statistical Mathematics / University of Adelaide / Lund University / Albert-Ludwigs-Universität Freiburg / University of Nottingham / The Chinese University of Hong Kong / University of Bologna / LMU Munchen / Korea University / Erasmus Medical Center Rotterdam / Monash University / Shimadzu Corporation / Novartis Pharma / NVIDIA Corporation / Eisai Co., Ltd. / Olympus Corporation / RaQualia Pharma / Sumitomo Pharma Co., Ltd. / Mitsubishi Tanabe Pharma Corporation / Takeda Pharmaceutical Co., Ltd. / CBmed / Hitachi Co., Ltd. / Astellas Pharma Inc (As of November 2022)

implement the findings to society. Thus, global awareness and diversity are vital to developing human resources. The CIBoG program, therefore, aims to foster the development of researchers, administrators, and entrepreneurs with deep insight into informatics and biomedical sciences who can build a collaborative research system for big data analysis, create personalized prevention systems, and promote their social implementation.

To develop globally competitive interdisciplinary research

CIBoG is based on 3 basic educational policies or pillars: Digital Biomedical Sciences, Multilayered Biomedical Sciences, and International and Diversity Education. During the five-year program (four years for medical doctors), students enrolled in the CIBoG program acquire proficiency in the three field that constitute the main pillars, through both basic science study and clinical practice. Graduates gain the ability to develop integrated medical and informatics research projects at a global level by applying what they learn in the CIBoG program. Digital Biomedical Sciences is a form of medical research that utilizes mathematical informatics. In CIBoG, the Graduate School of Medicine and the Graduate School of Informatics will not only work together to support graduate student education and research, but also to strengthen digital medicine education through the reorganization of the Department of Health Sciences and participation of the Institute of Statistical Mathematics, sure to



The CIBoG program recruits students in informatics and biomedical science, and supports them with financial aids to foster global leaders who can create and promote a new field integrated informatics and biomedical science.

prove a driving force behind this new graduate education program. In addition, the Center for 5D Cellular Dynamics (C5CD), a center for integrated medicine and informatics analysis, has been established at the Tsurumai Campus. Through close collaboration between the wet and dry laboratories, C5CD will promote joint research

among medical informatics research that integrates various related fields such as medicine, molecular biology, and mathematical sciences, with a focus on immunology, and promote spatio-temporal understanding of complex biological phenomena on a cell-by-cell basis.



Message from WISE Cooperating Institution

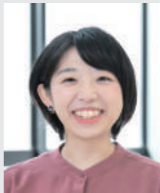


KAMIGUCHI Hidenori
Director, Neuroscience Translational Medicine, Neuroscience Drug Discovery Unit, Takeda Pharmaceutical Company Limited

Expectations for producing the high-level "knowledge professionals" who convolute informatics and biomedicine

Drug discovery through translational research requires analysis from huge amounts of big data. In other words, the fusion of informatics and biomedical sciences practiced in the CIBoG program is expected to advance drug discovery research. We hope that our lectures, discussions with researchers, and on-site company visits to the Shonan Health Innovation Park (Shonan iPark) will give students a sense of the practical application of the program in society.

Student's Voice



KIMURA Kazue
Graduate School of Pharmaceutical Sciences, second year of the doctoral program

Aiming to be a researcher who can create new value in the medical field

Through my experience in the clinical environment at the undergraduate level, I felt that it would be necessary to analyze an amount of medical information in the future. So, I participated in this program in order to acquire the skills and experience necessary for it. In CIBoG, we can listen to many lectures on both bits of knowledge of biomedical science and informatics. After graduating, I would like to play an active role as a researcher who creates new technologies and values in society.

Graduate Program for Medical Innovation

[Program Coordinator] WATANABE Dai (Professor, Graduate School of Medicine, Kyoto University)
[Fields of diplomas] Doctor of Medicine, Doctor of Medical Science, Doctor of Public Health, Doctor of Human Health Sciences, Doctor of Pharmaceutical Sciences, Doctor of Biomedical Sciences, Doctor of Bioinformatics and Chemical Genomics, Doctor of Medicinal Frontier Sciences
 Name of the program to be noted: Graduate Program for Medical Innovation



[URL] <https://www.mip.med.kyoto-u.ac.jp/en/>

Message from the President



MINATO Nagahiro
President, Kyoto University

Through the WISE Program, Kyoto University seeks to cultivate advanced “knowledge professionals” who will play key roles in industry, academia, and government

In 2021, Kyoto University established the Graduate School Education Support Office to enhance its liberal arts and general education courses, and centrally manage its diverse graduate degree programs. The new office promotes collaboration and cooperation among graduate schools in diverse aspects of education and research. It will ensure that the university continues to provide unique high-quality programs under the government’s Doctoral Program for World-leading Innovative & Smart Education (WISE Program). WISE programs are provided in close cooperation with leading companies and world-class research institutes in Japan and leading universities around the world with the aim of cultivating advanced “knowledge professionals” and promoting the reform of the university’s graduate schools.

Education for Next-Generation Medical Innovators

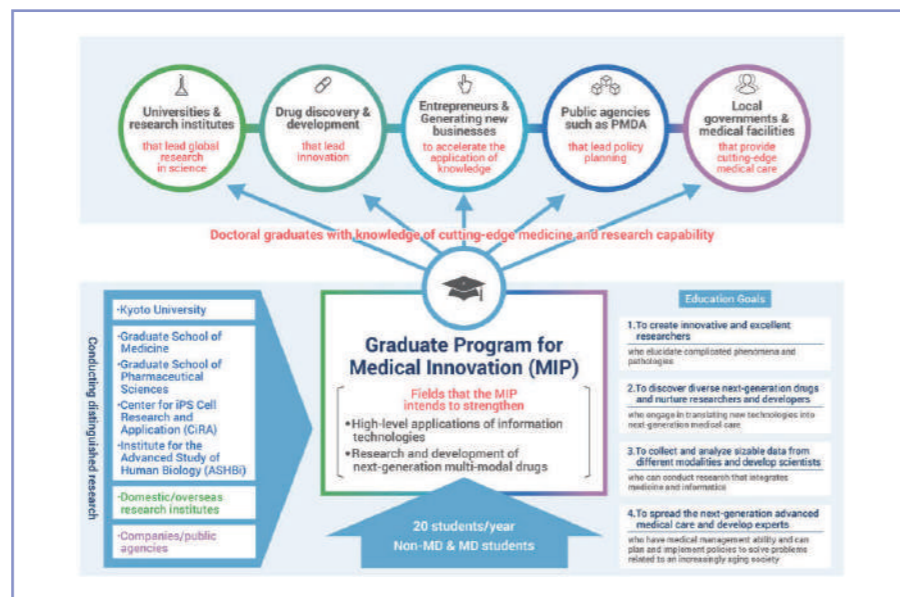
In order for medical and healthcare innovation in Japan to be accelerated and disseminated worldwide, a system for training outstanding personnel capable of undertaking cutting-edge research and development, needs to be established strategically. Based on this idea, the Graduate Program for Medical Innovation aims to train both MD (medical doctor) students and non-MD students to be medical innovators with a global mindset. This will be achieved through collaboration between accomplished medical, pharmaceutical, and health science researchers at Kyoto University.

[Education Goals]

1. To create innovative and excellent researchers who elucidate complicated phenomena and pathologies
2. To discover diverse next-generation drugs and nurture researchers and developers who engage in translating new technologies into next-generation medical care
3. To collect and analyze sizable data from different modalities and develop scientists who can

conduct research that integrates medicine and informatics
 4. To spread the next-generation advanced

medical care and develop experts who have medical management ability and can plan and implement policies to solve problems related to



Education Goals of the Graduate Program for Medical Innovation

DATA

[Number of students recruited (For FY2023, number of students to be recruited)] 20 each (FY2020-FY2021), 20 (FY2022), 20 (FY2023)
[Number of anticipated program graduates] 3-18
[Number of people engaged in the program] 99
[Students' affiliated schools and departments] 2 graduate schools, 8 departments
 (Graduate School of Medicine) Medicine, Medical Science, Public Health, Human Health Sciences
 (Graduate School of Pharmaceutical Sciences) Pharmaceutical Sciences, Biomedical Sciences,

Bioinformatics and Chemical Genomics, Medicinal Frontier Sciences
[WISE Cooperating Institutions] 3 Universities, 15 Companies, 8 Research institutes
 University of California, San Diego / University of Toronto / National Taiwan University / The FIRC Institute of Molecular Oncology / National Institutes of Health / Max-Planck Institute / NeuroSpin/RIKEN / Institute of Biomedical Research and Innovation, Foundation for Biomedical Research and Innovation at Kobe / Tazuke Kofukai Medical Research Institute

Kitano Hospital / Bioorganic Research Institute, Suntory Foundation for Life Sciences / NTT DATA Corporation / Deloitte Tohmatsu Consulting LLC. / mixi, Inc. / KBBM, Inc. / MIGIN, Inc. / Eisai Co., Ltd. / Daiichi Sankyo Co., Ltd. / Chugai Pharmaceutical Co., Ltd. / Asahi Kasei Pharma Corporation / Taisho Pharmaceutical Co., Ltd. / Sumitomo Dainippon Pharma Co., Ltd. / ONO PHARMACEUTICAL CO., LTD. / Mitsubishi Tanabe Pharma Corporation / KYORIN Pharmaceutical Co., Ltd. / Chordia Therapeutics, Inc.
 (As of November 2022)

an increasingly aging society

Features of the program

Kyoto University has been pursuing the world’s highest level of research and has produced internationally-recognized researchers including Nobel laureates. Curriculums that take advantage of this research-based strength of the university have been established by the Graduate School of Medicine, Graduate School of Pharmaceutical Sciences, Center for iPS Cell Research and Application (CiRA), and Institute for the Advanced Study of Human Biology (ASHBi), operating under the World Premier International Research Initiative (WPI).

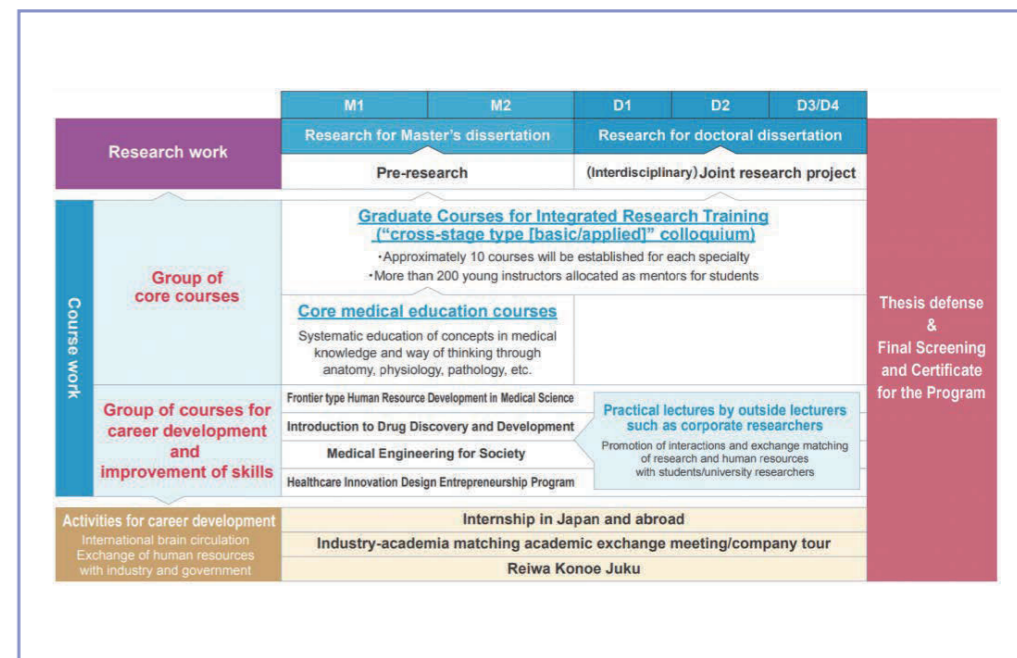
The program aims for students to acquire systematic medical knowledge as well as advanced and creative research capabilities according to their diverse backgrounds and interests. It also aims to cultivate a comprehensive perspective of the social implementation of next-generation medical treatment by interacting with leading experts in industry, government and academia in Japan and overseas.

[Program Features]

1. The program will build an advanced education and research system through an academic-

- industrial cooperation that covers everything from basic research to social implementation of the results.
2. To meet the diverse needs of students, a diverse group of faculty members will be assigned to run the program, and young mentor faculty members will provide detailed research guidance.
3. In collaboration with related departments that have world-class research achievements

and long-established expertise in industry-government-academia collaboration, the program will establish a research system that works together with domestic and international research institutions as well as industry and government.



Curriculum of the Graduate Program for Medical Innovation

Good Practice



Capturing students' needs in a timely fashion

Promoting interactions between students and junior researchers by holding various seminars upon request from students

A seminar on career paths was held this year for students who were thinking about their future or seeking information on career options. In this seminar, individual consultations were held to provide advice and answer questions. This event was well-received and is planned to be held again next year.

In addition, the MIP (Graduate Program for Medical Innovation) offers lectures by editors of prestigious scientific journals. The MIP also provides tutorials on how to write papers and make presentations in English. This is in response to students' concerns regarding their insufficient experience writing papers and making presentations in English.

These opportunities are also provided to students of other departments and junior researchers. They are effective in providing MIP students with chances to interact with other disciplines.

Message from WISE Cooperating Institution



Yoh-suke Mukouyama
National Institutes of Health,
Senior Investigator

The program fosters great researchers who are adaptable and diverse

Scientific and medical innovation is driven by an environment where people of diverse cultures, races, sexes, experiences, and lifestyles work together. In the United States, there are many laboratories where diverse perspectives are developed through passionate discussions. We will make our best effort to contribute to developing excellent researchers by helping students enjoy their studies in organizations that promote diversity and inclusion.

Student's Voice



Mami Ishibashi
First-year Doctor's student,
Department of medicine,
Graduate school of Medicine

Taking a fresh look at myself through encounters beyond expectations

I had been interested in applied research and I enrolled in the doctoral course after working in clinical settings. However, I initially did not have any specific idea of what I would explore through my research. In this program, I have a greater opportunity to experience unexpected encounters with people and ideas that I could not previously find. I continue to enjoy my current environment where I can get as many opportunities to advance my research as I want.

Multidisciplinary PhD Program for Pioneering Quantum Beam Application

[Program Coordinator] NAKANO Takashi (Director, Research Center for Nuclear Physics, Osaka University)
[Fields of diplomas] Ph.D. (Physical Science), Ph.D. (Medicine), Ph.D. (Health Sciences), Ph.D. (Informatics), Ph.D.
 Name of the program to be noted: Completion of Multidisciplinary PhD Program for Pioneering Quantum Beam Application
[URL] <https://www.rcnp.osaka-u.ac.jp/pqba/en/index.html>



Message from the President



NISHIO Shojiro
President, Osaka University

Cultivating individuals capable of tackling various societal issues through the fusion of knowledge

Osaka University has envisioned becoming a university dedicated to creating a society where each member leads a meaningful and fulfilling life. Based on this vision, we aim to cultivate individuals capable of tackling various societal issues through co-creation with society. This program combines quantum beam application with fundamental research in science, medicine, and information sciences, or in other words, “fusion of knowledge” to create new values, as exemplified by targeted alpha therapy, which aims to treat intractable advanced cancer. Students gain invaluable international experience through mandatory overseas training, even when affected by COVID-19.

We hope that this program will produce opinion leaders who are globally active in creating a society where everyone can enjoy a comfortable and happy life.

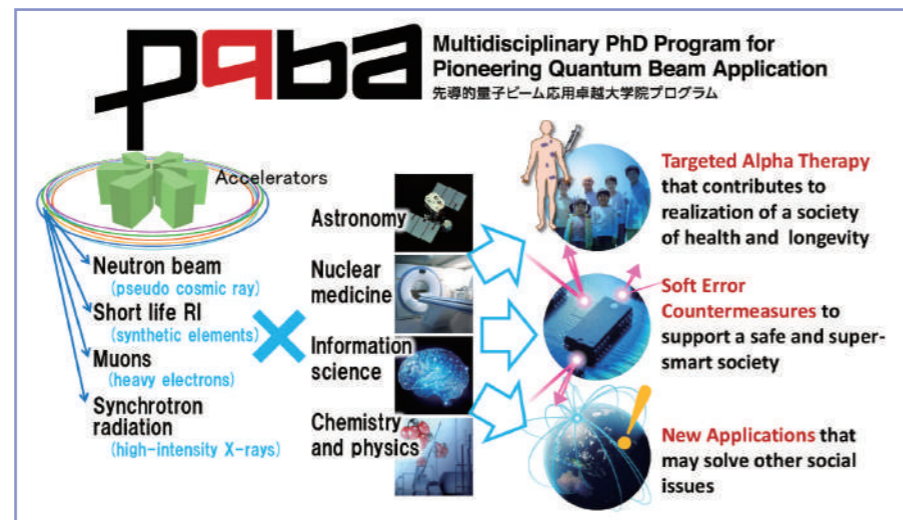
Pioneering quantum beam application to solve social issues

Confronted with the reality of rapid aging and a low birthrate, our country must address the urgent tasks to extend the healthy life expectancy and realize a super-smart society with a clear vision of Society 5.0. Academia, including universities, are expected to address this issue and create new value through interdisciplinary cooperation. In this context, quantum beams created by accelerators are being applied in innovative ways to solve problems of modern society. Radioactive isotopes (RIs), which support nuclear medicine, have been essential in cancer research. RIs played a critical role in the rapid evolution of gamma imaging technology and targeted alpha-particle therapy. In addition, cosmic rays contribute to soft errors, which were originally discussed in devices operating in harsh environments such as space. However, due to the rapid development of the Internet of Things (IoT), cosmic ray-induced soft errors have also become an issue on the ground. Therefore, accelerated testing using quantum beams is urgently needed to

evaluate and implement countermeasures.

This program aims to “continuously develop human resources to lead the creation of next-generation quantum beam application

technologies” by targeting students mainly in the fields of science, medicine, and information technology in cooperation with domestic and foreign universities, institutions, and companies



Characteristic quantum beam and expertise to create new value to solve social issues.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]
 16 (FY 2020), 14 (FY 2021), 15 (FY 2022), 15 (FY 2023)
[Number of anticipated program graduates] 3-15
[Number of people engaged in the program] 135
[Students' affiliated schools and departments]
 3 graduate schools, 5 departments
 (Graduate School of Science) Physics, Chemistry
 (Graduate School of Medicine) Medicine, Health Sciences
 (Graduate School of Information Science and Technology) Information Systems Engineering

[WISE Cooperating Institutions]
 4 universities, 14 private sectors, 6 national / local research institutes, 3 overseas universities, 1 overseas research High Energy Accelerator Research Organization Institute of Materials Structure Science / High Energy Accelerator Research Organization Institute of Particles and Nuclear Studies / National Institutes for Quantum and Radiological Science and Technology / Cyclotron and Radioisotope Center, Tohoku University / Research Center for Electron Photon Science, Tohoku University / J-PARC Center / Kyoto Institute of Technology / Graduate School of Informatics, Kyoto University / Isotope Science Center, The University of Tokyo / Kavli

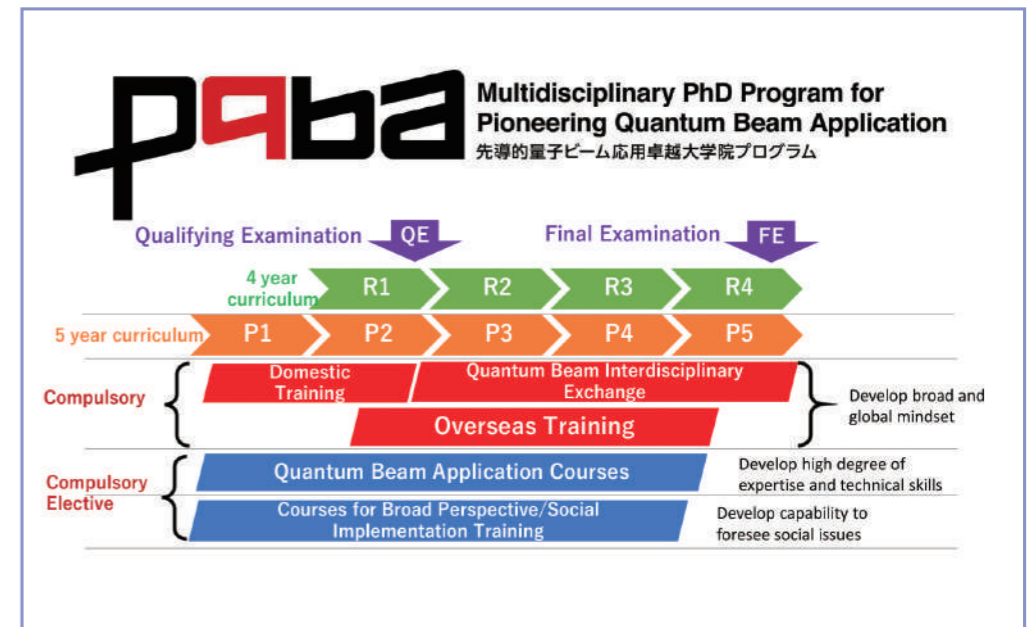
Institute for the Physics and Mathematics of the Universe, The University of Tokyo/RIKEN/TRIUMF / The University of Queensland / Heidelberg University Hospital / Heinrich Heine University Dusseldorf / National Institute of Health Science / ATOX / Telix Pharmaceuticals Japan / SOCIONEXT / Hitachi, Ltd. / Nihon Medi-Physics Co., Ltd. / Sumitomo Heavy Industries, Ltd. / FUJIFILM Toyama Chemicals Co., Ltd. / Kyoto Medical Technology / EPS Corporation / Metal Technology Co. Ltd. / Toshiba Electronic Devices & Storage Corporation / Yamato Scientific Co., Ltd. / Japan Radioisotope Association / Anderson Mōri & Tomotsune / Alpha Fusion Inc.
 (As of October 2022)

related to various quantum beams, including radionuclides, neutrons, and muons.

Curriculum and attributes of individuals in the program

Individuals in the program are expected to become keenly aware of social issues and explore the treasure trove of past research to create innovative key technologies for social implementation of new value. By gaining a high degree of expertise, a broad perspective, and advanced global communication skills, they are expected to thrive as global leaders and “knowledge professionals” within all sectors (industry, academia, and government). They will possess the following attributes:

- * Ability to consider risks in terms of human sustainability
- * Significant academic and technical knowledge in a specialized field
- * Ability to consider phenomena on various scales and academic fields
- * Experience and knowledge of advanced experiments and calculations in different fields
- * Ability to evaluate risks and benefits of the implementation of advanced technologies
- * Ability to develop and capitalize on human



We offer a curriculum to acquire a high degree of expertise, an ability to understand from a broad perspective, and global communication skills.

networks by taking a leadership role in international activities

To educate individuals who possess these attributes, the program offers a curriculum focusing on interdisciplinary and international joint research. In particular, overseas training is mandatory. Training locations include Canada's Particle Accelerator Centre TRIUMF (Canada) and The University of British Columbia (Canada),

which shares property boundaries with TRIUMF; University of Queensland (Australia), which has the Center for Advanced Imaging; and Heidelberg University (Germany), which has close collaborative relationships with Osaka University in a variety of fields related to nuclear medicine.

Good Practice



Investments for the future

Sparking middle and high school students' interest in science is crucial to further cultivate talent in this program. Therefore, Osaka University works in collaboration with “Mebae Tekijuku” (JST Junior Doctor Training After-School Program), which is offered to elementary, middle, and high school students, and “SEEDS” which is offered to high school students. Doctoral candidates in PQBA participate as TAs and mentors. Approximately half of the participants in “Mebae Tekijuku” and “SEEDS” are female students. We expect that nurturing exceptional young talent will continue to cultivate future leaders and improve gender balance in scientific fields.

Message from WISE Cooperating Institution



SAITO Naohito
Director of Institute of Particle and Nuclear Studies

Anticipate polymaths who expedite new value creation with accelerators.

Japan has been leading the world with numerous advanced accelerator facilities. Many organizations that own such facilities are participating in the program. Although accelerators hold great promise to solve social issues, their potential is not fully utilized at present. We anticipate cultivating exceptional individuals who can lead the world by creating new value with accelerators.

Student's Voice



CHONG Tsun Him
First year in Doctoral course, Physics Department, Graduate School of Science

Getting advices from experts in different disciplines

I joined the program because its perspective on beam application matches my research interest, which is developing a new type of particle accelerator. In practice, the double mentor system allow me to discuss my research with professor from different scientific discipline, who gave me precious advices on my master thesis and helped me to make further progress. I am also looking forward to participating in the domestic and overseas internships. This program provides me great experiences and help me to build my career as a researcher.

[Office and section in charge] Research support section Research Center for Nuclear Physics **[Inquiries]** 06-6879-8904

Multi-Scope·Energy WISE Professionals

[Program Coordinator] IHARA Manabu (Professor, School of Materials and Chemical Technology, Tokyo Institute of Technology)
[Fields of diplomas] Doctor of Engineering, Doctor of Science, Doctor of Philosophy
 Name of the program to be noted: Tokyo Tech Academy of Energy and Informatics program
[URL] <https://www.infosyenergy.titech.ac.jp/en/>



Message from the President



MASU Kazuya
President, Tokyo Institute of Technology

Tokyo Tech Pushes Strategic Promotion of Three Outstanding Graduate School Programs

Tokyo Tech implemented Institute-wide, ambitious reforms in education, research, and governance in 2016, reorganizing its system into the current six schools, Institute of Innovative Research, and Institute for Liberal Arts. Having also identified three strategic fields and three priority fields that are applicable and relevant to all departments, we were selected as a Designated National University (DNU) in March 2018. The three new priority fields – “Next-Generation Element Strategy”, “Integrated Energy Science”, and “Digital Society Devices and Systems” – are the fields in which we will take future initiatives in leading Japan. Under my leadership as president of Tokyo Tech, we have also put forth Institute-wide efforts to promote the funding program for outstanding graduate schools since its start in AY 2018. We have made one proposal every year in the aforementioned priority fields, all of which have been adopted.

Multi-scope·Energy WISE Professionals shape the future of energy

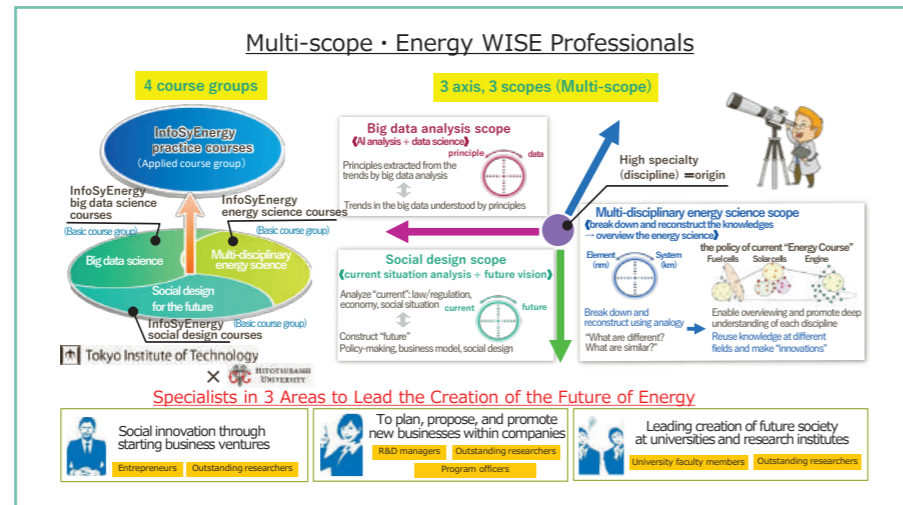
Supplying sustainable energy while curbing activities that contribute to climate change is an urgent mission for the global community. To build a society suitable for the future of energy, we must transition to a culture of sustainability and carbon neutrality by making the most of big data science, AI analysis and data science, and digitization. Tokyo Tech defines its sought-after “ambient energy society” as one in which the environment and economy coexist without people having to worry about energy sources and protecting the environment. We aim to achieve such a society in cooperation with industries.

The newly established Tokyo Tech Academy of Energy and Informatics program helps students develop into Multi-scope·Energy WISE Professionals who, with a solid basic understanding of energy science, are capable of applying big data science to the research and development of devices, systems, and scenarios, designing the

future of energy, and taking leadership to bring about transformations.

Students are evaluated and awarded diplomas based on their readiness for expected roles in 1) bringing social innovation through new ventures,

2) planning and promoting new businesses in companies, and 3) driving the creation of a future society. Such outstanding professionals, trained through the program’s collaborations with companies, are expected to demonstrate



Cultivate “3 scopes” by “4 course groups” collaborating with “InfoSyEnergy Research and Education Consortium”

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]
 30 (FY 2021), 25 (FY 2022), 25 (FY 2023)
[Number of anticipated program graduates] 8-25
[Number of people engaged in the program] 117
[Students' affiliated schools and departments]
 5 schools, 17 department, 1 professional master's degree program
 (School of Science) Mathematics, Physics, Chemistry
 (School of Engineering) Mechanical Engineering, Systems and Control Engineering, Electrical and Electronic Engineering, Information and Communications Engineering, Industrial Engineering and Economics
 (School of Materials and Chemical Technology) Materials Science and Engineering, Chemical Science and Engineering
 (School of Computing) Mathematical and Computer Science, Computer Science

(School of Environment and Society) Architecture and Building Engineering, Civil and Environmental Engineering, Transdisciplinary Science and Engineering, Social and Human Sciences, Innovation Science, Technology and Innovation Management
[WISE Cooperating Institutions]
 24 companies, 7 public institutions, 14 overseas · domestic universities
 IHI Corporation / Azbil Corporation / Iwatani Corporation / ENEOS Corporation / NTT DATA CUSTOMER SERVICE CORPORATION / NTT DATA BUSINESS SYSTEMS CORPORATION / NTT FACILITIES, INC. / KAJIMA CORPORATION / Kawasaki Heavy Industries, Ltd. / JFE Engineering Corporation / SUMITOMO CORPORATION / SHOWA DENKO K.K. / Sony Group Corporation / Chiyoda Corporation / Deloitte Touche Tohmatsu Limited. / Tokyo Electric Power Company Holdings, Inc. / TOSHIBA CORPORATION · Toshiba Energy Systems & Solutions Corporation / Tokuyama Corporation / TOYO KANETSU K.K. / Panasonic Corporation / Fujitsu Limited / BROTHER INDUSTRIES, LTD. / Mizuho Research & Technologies Ltd. / Mitsubishi Electric Corporation / Japan International Cooperation Agency (JICA) / CEA-Liten / National Institute of Advanced Industrial Science and Technology (AIST) / Thailand National Science and Technology Development Agency / Forschungszentrum Jülich (Jülich Research Centre) / Deutsches Zentrum für Luft- und Raumfahrt(DLR) / Kawasaki City / HITOTSUBASHI UNIVERSITY / Georgia Institute of Technology / Imperial College London / INSA Lyon / Korea Advanced Institute of Science and Technology / Massachusetts Institute of Technology / Princeton University / Nanyang Technological University / RWTH Aachen University / Tsinghua University / University of California, Santa Barbara / University of Cambridge, Judge Business School / Uppsala University / University of Stuttgart

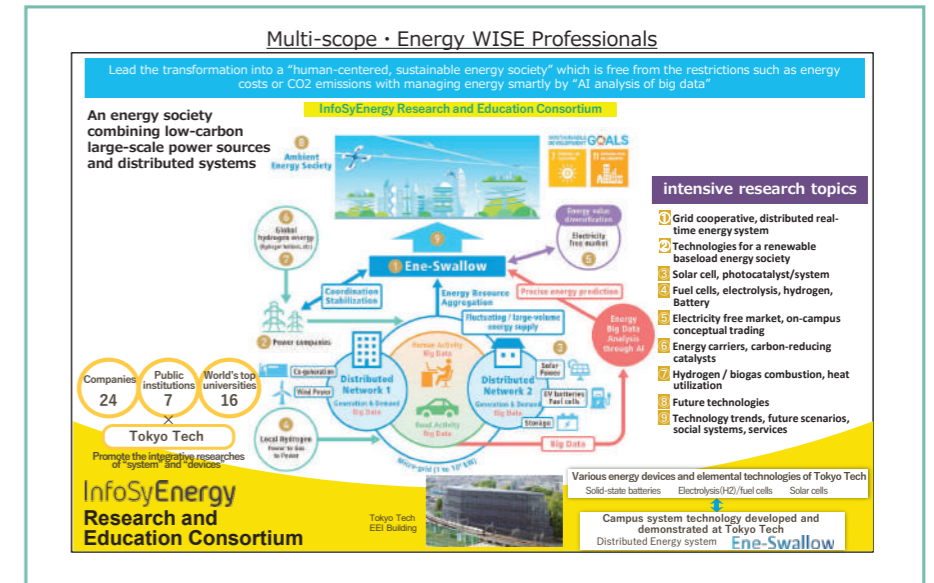
(As of November 2022)

excellence across the scopes of multi-disciplinary energy science (profound expertise), big data science (expertise and skills), and social design for the future (expertise and quality as member of society).

Liaison with InfoSyEnergy Research and Education Consortium

Prior to the establishment of the Academy of Energy and Informatics program, Tokyo Tech launched the InfoSyEnergy Research and Education Consortium in November 2019 as an industry liaison hub for research and education. “InfoSyEnergy” was coined from “Informatics,” “Synergy,” and “Energy.” The consortium functions as a framework to support feasibility and continuity of the program in its mission to train Multi-scope·Energy WISE Professionals.

Joint research projects between industry and academia have typically been between one lab and one company. But through this program, we aim to build a platform where proposing and implementing a number of collaborations of various scales and levels are possible. A major feature of this program is the close cooperation with the consortium. Consortium member organizations select representatives to work with Tokyo Tech faculty members to promote the program. By inviting renowned researchers from overseas institutions – including the world’s top 14 universities – as well as business mentors from member companies to report on research outcomes and conduct



Research topics and collaborating organizations for cultivating Multi-scope·Energy WISE Professionals in InfoSyEnergy Research and Education Consortium

discussions, the consortium aims to strengthen the feasibility of the program’s concept, enhance graduate education, and improve continuity of the program with additional financing from corporate members. The program will also provide doctoral students with research opportunities and financial support though joint research projects with companies, so that the students can become financially independent and concentrate on their studies.

In addition, the program will launch courses –

through which students are expected to acquire or enhance their basic knowledge in social sciences – in new business creation, energy policy planning, and energy econometrics with the full support of Hitotsubashi University. Multi-scope·Energy WISE Professionals, as they complete these studies and projects, will contribute to bringing about the desired shift to a society of sustainable energy free from restrictions on the use of energy such as cost and carbon emissions.

Good Practice



Cross-border Student Exchange Event Connecting Asia, the U.S., and Europe online: First International Energy & Informatics Forum to Design a “Future Energy Society”

This international forum, held once a year, aims to help students develop their design thinking skills by integrating academic knowledge they have gained from their multidisciplinary education and exploring, crossing, and blurring the boundaries between energy and informatics. For the first time, students of the Academy of Energy and Informatics as well as program members (Tokyo Tech, domestic and international partner organizations, universities and their students) gathered online for lectures by overseas partners, workshops and presentations by students, and technical tours at energy-related facilities. There were 40 sessions in 5 days, during which 102 people participated.

Message from WISE Cooperating Institution



OCHIAI Makoto
Chief Technology Executive, Toshiba Energy Systems & Solutions Corporation

Developing Highly Skilled Professionals for a Sustainable Society

As renewable energy becomes a main power source, battery and hydrogen energy storage and energy aggregation are becoming increasingly important. At the same time, major changes have begun toward realizing a carbon-neutral society, including the creation of new technologies to convert CO₂ into resources. We hope to contribute to the growth of many professionals with strong problem-solving skills who will commit to creating a sustainable society.

Student's Voice



OTOSHI Natsuki
1st-year doctoral student, School of Materials and Chemical Technology, Department of Chemical Science and Engineering

Expertise & Social Design: Main Factors in the Field of Energy Research

Since I was an undergraduate student, I have hoped to contribute to society via the research of energy and its practical application. The ‘multi-scope’ WISE program suits my purpose well as it helps me to deepen my expertise while learning social design, which became my main motivation for participating in this program. After taking part, I felt that the broad perspectives gained from big data science courses and the Energy & Informatics International Forum, along with my own knowledge and experience, will serve as a powerful tool.

[Office and section in charge] WISE Program Group, Promotion Office for Education Programs **[Inquiries]** 03-5734-3793

Graduate Program for Lifestyle Revolution based on Transdisciplinary Mobility Innovation

[Program Coordinator] KAWAGUCHI Nobuo (Professor, Institutes of Innovation for Future Society, Nagoya University)

[Fields of diplomas] Doctor of Arts, Doctor of Laws, Doctor of Comparative Laws, Doctor of Modern Laws, Doctor of Economics, Doctor of Informatics, Doctor of Engineering, Doctor of Environmental Studies, Doctor of Sciences, Doctor of Architecture, Doctor of Sociology, Doctor of Geography

Name of the program to be noted: Transdisciplinary Mobility Innovation Graduate Program

[URL] <https://www.tmi.mirai.nagoya-u.ac.jp/en/>



Message from the President



SUGIYAMA Naoshi
President, Nagoya University

Fostering human resources for social change who will lead lifestyle revolution

Recent technological innovations in information and mobility have minimized the cost of traveling in time and space and have created major changes since the Industrial Revolution. On the other hand, due to global issues such as pandemics, resource depletion, and climate variability, complication of social issues such as declining birthrate and aging population, and diversification of values such as diversity and inclusion, the conventional technology-led approach to "realizing a rich lifestyle" is becoming difficult. In order to lead a "lifestyle revolution" where people can freely choose various ways of life, it is necessary to have specialized human resources who can collaborate with different fields. Through this program, students with diverse specialties will work hard toward the goal of mobility innovation. I sincerely expect the nurturing of human resources who will lead social change through research results, and I will do my utmost to promote the program.

Transdisciplinary talents leading lifestyle revolutions

In recent years, technological innovation also known as "mobility revolution" has created social change since the Industrial Revolution that minimizes the cost of traveling in time and space. However, as social issues become more complex and value standards diversify, technology-led "realization of rich lifestyles" is becoming difficult. To drive lifestyle revolution, transdisciplinary human resources are required to team up with experts from different fields (multidisciplinary) such as humanities, social sciences, engineering, informatics, and environmental science, to understand and respect each other's specialties, to create diverse values (value creation) for lifestyle, and to translate those values to society by building the "technology and methodology". In this program, in addition to "Industry-Academia Co-Creation Education" in which the university collaborates with private companies, 6 graduate schools and 7 centers are structuring an outstanding curriculum that cultivates transdisciplinary collaboration by expert

teams. In this way, we will train "Transdisciplinary Mobility Innovation (TMI) human resources" who can contribute to efforts to create "mobility" with high social values. Through the curriculum,

program students will develop five abilities that make up transdisciplinary collaborative ability. The five abilities are "Specialized Research Ability" in one's own field, "Broad View/Problem Finding



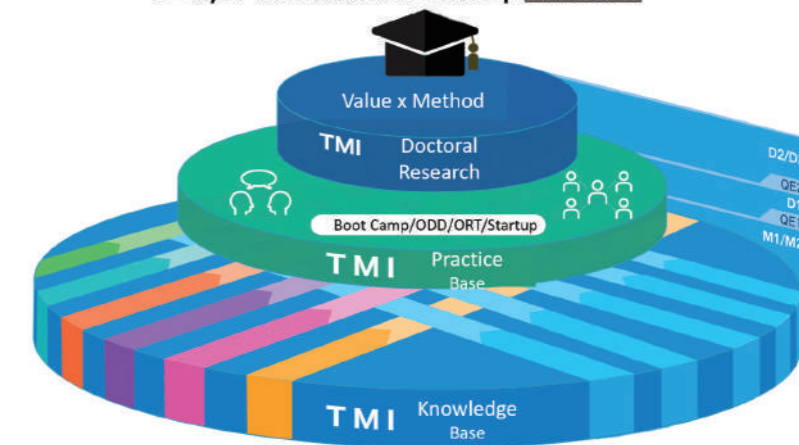
Mobility innovation will bring about major changes in society. In order to create truly rich lifestyles and values, not only technology but also deep understanding of people and society, and "transdisciplinarity" are required.

Ability" necessary to elevate value in the social system, "Value Co-Creation Ability" to create value through communication among experts in different fields, "Challenge/Resilience" to boldly implement measures in society and overcome difficulties, and "International Outlook" to play an active role in the international community. TMI human resources who complete this program are expected to play active roles as professionals such as researchers, engineers, entrepreneurs, businesspersons, and government officials for lifestyle revolution in a wide range of fields of society.

Collaboration with industries and 3-layered curriculum

In this program, the knowledge and practice necessary for conducting Transdisciplinary Mobility Innovation (TMI) through transdisciplinary collaboration is structured as a 3-layer transdisciplinary curriculum. The most basic "TMI Knowledge Base" can be selected according to the backgrounds of the students, and consists of: "Course Works" in which basic knowledge necessary for transdisciplinary collaboration is learned through courses in specialized fields and courses in multidisciplinary fields that connect different fields, "Transdisciplinary Faculty Discussion Lecture" to learn different viewpoints from lecturers in different fields, and "Mobility Innovation Common Lectures" to learn basic knowledge about mobility. The "TMI Practice Base" consists of: "Boot Camp" that fosters

3-Layer Curriculum to Develop 5 Abilities



This program adopts a 3-layer curriculum composed of a "TMI Knowledge Base" consisting of course works, a "TMI Practice Base" consisting of a boot camp, testbed construction, venture catapult, etc., and "TMI Doctoral Research".

transdisciplinary collaboration through close team-type collaboration in a training camp format, "On-site Research Training (ORT)" in which site surveys are conducted on sites such as local governments, "Testbed Design and Development (TDD)" in which students collaborate with corporate mentors to design and develop a "testbed" as a basis of demonstration experiments, and "Venture Catapult" through which students plan and practice the establishment of a venture by forming a team among students. In "TMI Lifestyle

Revolution Doctoral Research", in addition to a student's own specialized field, students conduct doctoral dissertation research focusing on "value creation" and "methodology" in lifestyle revolution based on transdisciplinary collaboration such as industry-academia co-creation research. In particular, in the "Industry-Academia Co-Creation Education" promoted by the university, "intellectual professional" ability will be cultivated through joint research with private companies.

Good Practice



TMI students participated Smart City Expo World Congress in Barcelona - introducing TMI Testbed projects

TMI faculties and students participated in the Smart City Expo World Congress, the world's largest smart city exhibition held in Barcelona in November 2022, and introduced our educational and research activities. Three student groups exhibited and had discussions with many visitors about the various TMI testbeds, as well as the initiatives that utilize these testbeds (garbage truck sensor systems, smart warehouses, and human flow utilization). We also studied the efforts of other exhibitors and obtained many hints for future urban design.

Message from WISE Cooperating Institution



MIYASHITA Yutaka
Central Japan International Airport Co., Ltd.
Director Smart Technology Division

Create new value for air mobility innovation collaborating TMI

Central Japan International Airport, Centrair aims to maximize the use of digital and data from the customer's point of view. The reason is to make air travel from home to the destination more fun, convenient, and super comfortable. We look forward to working with TMI students from a variety of perspectives. Thank you for supporting the smart and attractive Centrair that contributes to the development of the local community.

Student's Voice



HORII Ryo
Department of Social Informatics,
Graduate School of Informatics, Nagoya University second year of Master course

Challenges with excellent colleagues in TMI

I applied to TMI because I wanted to improve myself and my research with excellent colleagues. I am inspired everyday by the opportunity to engage with many students in various research fields.

At TMI Boot Camp 2022, we had discussions day and night not only with students but also with teachers. Since TMI gives us many opportunities and experiences for our precious 20s, I enjoy and fulfill everyday very much.

[Office and section in charge] Office of TMI **[Inquiries]** 052-788-6114

DATA

[Number of students recruited (For FY 2023, number of students to be recruited)]

12 each (FY 2020-FY 2022), 12 (FY 2023)

[Number of anticipated program graduates] 2-19

[Number of people engaged in the program] 99

[Students' affiliated schools and departments]

6 graduate schools, 20 departments

<Graduate School of Humanities> Humanities

<Graduate School of Law> Combined Graduate Program in Law and Political Science

<Graduate School of Economics> Socio-Economic System, Industrial Management System

<Graduate School of Informatics> Mathematical Informatics,

Complex Systems Science, Social Informatics, Cognitive and Psychological Sciences, Computing and Software Systems, Intelligent Systems

<Graduate School Engineering> Electrical Engineering, Electronics, Information and Communication Engineering, Mechanical Systems Engineering, Micro-Nano Mechanical Science and Engineering, Aerospace Engineering, Civil and Environmental Engineering

<Graduate School of Environmental Studies> Earth and Environmental Sciences, Environmental Engineering and Architecture, Social and Human Environment

[WISE Cooperating Institutions]

8 universities, 19 enterprises

Gifu University / University of Michigan (USA) / Virginia Institute

of Technology (USA) / The Ohio State University (USA) / Chalmers Institute of Technology (Sweden) / National University of Singapore (Singapore) / Chulalongkorn University (Thailand) / Hanoi University of Science and Technology (Vietnam) / WHILL Inc. / MTG Ventures / KYOCERA Mirai Envision Co., Ltd. / KDDI Research, Inc. / Cisco Systems / O1 Booster, Inc. / Sohgo Security Services Co., Ltd. / Sompo Japan Insurance Inc. / Central Japan International Airport Co., Ltd. / Tier IV, Inc. / Denso Corporation / Toenec Corporation / Toyota Motor Corporation / Toyota Technical Development Corporation / Trusco Nakayama Corporation / Nagoya Railroad Co., Ltd. / Sumitomo Mitsui Banking Corporation / Yahoo Japan Corporation / Yamaha Motor Co., Ltd.

(As of October 2022)

Distinguished Doctoral Program of Platforms

[Program Coordinator] HARADA Hiroshi (Professor, Department of Communications and Computer Engineering, Graduate School of Informatics, Kyoto University)

[Fields of diplomas] Doctor of philosophy, or Doctor in Informatics, Doctor of Agricultural Science
Name of the program to be noted: Distinguished Doctoral Program of Platforms

[URL] <https://www.platforms.ceppings.kyoto-u.ac.jp/en/>



Message from the President



MINATO Nagahiro
President, Kyoto University

Through the WISE Program, Kyoto University seeks to cultivate advanced “knowledge professionals” who will play key roles in industry, academia, and government

In 2021, Kyoto University established the Graduate School Education Support Office to enhance its liberal arts and general education courses, and centrally manage its diverse graduate degree programs. The new office promotes collaboration and cooperation among graduate schools in diverse aspects of education and research. It will ensure that the university continues to provide unique high-quality programs under the government’s Doctoral Program for World-leading Innovative & Smart Education (WISE Program). WISE programs are provided in close cooperation with leading companies and world-class research institutes in Japan and leading universities around the world with the aim of cultivating advanced “knowledge professionals” and promoting the reform of the university’s graduate schools.

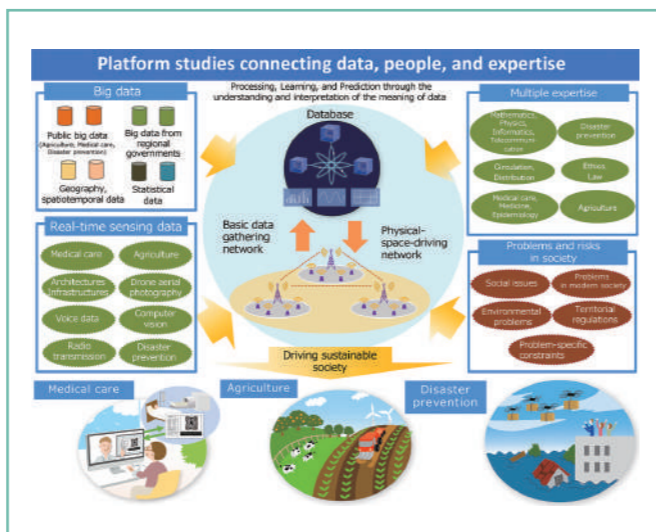
Platform Studies: A new academic field to advance society

To reduce the social risks involved in various fields such as agriculture, medical care, and natural disasters, the “platforms” plays an increasingly important role in our society. The platforms use information and communication technologies to categorize, analyze, and share digital data obtained from various information sources that are non-uniformly spread throughout our society, which are collected and stored in the form of big data. A platform consists of three components: a basic data gathering network composed of various sensors, information terminals, and information communication networks; a database that carries out tasks such as feature extraction and prediction utilizing machine learning and/or deep learning; and a physical-space-driving network that feeds back the processed results into physical space (actual society) and controls various devices.

Currently, the collection and processing of extensive data by platforms entails high power consumption and computer resources. However, we can reduce the power consumption and

cost if we consider the processes involved in decentralization, safety, and speed in the data generation and collection process. This, however, requires knowledge of informatics. Deep learning and machine learning have become standard techniques nowadays but often end up being black boxes. It is possible to improve the output while reducing costs by understanding and interpreting the data’s meaning in each specific field properly and by optimizing the data. To achieve this, informatics must be combined with knowledge of other disciplines such as agriculture, medical care, and disaster prevention. The emergence of cloud computing

and communication networks developed in other countries challenges Japan. It is not sufficient for engineers to be only involved in platform development. They also need to consider the business as well as the standardization from an



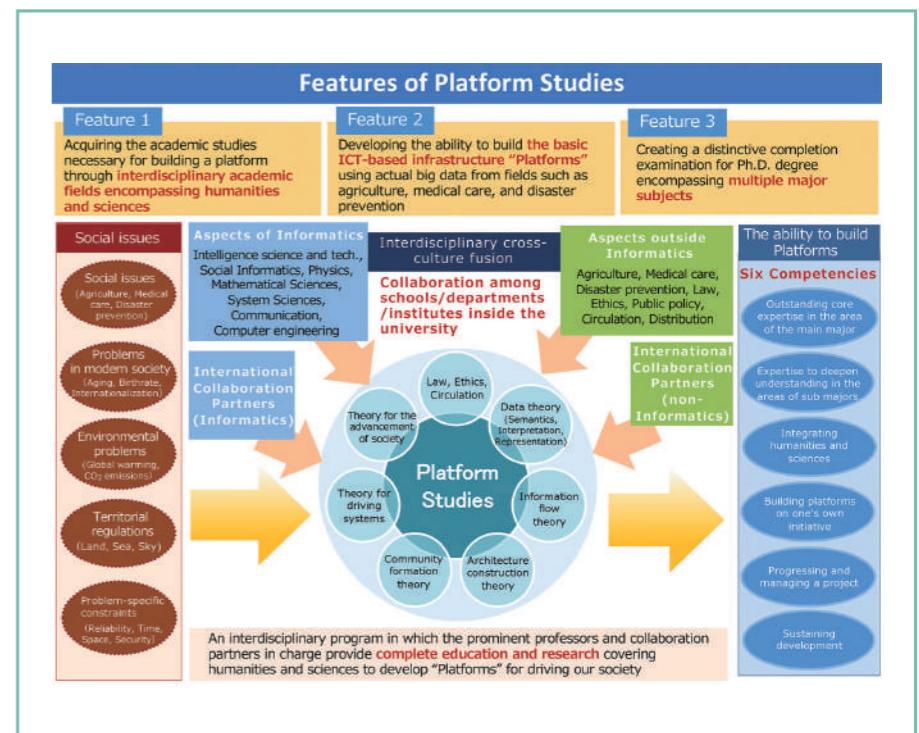
Mission of distinguished doctoral program

international perspective. Indeed, such platform developments with a broader world perspective require the knowledge of laws, ethics, public policy, distribution, and other human studies. We believe this kind of comprehensive expertise helps engineers implement new collective decision-making mechanisms on platforms supplied by Japan’s unique outlook on social ethics and fairness. In this program, we name this new interdisciplinary academic field “Platform Studies” and we propose to develop the required skills with our five-year doctoral program.

The six competencies to be developed, and program features

In this program, we will develop the ability to build the basic infrastructure of platforms using actual big data from agriculture, medical care, disaster prevention, among others. Then, according to the students’ backgrounds and orientations, we will develop an educational system that helps them acquire the knowledge of Platform Studies, encompassing multiple major subjects and advanced, original research capabilities across the following six competencies.

- (1) Outstanding core expertise in the area of the primary major
- (2) Expertise to deepen understanding in the areas of sub majors
- (3) Integrating humanities and sciences, including subjects such as law, ethics, and distribution that are required to build a platform



Features of distinguished doctoral program

- (4) Building platforms on one’s own initiative
 - (5) Progressing and managing a project and operating and expanding the results globally
 - (6) Sustaining development through standardization and social implementation
- To demonstrate and implement the platforms

built in this program, we will create an environment in which students can access a wealth of actual data and have opportunities to interact with front-line professionals from industry, government, and academia in Japan and overseas.

Good Practice



Lectures, exercises, and seminars by in-house and external experts in the key technologies, user realities, and approaches to implementation needed for platform building

We offer fundamental lectures providing a comprehensive understanding of the key information and communications technologies needed for platform building, lectures discussing essential viewpoints on implementation of platforms in agricultural, medical, and disaster prevention settings, and practical exercises in building infrastructure using sensors, transmission devices, and clouds. Moreover, in order to promote a deeper understanding of platform science and communicate information to the public, we hold open seminars once a month, inviting speakers from researchers in fields related to the topic, or from companies and other organizations involved in implementation in society. Students are broadening their knowledge through opportunities for discussion with speakers after these seminars.

DATA

[Number of students recruited (For FY2023, number of students to be recruited)]
15 (FY2021), 15 (FY2022), 15 (FY2023)
[Number of anticipated program graduates] 3-12
[Number of people engaged in the program] 95
[Students' affiliated schools and departments]
2 graduate schools, 11 departments
(Graduate School of Informatics) Intelligence Science and Technology, Social Informatics, Advanced Mathematical Sciences, Applied Mathematics and Physics, Systems Science, Communications and Computer Engineering
(Graduate School of Agriculture) Agronomy and Horticultural Science, Forest and Biomaterials Science, Applied Biosciences, Environmental Science and Technology, Natural Resource Economics

[WISE Cooperating Institutions]
17 universities, 15 business enterprises, 5 National Research and Development institutes, 1 incorporated association, 2 judicial foundations
Jichi Medical University / The Institute of Statistical Mathematics / Toyota Motor Corporation / NTT Communication Science Laboratories / Meteorological Engineering Center / Agricultural and Rural Development Information Center / The Research Institute for Humanity and Nature / Mitsubishi UFJ Research and Consulting / RIKEN / Yahoo! JAPAN Research / System Platform Research Laboratories / Advanced Telecommunications Research Institute International / Nippon Telegraph and Telephone West Corporation / KDDI Research, Inc. / KADOKAWA ASCII Research Laboratories, Inc./Ruby Association / Anritsu Corporation / Institute for Health Economics and Policy / National Institute of Information and Communications Technology / National Fisheries

University / Japan Agency for Marine-Earth Science and Technology / The National Agriculture and Food Research Organization / wenoovator LLC / Mitsubishi Electric Corporation Information Technology R&D Center / Sony Group R&D Center / University of Chicago / University of Illinois / Vienna University of Technology / University of Potsdam / Delft University of Technology / Technical University of Berlin / Aalborg University / Huazhong Agricultural University / National Chung Hsing University / National Taiwan University / University of Florida / Technical University of Munich / Sorbonne University / The French National Centre for Scientific Research / Institute for Infocomm Research, Agency for Science, Technology and Research (A*STAR)

(As of October 2022)

Message from WISE Cooperating Institution



KOJIMA Fumihide
Director General, ICT Testbed Research and Development Promotion Center, Social Innovation Unit, NICT

WISE, an all-in-one program for “platformers” to lead from Japan

It has been four years since the launch of a program designed to foster personnel who will contribute to building platforms that can respond quickly to social risks such as infectious diseases and natural disasters. This program involves creating a multi-disciplinary, optimized platform and using it to cultivate personnel who can drive doctoral-level research and development. As a collaborating institution, we will spare no effort to support these personnel to enable them to help solve social risks globally in the future.

Student's Voice



MATSUOKA Tamami
Second year of Master's program, Division of Environmental Science & Technology, Graduate School of Agriculture

Making use of a liberal and enriching environment

I applied for graduate school admission because I had an interest in the humanities and social sciences despite my science and engineering affiliation, which attracted me to platform studies’ mission of interdisciplinary integration. I feel blessed with opportunities to interact with other hardworking doctoral students in an atmosphere of freedom. This environment inspires me to tackle all kinds of challenges in Japan and beyond, and to contribute through my research to the resolution of global-scale food supply problems.

Graduate Program of Mathematics for Innovation

[Program Coordinator] SAEKI Osamu (Vice Dean of the Joint Graduate School of Mathematics for Innovation, Kyushu University)
[Fields of diplomas] Doctor of Philosophy, Doctor of Philosophy [Mathematics], Doctor of Functional Mathematics, Doctor of Information Science, Doctor of Science, Doctor of Engineering, Doctor of Economics
 Name of the program to be noted: Graduate Program of Mathematics for Innovation
[URL] <https://www.jgmi.kyushu-u.ac.jp/>



Message from the President



ISHIBASHI Tatsuro
President, Kyushu University

Nurturing "Excellent Doctoral Talents in Mathematics" who can develop new interdisciplinary fields and create innovation

In November 2021, we outlined "Kyushu University VISION 2030", which is comprised of the 8 visions, and have been promoting educational and research activities that rank with the world's leading universities in order to transform ourselves into a "university that drives social change through integrative knowledge", which we have set as our ideal figure.

This program is positioned as one of the most important graduate programs in Kyushu University. Through nurturing "Excellent Doctoral Talents in Mathematics" who develop new interdisciplinary fields and create innovation, we are committed to achieve our vision of "Train students and researchers who can apply mathematics, data-science and AI skills to their own research fields of specialization" and "Train doctoral talents who can lead the way in solving the social issues by developing integrative, cross-disciplinary degree programs."

Mathematical Modeling Talents with Mathematics Five Forces

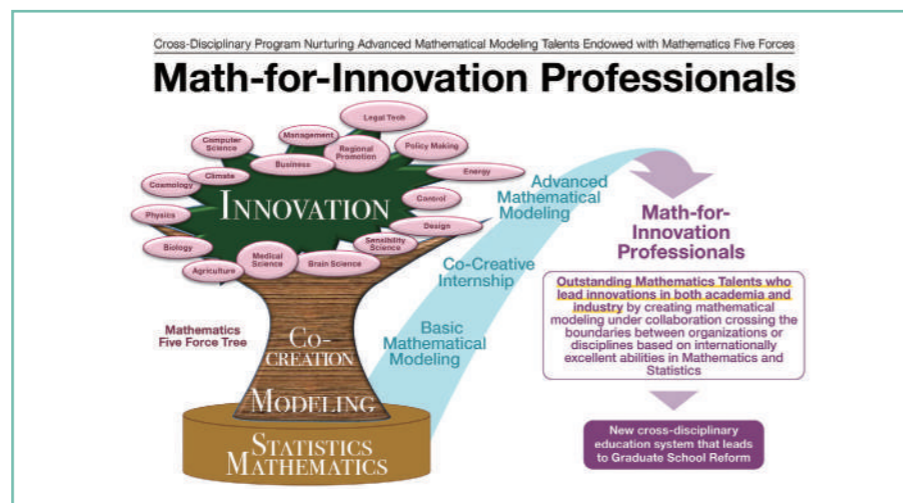
In the super-smart society that Japan aims at, Artificial Intelligence technology and data analysis are essential, but they have certain limits. The versatility and rigor of Mathematics have received attention as a way to break the limits and change our future business and life dramatically.

Mathematics can make great contributions to innovation. For example, in the United States GAFA has made a big impact on the world by utilizing mathematical modeling.

On the other hand, the strength of Japanese industries lies in precision and high quality, so we can make a leap forward by using Mathematics resources. We have the potential to lead the world: unfortunately, we have not been able to do so because Mathematics has not actively collaborated with other fields, and other fields have not been fully utilizing Mathematics. In order to overcome the situation, we need new doctoral talents in Mathematics, so to speak, "mathematical modeling talents".

Therefore, we envisioned "the Graduate Program of Mathematics for Innovation". The five skills that this program aims to cultivate are shown in the Mathematics Five Force Tree (Figure 1). Having excellent mathematical and statistical

skills is the basis and represents the soil, and by utilizing the mathematical modeling power and the power to co-create across organizations and fields, it fertilizes the lush leaves to create innovation and blooms flowers in each field, in turn cultivating



(Figure 1) Mathematics Five Force Tree & Math-for-Innovation Professionals

DATA

[Number of students recruited (For FY2023, number of students to be recruited)] 18 (FY 2021), 14 (FY 2022), 14 (FY 2023)
[Number of anticipated program graduates] 4-14
[Number of people engaged in the program] 84
[Students' affiliated schools and departments] 1 graduate school
 Joint Graduate School of Mathematics for Innovation
[WISE Cooperating Institutions] 7 universities, 3 public research institutes, 5 companies, 1 local public body

The Institute of Statistical Mathematics / RIKEN (Center for Advanced Intelligence Project / Interdisciplinary Theoretical and Mathematical Sciences Program) / Fujitsu Research, Fujitsu / Beautiful Mind / Mazda Motor Corporation / Sumitomo Electric Industries, Ltd. / The National Institute of Advanced Industrial Science and Technology / Itoshima City (A planning department, Regional Promotion Division) / NIPPON TELEGRAPH AND TELEPHONE CORPORATION / Department of Mathematics, University of Illinois at Urbana-Champaign / Department of Mathematics,

University of California, San Diego / Department of Mathematics and Statistics, La Trobe University / Department of Mathematics, National University of Singapore / Department of Mathematics, National Taiwan Normal University / Mathematical Institute, Leiden University / Zuse Institute Berlin

(As of November 2022)

"Math-for-Innovation Professionals". In the Master's Program, students join the labs of faculty members of other fields as "Basic Mathematical Modeling". In the Doctoral Program, we have three "Co-Creative Internships", i.e. industrial, interdisciplinary, and international ones, as well as "Advanced Mathematical Modeling", in which students teach mathematical modeling to researchers in other fields as reverse mentors.

Kyushu University's Distinctive Initiatives

The main reason for proposing this WISE program at Kyushu University is that we have a proven track record of contributions to society by Mathematics and have a strong determination to take on that responsibility.

In order to establish a stronger educational structure, Kyushu University established the Joint Graduate School of Mathematics for Innovation in April 2022 through the collaboration of the Cooperative Graduate Schools (Mathematics, Information Science and Electrical Engineering, and Economics) as a basic organization for the delivery of inter-graduate school program. In particular, the Graduate School of Mathematics offers long-term internship training, and is one of the two organizations that have earned the highest result in the second-term corporate evaluation by MEXT, Japan. As research organizations, we have the Institute of Mathematics for Industry (IMI) and the Pan-Omics Data-Driven Research Innovation Center. The IMI is Japan's unique joint usage/research

New Innovative System Solving Shortage of Doctors

First in Japan! WISE Doctoral System for Mature Students

A student is hired by a company when completing Master's Program, and immediately starts Doctoral Program.

- Problems of financial support, career development, industry-academia collaboration, human resource exchange, etc., are solved at a time.
- Realized by collaboration with established companies such as Fujitsu Research, Fujitsu: the first system in Japan.
- The system aims at three students per year.

In 2022: Employment at Fujitsu Research, Fujitsu, and advancement to the doctoral program have been realized.

(Figure 2) WISE Doctoral System for Mature Students solves multiple problems at once, such as financial support, career development, etc.

center for industrial Mathematics, and is actively engaged in the mission to develop "Mathematics for Industry", a new research area of Mathematics born from dialogues with industry. We will take on the responsibility of the University through this Interdisciplinary degree program, designed by various departments and faculty members.

One of the most distinctive initiatives in this plan is to establish the WISE Doctoral System for Mature Students (Figure 2). This means that companies hire excellent Master's graduates, and at the same time, the students are admitted to the

doctoral program as mature students, and they return to the company after obtaining their doctoral degrees. This system allows us to solve various problems at once, such as financial support, career development, and strengthening industry-academia collaboration. Employment at Fujitsu Research, Fujitsu, and advancement to the doctoral program have been realized in 2022. We would like to extend this system to other companies, increase the dwindling number of doctoral students in Japan, as well as to contribute to the active exchange of industry-academia human resources.

Good Practice



"Mathematics for Innovation Café", Co-creative Activity Organized by Students

Students and young mentors collaborate to take the initiative in planning, organizing, and disseminating the entire program to society, and regularly hold lectures and poster presentations by young researchers, etc., as well as social gatherings on a scale where all participants can see each other. Not only program students but also undergraduate students of the Department of Mathematics and students in other fields participate in the café, where research on the theme of mathematics is introduced in an easy-to-understand manner and opinions from various perspectives are exchanged, which is useful for recruiting activities. The program students themselves also have opportunities to give lectures and presentations, and through implementation and participation in this café, they can improve their mathematical and co-creation skills.

Message from WISE Cooperating Institution

Innovation based on Artificial Intelligence and Mathematical Technology



ANAI Hirokazu
Director, Artificial Intelligence Laboratory, Fujitsu Research, Fujitsu

In the present era of digital transformation, expectations for Mathematics talents who are in charge of artificial intelligence and mathematical technology are becoming greater and greater. This program is unique in that it will contribute to the development of human resources who can create innovations by practicing co-creation with society and possessing fundamental mathematical skills. It also offers the first initiative of the WISE Doctoral System for Mature Students and we are glad to be a part of it.

Student's Voice

Aiming to become a doctor of mathematics who creates innovation through co-creation with other fields



YOSHIDA Wataru
Joint Graduate School of Mathematics for Innovation D1

In my major, statistics, we can learn a lot not only from textbooks and papers but also from actual data analysis. In this program, we can try data analysis that we cannot usually experience. For example, I analyzed seismic wave velocity data with geology teachers. Through this practical experience, I was able to acquire knowledge of various statistical models. In addition, the opportunity to discuss with experts in other fields is very valuable, and I feel that it will broaden the range of my research.

▶ **For inquiries about the overall WISE Program**

**Office for Higher Education Policy
Policy Division, Higher Education Bureau
Ministry of Education, Culture, Sports, Science and Technology (MEXT)**

3-2-2 Kasumigaseki, Chiyoda-ku, Tokyo 100-8959, JAPAN
Phone : +81-3-5253-4111 (ext.3357)

**[https://www.mext.go.jp/a_menu/koutou/kaikaku/
takuetudaigakuin/index.htm](https://www.mext.go.jp/a_menu/koutou/kaikaku/takuetudaigakuin/index.htm)**
(Only in Japanese)



▶ **For inquiries about screening and evaluation under the Program**

**Secretariat of the Program Committee
University Cooperation Program Division, Human Resource Development
Program Department, Japan Society for the Promotion of Science (JSPS)**

Kojimachi Business Center 6F, 5-3-1 Kojimachi, Chiyoda-ku, Tokyo 102-0083, JAPAN
Phone : +81-3-3263-0979

<https://www.jsps.go.jp/j-takuetsu-pro/index.html>
(Only in Japanese)

