



JSPS

WISE Program

Doctoral Program for
World-leading Innovative &
Smart Education

Message



Chair, WISE Program Committee
HAMAGUCHI Michinari

Amid the enduring Coronavirus pandemic and progressing global warming, a wandering hope for attaining sustainability is seen within the global community. To sustain and grow Japan's hope for the future amid this turbulence, expectation is placed on the nation being able to create new key industries including the revamping of its industrial structure. (That is, for Japan to achieve its "Society 5.0" vision.) To this end, university graduate schools in Japan are expected to be a wellspring for generating new knowledge genres and technologies while performing as an incubator of talented people attuned to the social values attending these innovations.

However, when looking at the situation currently enveloping graduate schools in Japan, we witness a variety of problems in both the quantitative and qualitative aspects of Japan's educational environment, one being a shrinking population of young people and another being a phenomenon of excellent young people shying away from entering PhD programs.

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. Taking a lead in generating and applying new knowledge, the WISE Program has as its aim the fostering of excellent doctoral students, who will be the high-level "knowledge professionals" who can 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 create doctoral programs that amplify their unique institutional characteristics and strengths and to make 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. Through follow-up activities and interim evaluations, which started in FY 2021, the WISE Program Committee supports each selected graduate school program while working to foster the next generation of excellent professionals who will shoulder Japan's future.

The executives of the selected universities 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.

We expect that each program will foster high-level knowledge professionals who personify the WISE objective while overcoming unanticipated difficulties in confronting an increasing spread of the new coronavirus. We also strongly expect that the results attained through the WISE program will be used to advance university reform throughout Japan.

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WISE Program Doctoral Program for World-leading Innovative & Smart Education

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.

Image of the Entire Program



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.

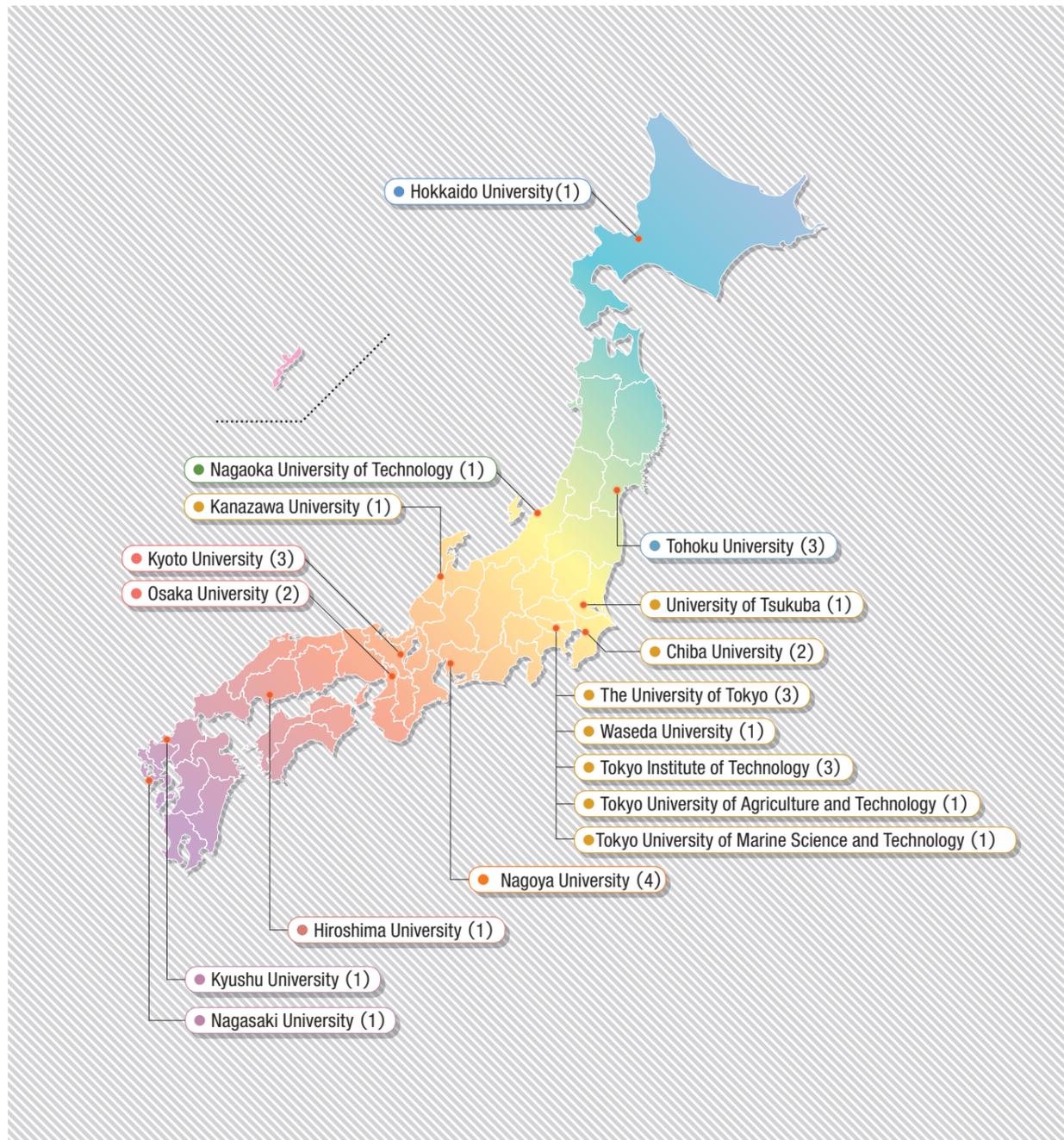
Q What is studying like WISE doctoral programs?

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) / Office international des Epizooties (OIE-World Organisation for Animal Health) / 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 Dainippon 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. / Hitachi Astemo, Ltd. / 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.	18
1804	Ph.D. Program in Humanics	University of Tsukuba	YANAGISAWA Masashi	University of California, Irvine / University of Bordeaux / National Taiwan University / University of Edinburgh / Materials Science / Advanced Industrial Science and Technology / Toyota Motor / Hitachi / Shimadzu / CYBERDYNE / Astellas Pharma	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 / Janssen Pharmaceutical K.K. / DAIICHI SANKYO COMPANY, LIMITED / Takeda Pharmaceutical Company Limited / Utoyo 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	GOMI Takashi	KUBOTA Corporation / AEON AGRICULTURE CO., LTD / SHIMADZU CORPORATION / Japan Automobile Research Institute / Japan Agricultural Corporations Association / Greate Tokyo Initiative / Leave a Nest Co., Ltd. / Recruit Career Co., Ltd. / 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. / MITSUI 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 / 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	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 SANSOCORPORATION / Tokyo Electron Ltd. / TOYODA GOSEI CO., LTD. / TOYOTA MOTOR CORPORATION / Nissan Motor Co., Ltd. / Furukawa Electric Co., Ltd. / Mitsubishi Electric Corporation / Nanjing University / Japan Venture Capital Association / NC State University / Forschungszentrum Jülich	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. / Bayer Yakuhin, Ltd / 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 / 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	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 / 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	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	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 of Radiological Sciences / 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. / 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 / Hitachi Industrial Equipment Systems Co., Ltd. / Yokogawa Electric Corporation / Koden Electronics Co., Ltd. / KDDI Corporation / SoftBank Corp. / Huawei Japan / SHO-BOND Corporation / DENSO Corporation / Kawasaki City / Ota City / Google LLC / SOLID Gear Inc. / CEA Leti / Georgia Institute of Technology / 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 / Asurion LLC / RWTH Aachen University	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	National Institute of Maritime, Port and Aviation Technology / Japan Agency for Marine-Earth Science and Technology / Japan Fisheries Research and Education Agency / Technical University of Denmark / IDEA Consultants, Inc. / BEMAC Corporation / 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	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 / 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 Dainippon 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 / 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 / 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.	64

List of Programs Selected in FY2020

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 / SEKISUI CHEMICAL CO., LTD. / 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 / BROTHER INDUSTRIES, LTD. / Mizuho Research & Technologies, Ltd. / Mitsubishi Corporation / Mitsubishi Electric Corporation / Japan International Cooperation Agency (JICA) / CEALiten RESEARCH INSTITUTE / National Institute of Advanced Industrial Science and Technology (AIST) / Thailand National Science and Technology Development Agency / Kawasaki City / Georgia Institute of Technology / HITOTSUBASHI UNIVERSITY / 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 / KDDI Research, Inc. / Cisco Systems / 01Booster, Inc. / Sohgo Security Services Co., Ltd. / Somo 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 / GOOD EAT COMPANY Inc / 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 tough time under the 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.

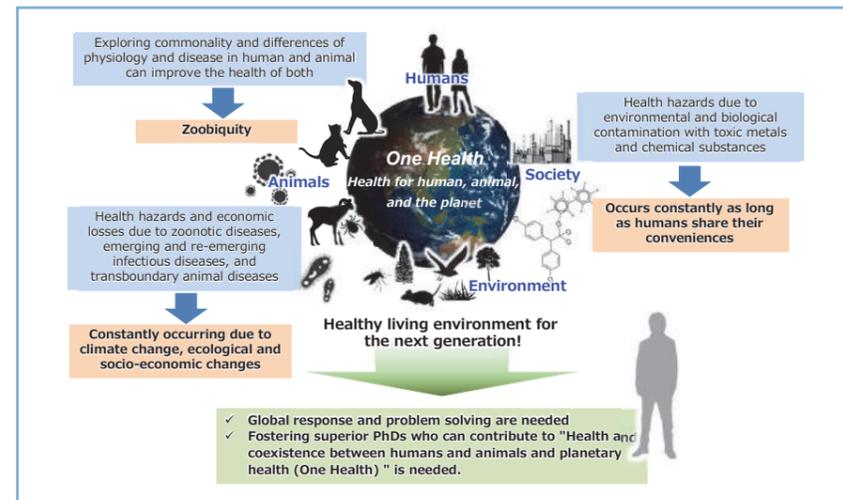
Hazards chemicals discharged into environment that include poisonous metals, pollutants such as dioxin, and persistent organic pollutants, are known to have caused global-scale contamination and threaten the health of humans and animals. Environmental pollution, rather than disease, is the leading cause 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, "Zoobiquity", 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



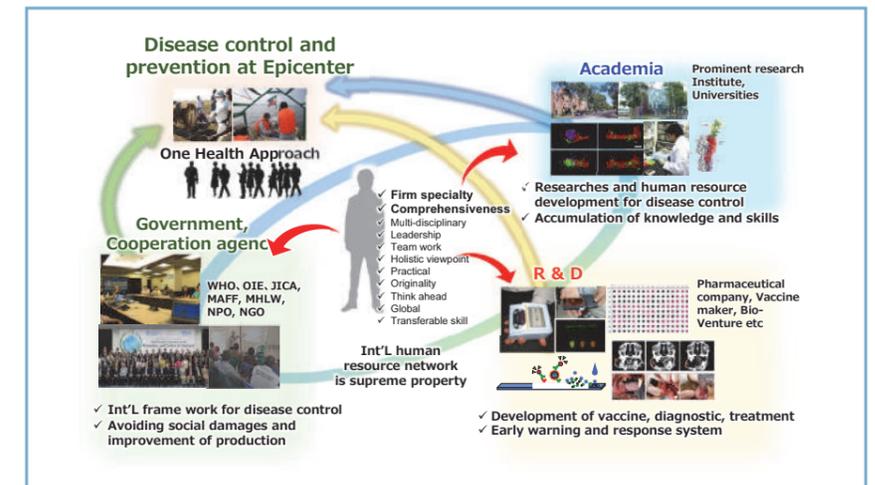
The human resources that we aim to foster is superior PhDs who will be able to contribute to the achievement of "One Health" to pass soundness and integrity of living environments to the next generations.

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, OIE, and JICA, and/or development research in collaboration with public institution



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

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



Workshop for developing successful global leaders

One Health leaders are required to perform their tasks and activities in complex and dynamic environment. This one-day workshop offered by Mr. TODA from Fuso Pharmaceutical Industries Ltd. provided our students with opportunities to gain general and occasion-specific knowledge of various types of leadership. The participants also joined groupwork where they work together for improving their cognitive ability in novel situation. The lecturer assigned a small task to be accomplished by each group in limited time. The leader in a group had to perform cross-cultural and intersectoral adjustment to accomplish their goal. It was a successful experience-based learning. At the end of the day, the students were confident performing their own leadership in the communities they belong to.

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



MUTHUSINGHE, Bungiriye Devinda Shameera

Graduate School of Infectious Diseases, DC4

Working towards the control of rodent-borne zoonotic diseases

The concept of One Health was introduced to me during my graduate studies. The fully funded internship offered by WISE Program provided a great opportunity for me to expand my knowledge and skills detecting zoonotic pathogens in rodents and other animals including humans. It opened a new area of study for me to continue in future carrier. Also, getting known to the leading researchers and their institutions provided me the opportunities to collaboratively work for the control of zoonotic diseases standing on the ground of One Health.

[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 of social progress in anticipation of the New Normal Producing leaders who will drive futuristic medical care through data / technology

The COVID-19 crisis demands a "New Normal," which our university is addressing by advancing education, research, and social synergy as we "strive for creativity and innovation" while leading social progress from a global outlook. Now, as in the past, our university implements diverse degree programs as part of a positive cycle of education, research, and social synergy aimed at developing highly specialized human resources.

For four years the Advanced Graduate Program for Future Medicine and Health Care has steadily fostered human resources to drive futuristic medical care (which promotes health, prevention, and treatment through data, technology, and social infrastructure), making this degree program central to our graduate school innovations.

Overcoming the Pandemic

We thought that futuristic medicine should be a medicine that can quickly solve the problems of society by making full use of data and technology, and we are fostering human resources who can contribute to it through this program. The Tohoku region is the most advanced in a super-aging

in Japan. We run this program with the aims of understanding the medical issues that can be seen in the Tohoku region, creating solutions to these issues, and developing these solutions to the world. The experience of the new Corona pandemic made us realize that simply aiming for the advancement of medical technology is not enough to contribute to maintaining the health

of the people. For solving problems in both acute diseases such as infectious diseases and chronic medical care which is an issue in our aging society, we need a system that allows organic cooperation between the fields of medicine and welfare, psychology, sociology, and economics. We would like to contribute to the construction of a healthy society for as many people as possible by



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.

DATA

[Number of students recruited]
15 (FY2019), 15 (FY2020), 15 (FY2021)
[Number of anticipated program graduates] 1-15
[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 Dainippon Pharma Co., Ltd.

(As of April 2021)

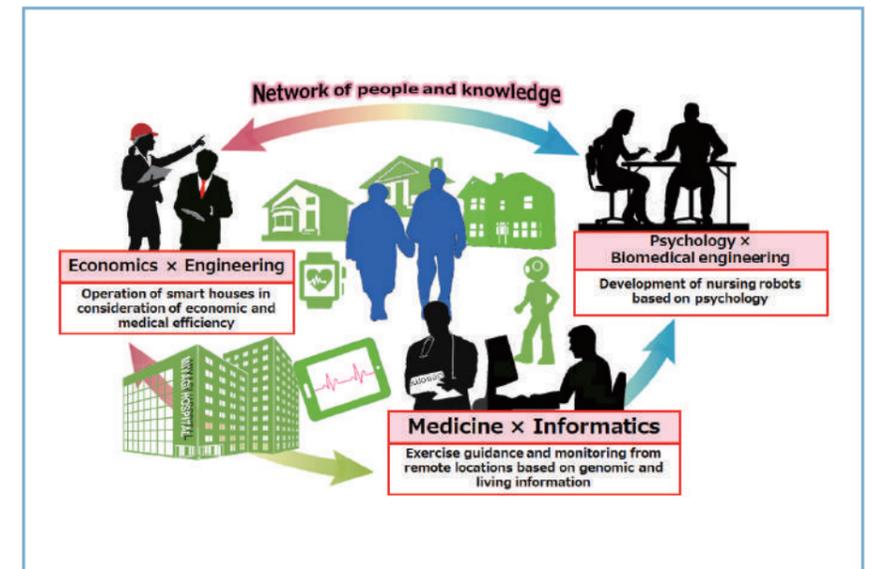
producing human resources who can build such a system and who can deepen cooperation among people in various fields within such a system from the program.

Show the power of the students themselves

Students, even those who have not studied medicine or the medical field, participate in the program with their own perspectives on what is necessary for a healthy society in the future, and brush up their perspectives with other students, faculty members, and external mentors.

In our program, we place special emphasis on training. All students will visit university hospitals, regional hospitals, and biobanks in groups of three to see for themselves what is really going on in that field. While discussing the findings within the group, we also conduct interviews with medical professionals who are active on the front lines of medical and welfare care, and train them to identify issues in the field. Students from different fields of sciences participate in the training together from each student's perspective, leading to foster the ability to share knowledge and skills and to interact with multiple professions based on deep mutual understanding, while at the same time to develop the ability to discover issues that are currently required, and to proceed to the solution of those issues.

Another feature of our program is that we create many opportunities to interact with



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.

people who are innovating in modern society. We ask people who are active on the front lines of companies to provide mentoring to groups of students, and we also provide more advanced one-on-one mentoring. Although it has become more difficult to talk face-to-face because of the Corona disaster, it has become rather easy to set up online meetings, and students are receiving advice on their research and career paths from

mentors outside the university. These experiences have been very stimulating and something that students could not have encountered in their university life so far.

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.

Message from WISE Cooperating Institution



KATO Takashi
CEO, Fracta

From agenda-setting to implementation: Expectation for Program for FMHC

I have extensive knowledge and experience in AI (data science and machine learning). I am entrepreneur who has been creating new value (innovation) to solve social issues as well. As the CEO of Fracta, an AI venture company, I plan to develop cross-cutting and practical classes that are appropriate for training people with the leadership skills required by this program.

Student's Voice



HIRAYAMA Hideyuki
2nd year of Master's Program in Health Sciences, Graduate School of Medicine

To solve the issues facing medicine and create a future

I participated in this program because I wanted to acquire the skills to solve the "Unclear needs" I felt in the clinical practice as a nurse. In this program, we have the training to visit medical sites and find the essential issues that need to be resolved, and we receive a lot of support when we work on solving issues. The program also brings together students with various specialties to work on activities that make use of their respective skills.

[Office and section in charge] Office of Advanced Graduate Program for Future Medicine and Health Care **[Inquiries]** 022-717-8031

WISE Program for AI Electronics

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



Message from the President

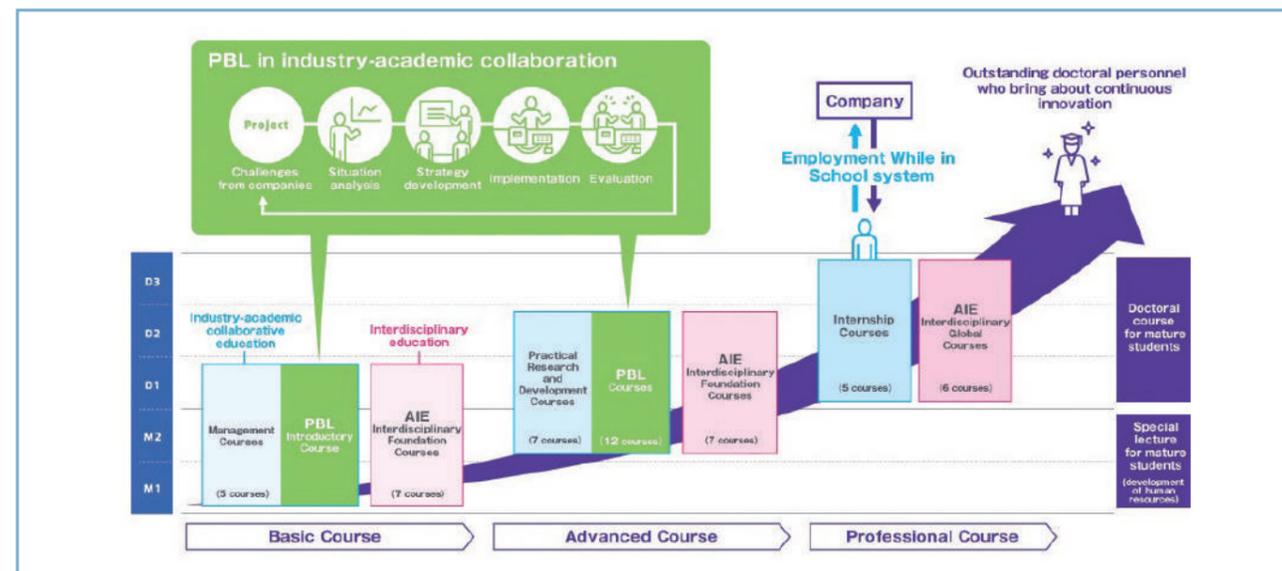


OHNO Hideo
President, Tohoku University

Fostering leaders of social progress in anticipation of the New Normal Producing leaders with executive abilities and big-picture thinking to create ultra-smart communities

The COVID-19 crisis demands a "New Normal," which our university is addressing by advancing education, research, and social synergy as we "strive for creativity and innovation" while leading social progress. Now, as in the past, our university implements diverse degree programs as part of a positive cycle of education, research, and social synergy aimed at developing highly specialized human resources.

For four years the WISE Program for AI Electronics has provided students with the executive abilities and big-picture thinking needed to create ultra-smart communities. Incorporating interdisciplinary techniques, it fosters exceptional doctoral students capable of "continuous innovation," making this degree program central to our graduate school innovations.



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

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.

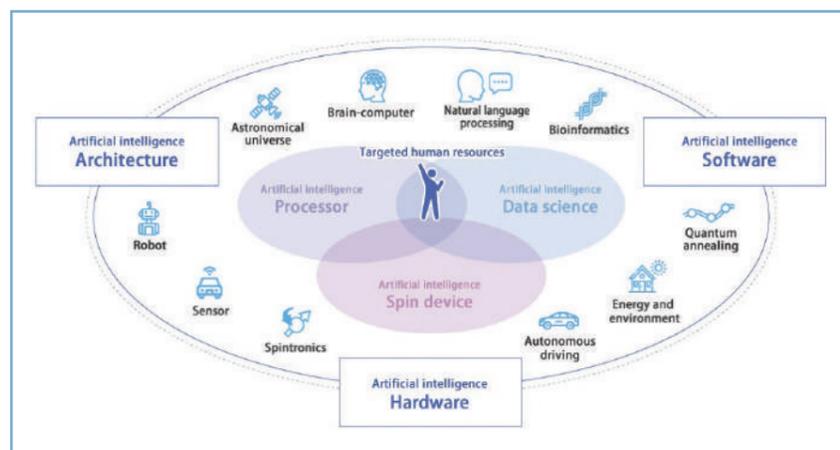
Research and development are required not only in algorithms and computer programs to process big data, but also in spintronics and electronics to develop devices and in computer architecture for designing processors that realize low-power consumption and high-performance computation.

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



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

DATA

<p>[Number of students recruited] 25 (FY2029), 30 (FY2020), 40 (FY2021)</p> <p>[Number of anticipated program graduates] 10-20</p> <p>[Number of people engaged in the program] 69</p> <p>[Students' affiliated schools and departments] 6 graduate schools, 15 departments <Graduate School of Engineering> Electronic Engineering, Electrical Engineering, Communications Engineering, Applied Physics, Management Science and Technology <Graduate School of Information Sciences> Computer</p>	<p>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 and Management> Economics and Management</p>	<p>[WISE Cooperating Institutions] 13 companies NEC Corporation / TOSHIBA CORPORATION / CANON MEDICAL SYSTEMS CORPORATION / Hitachi Solutions East Japan, Ltd. / Hitachi Astemo, Ltd. / 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.</p>
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(As of October 2021)

take a bird's 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 professional course, 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 learning outcomes for Project Based Learning (PBL) subjects, which produce and implement learning content in collaboration with partner companies. In the PBL course, several students are investigating, researching, proposing solutions, and verifying the issues presented by each partner 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 participated in PBL subjects devised their own presentations, and many students took up and solved social issues such as COVID-19 and SDGs from a broad perspective. It seems that they showed their ideas for the future and learned that research and technological development are important in relation to society.

Message from WISE Cooperating Institution



SAKAGUCHI Shuji
Manager, TDK MAKER DOJO, Technology & Intellectual Property Division, TDK Corp.

An environment that creates human resources to take on challenges

When I started my career, Japanese companies had sales offices all over the world, where everyone could play an active role. A society where IoT and AI are heavily used will come in near future. I strongly sympathize with this program, in which industry, academia and government work together to develop human resources who will take on bold challenges amid major changes in the conventional system. We, as a company, believe that it is urgent to create an environment that accepts such human resources.

Student's Voice



SHIN Duckgyu
1st year of Doctoral Program in Communications Engineering, Graduate School of Engineering

A place for practical learning

The most attractive on this program is that we can learn about artificial intelligence, which is currently used in society, from practical and academic perspectives in various research fields in collaboration with partner companies. My motivation for joining the program is the study of PBL courses, where we consider the issues provided by the companies ourselves, propose solutions, and verify them. Practical experience that cannot be experienced in the laboratory will be a valuable asset for future academic research and activities.

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
 * Ph.D. Program in Humanics is included
[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.

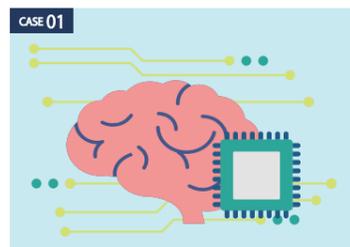
This graduate program sheds light on the fundamental principles of physiology and pathology of the human, defines “Humanics” as a discipline that generates new science and

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

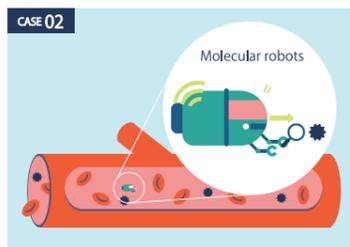
Humanics Aims for Fusion Research

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

DATA

[Number of students recruited]

15 (FY2019), 15 (FY2020), 15 (FY2021)

[Number of anticipated program graduates] 15

[Number of people engaged in the program] 118

[Students' affiliated schools and departments]

4 graduate schools, 10 departments

(After restructuring of schools and programs in April, 2020 : 2 graduate schools, 4 degree programs, 9 programs)

(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 Comprehensive Human Sciences)

Medical Sciences, Neuroscience)

(Graduate School of Life and Environmental Sciences) Life Sciences and Bioengineering, Biological Sciences

(After restructuring of schools and programs in April, 2020 : (Graduate School of Science and Technology) Life and Agricultural Sciences, Biology)

(Graduate School of Systems and Information Engineering) Computer Science, Intelligent Interaction Technologies

(After restructuring of schools and programs in April, 2020 : (Graduate School of Science and Technology) Computer Science, Intelligent and Mechanical Interaction Systems)

(Graduate School of Pure and Applied Sciences) Chemistry, Physics, Materials Science and Engineering

(After restructuring of schools and programs in April, 2020 : (Graduate School of Science and Technology) Chemistry, Physics, Engineering Sciences)

[WISE Cooperating Institutions]

4 universities, 2 national institutes, 5 companies
 University of California, Irvine / University of Bordeaux / National Taiwan University / University of Edinburgh / Materials Science / Advanced Industrial Science and Technology / Toyota Motor / Hitachi / Shimadzu / CYBERDYNE / Astellas Pharma

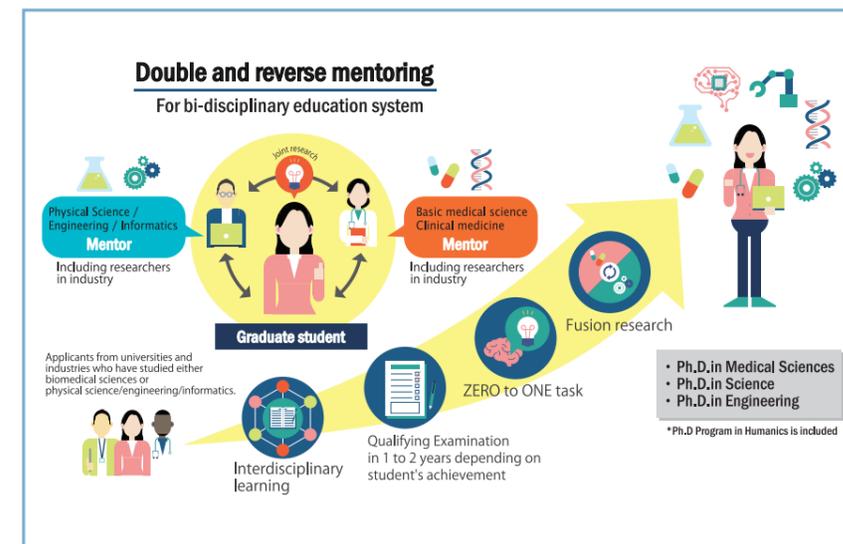
(As of October 2021)

sciences/engineering/informatics, 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



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

the field of biomedical sciences and the other from physical sciences/engineering/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.

Message from WISE Cooperating Institution

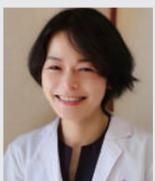


SANKAI Yoshiyuki
President and CEO, CYBERDYNE Inc.; Executive Research Director, Center for Cybernetics Research Director, MIRAI / Professor, University of Tsukuba

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 Seihou
3rd 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 fourth year of operation, with the goal of developing "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.

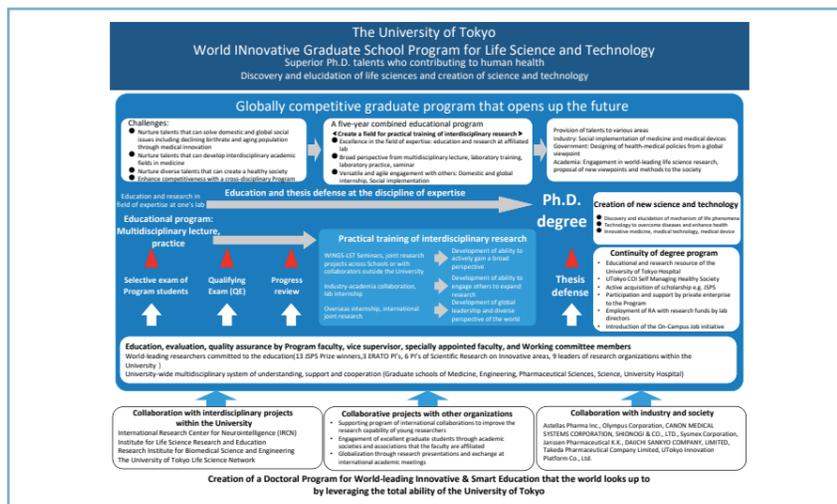
In this program, we aim to foster human talents who can create new academic fields in the future by co-developing excellence in three assets: expertise in specialized disciplines, broadness of scientific perspective, and agile engagement with others to develop new opportunities.

(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.

[Number of students recruited] 86 (FY2018), 40 (FY2019), 40 (FY2020), 40 (FY2021)
[Number of anticipated program graduates] 40
[Number of people engaged in the program] 86
[Students' affiliated schools and departments] 4 graduate schools, 22 departments
 <Graduate School of Medicine> Molecular Cell Biology, Functional Biology, Pathology Immunology and Microbiology, Radiology and Biomedical Engineering, Neuroscience, Social Medicine, Internal Medicine, Reproductive, Developmental and Aging

Sciences, Surgical Sciences
 <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
 <Graduate School of Pharmaceutical Sciences> Pharmaceutical Sciences, Pharmacy
 <Graduate School of Science> Biological Sciences

[WISE Cooperating Institutions] 9 companies
 Astellas Pharma Inc. / Olympus Corporation / CANON MEDICAL SYSTEMS CORPORATION / SHIONOGI & CO., LTD. / Sysmex Corporation / Janssen Pharmaceutical K.K. / DAIICHI SANKYO COMPANY, LIMITED / Takeda Pharmaceutical Company Limited / Utokyo Innovation Platform Co., Ltd.

(As of November 2021)

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



At the Colloquium, everybody in the Program got together to enjoy a lecture by Prof. OHSUMI Yoshinori, panel talk with Prof. KIKKAWA Masahide and Prof. MIZUSHIMA Noboru, students group work, and discussion with Cooperating Institutions.

phenomena (related to basic medical sciences and 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.

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



CHUNG Myung
2nd year Doctoral Student in Molecular Cell Biology, Graduate School of Medicine, The University of Tokyo

Towards a paradigm shift in life science research

WINGS-LST provides many opportunities to get a bird's-eye view of each field of life science, such as lectures by program advisors and experimental training. I decided to participate in this program with the idea of creating a new academic field and becoming a leader who can contribute to society. In particular I was attracted by the annual events, which offer a great opportunity for all program members to get together and think about what we can do to achieve human health and a better society through cross-disciplinary discussions.

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

[Program Coordinator] GOMI Takashi (Director of Institute for WISE Program, Professor in Department United Graduate School of Agricultural Science, 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/>



Message from the President



CHIBA Kazuhiro
President, Tokyo University of Agriculture and Technology

Developing dynamic doctoral degree holders with practical abilities who can expand values for the future to pioneer a 'Super-Smart Society'

Our university's goal is to foster human resources who will lead the knowledge-based society of the future via scientific inquiry and knowledge based on public service, sociality, internationality and ethics as well as to educate students to become people who care for others on a large scale. This program plays a key role to acquire abilities for practical action while designing the vision for future generation and sharing each other's perspective. By respecting the individuality of others and developing their own originality, we expect them to discover their own talents and connect them to social implementation. Then, they can play an active role as powerful and dynamic doctoral students who will pioneer a 'Super-Smart Society' where cyberspace and realworld space merge.

Driving Super Smart Society by New Industry and Diversity

In this program, based on agriculture and engineering, we will produce high-level human resources with doctoral degrees who can implement the Society 5.0 "Super Smart Society" in 5th Basic Plan for New Science and Technologies to solve social problems. We feature "Creation of New Industries" and "Diversity" which are essential for the creation of excellent innovation.

As for "Creation of New Industries", we apply the cutting-edge technologies such as Artificial Intelligence (AI), machine learning, advanced measurement and IoT, robot, smart mobility (automated driving), and energy control to agriculture. We cultivate human resources with doctoral degree who will create and drive the safe, secured and sustainable new industries regarding "Smart Food Supply Chain" or "Smart Production System", harmonizing with water, air, soil and weather, and promoting the "Smart Agriculture" or "Smart Stock Farming" at an accelerated rate with ICT.

Collaborating with nine partner organizations

and eight overseas partner universities, we will produce a "knowledge professional" with bigpicture perspective, originality and highlevel specialization for industry and international organizations.

As for "Diversity", regardless of gender or nationality, diversity-related courses are required for all the WISE Students, which characterize our cultivation of high-level human resources with doctoral degrees.

The vision of human resources cultivated by the WISE Program is;

- (1) Challenging "creating new industries through agri-engineering collaboration" and thereby leveraging cutting-edge technologies to solve the social challenges relating to agriculture,
- (2) Strengthening the understanding of diversity

(gender, nationality, social experiences, etc.) which is essential for innovative human resources, and (3) Excellent leadership with a big-picture perspective, originality, appreciation of diversity, international competitiveness, and high-level specialization.



This program develops excellent human resources who challenge application of research outcomes for Society 5.0 "Super Smart Society" through postgraduate education.

DATA

[Number of students recruited]

27 (FY2019), 30 (FY2020), 24 (FY2021)

[Number of anticipated program graduates] 18-22

[Number of people engaged in the program] 99

[Students' affiliated schools and departments]

4 graduate schools, 17 departments

<Graduate School of Engineering> Electronic and Information Engineering, Biotechnology and Life Science, Applied Chemistry, Mechanical Systems Engineering, Joint Doctoral Program for Sustainability Research, Computer and Information Sciences, Electrical and Electronic Engineering <Graduate School of Agriculture> Environmental Conservation, Cooperative Division of Veterinary Sciences, Agriculture

<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), 5 companies, 1 general incorporated foundation, 1 public interest incorporated association, 1 general incorporated association, 1 research institute (including 1 foreign institute)

KUBOTA Corporation / AEON AGRI CREATE CO.,LTD / SHIMADZU CORPORATION / Japan Automobile Research Institute / Japan Agricultural Corporations Association / Create Tokyo Initiative / Leave a Nest Co.,Ltd. / Recruit Career Co., Ltd. / 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

(As of November 2021)

Year of selection FY 2018



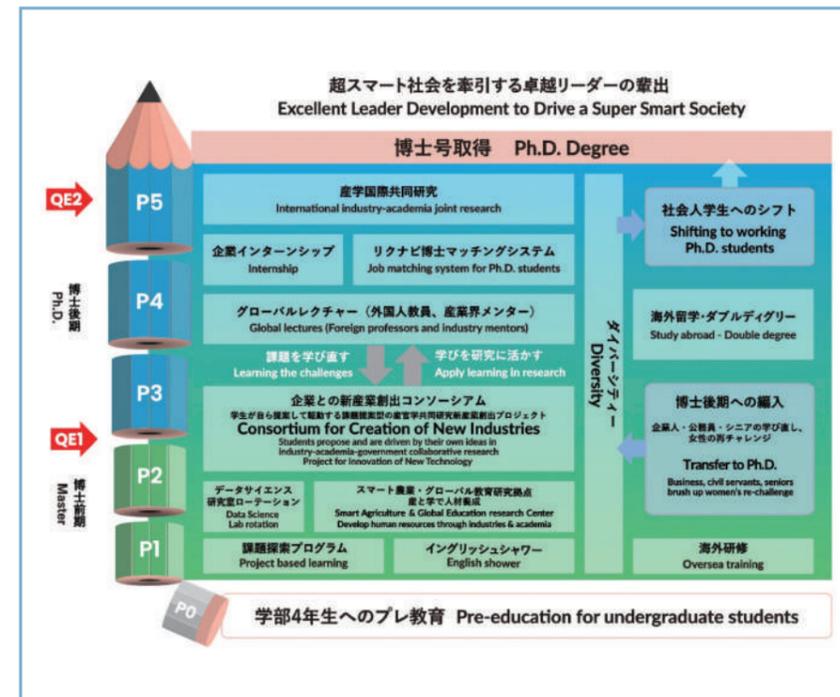
Develop International Leaders with Partner Organizations

This program consists of a five-year integrated program (master's + doctoral) and students who have completed a master's course are also accepted.

We conduct problem-proposal-type industry-academia joint research where students themselves can challenge to propose and drive to build the "Consortium for the Creation of New Industries" with the partner organizations. We already built collaboration and cooperation with companies as an organization-to-organization framework. We established the system where both parties can have a consensus systematically so that the research outcomes can be published by students paying attention to intellectual properties. Also, young researchers in companies are encouraged to join this program to obtain a doctoral degree.

To cultivate excellent leaders, enhancement of education in global perspective is indispensable. Foreign researchers commit in this educational program collaborating with the top-class universities in North America, Europe and Asia. World top-class researchers from these partner organizations come to Japan, give global lectures, and accept training or study abroad of Japanese students, as well as activating international joint researches.

Lectures are provided by practitioners from the collaborating companies and project-based practical education under the Consortium for the



This curriculum develops excellent human resources who drive a "Super Smart Society" collaborating with private companies, public institutes and overseas partner organizations with a five-year integrated postgraduate program as a pillar.

Creation of New Industries composed of private companies and public research institutes.

To complete the program, besides meeting the completion requirements of the department, students must pass the Qualifying Examination

(QE) by taking the courses provided by the WISE Program. 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



The Charm of Integration of Agriculture and Engineering: Enjoy "NOKODAI CRAFT BEER" !

TUAT-WISE students made the NOKODAI CRAFT BEER by combining the knowledge of agriculture and engineering. It all started from "Outline of Global Leadership", a course in which students learn how to define social issues, understand the real situation, and develop a business plan as a solution receiving the advice from mentors from industry. After this course, a doctoral student developed the "TUAT Beer Project" using the funding system of the program. As a result, his team succeeded to create the original craft beer by applying ultrasonic ripening technology to blueberries produced at university's farm. This project became a good practice of supporting students' creative challenges, expanding networks with alumni and local people, and also promoting the WISE Program and university.

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.

Student's Voice



HAMA Rikako
1st year of Ph.D. course Department of Biotechnology and Life Sciences, Graduate School of Engineering

Challenge to various collaboration and integration

Towards my dream of returning research results to society, I participated in this program that allows me to experience international industry-academia collaboration based on integrating agriculture and engineering. Through the collaborative works with others beyond different backgrounds, I gained practical learning on extracting social issues, intellectual property and commercialization of research outcome. Utilizing the bird's-eye view that I obtained, I continue the research that leads to the society in line with the SDGs.

[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 multitalented 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 “multitalented 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 “multitalented individuals”.

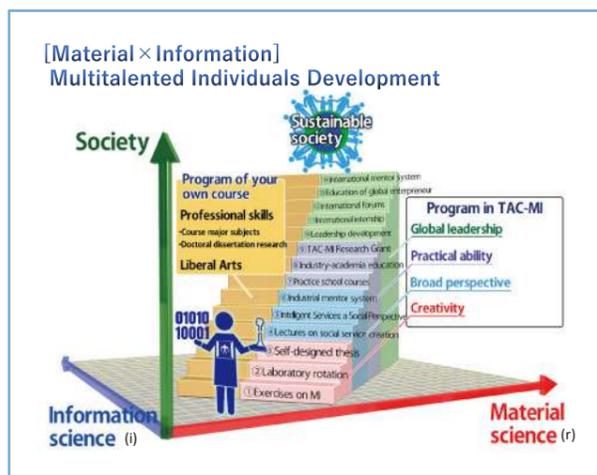
Fostering individuals who can create new industries

The program empowers students to become “multitalented 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. Multitalented 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 attaining a sustainable society, and 4) global leadership ability to introduce new services to the world.

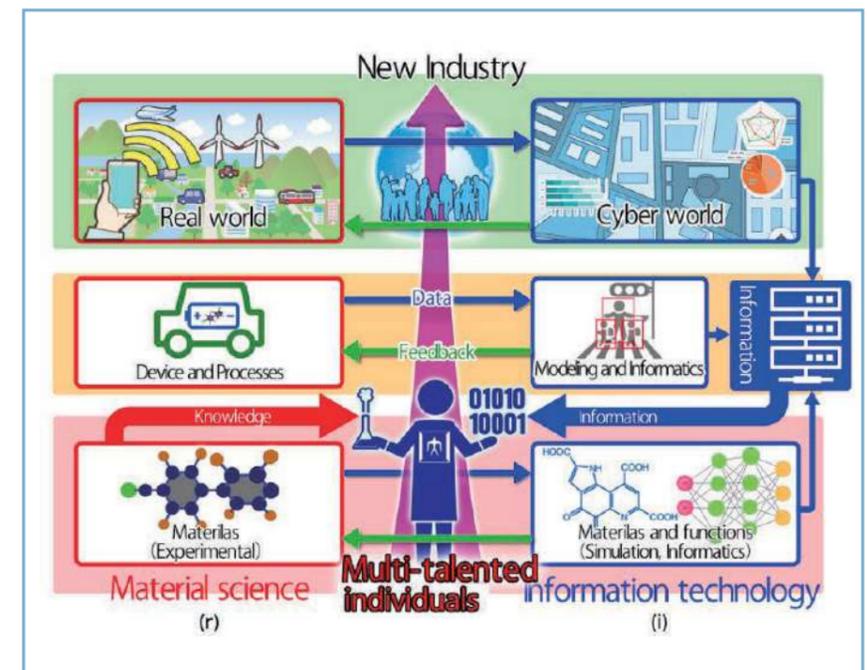


“Multitalented individuals” empowered by this program can freely move across complex space with axes of materials science, informatics, and social services. Due to diverse training, they flourish professionally.

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 students to study materials science and informatics independently, opportunities for cross-disciplinary interactions among students and faculties as



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.

well as to connect ideas from molecules to social innovation are woefully lacking. The characteristics and excellence of the program are to produce “multitalented 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 most 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 2020 were conducted in cooperation with 2 companies: Asahi Kasei and TDK. Both companies presented clear issues relating to their products, 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] 35 (FY2019), 20 (FY2020), 20 (FY2021)
[Number of anticipated program graduates] 8-20
[Number of people engaged in the program] 88
[Students’ affiliated schools and departments] 6 schools, 13 departments

[WISE Cooperating Institutions]
(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, 33 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. / 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 / Toshiba Corporation / TOSOH CORPORATION / Toyo Seikan Group Holdings, Ltd. / TOYOTA MOTOR CORPORATION / ZEON CORPORATION

(As of November 2021)

Message from WISE Cooperating Institution



HASHIMOTO Kazuhito
National Institute for Materials Science (NIMS), President

Contribute to develop excellent human resources for materials innovation

It has been four years since the National Institute for Materials Science (NIMS) joined the Tokyo Tech Academy for Convergence of Materials and Informatics (TAC-MI) as a collaborating institution. The students who come to NIMS in the laboratory rotation program are all excellent and have a lot of flexibility to use data science in their own research. They energize the NIMS researcher hosting them. We would like to continue to work together to develop human resources who can lead materials innovation based on data-driven research.

Student's Voice



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

Developing innovative abilities through interdisciplinary learning

In order to become a scientist who can create innovative ideas, it is essential to learn new perspectives. That is why I participated in TAC-MI. Through learning informatics, which is a different field for me, I feel that not only my practical knowledge of the interdisciplinary field, but also my ability to think flexibly and to accept different fields have improved. In this program, there are well-balanced opportunities for lectures and practice so that students can work hard with feelings of social demands.

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

Global Pro-Active Root Technology Program

[Program Coordinator] UMEDA Minoru (Executive Director · Vice President, Nagaoka University of Technology)
[Fields of diplomas] Doctor (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.

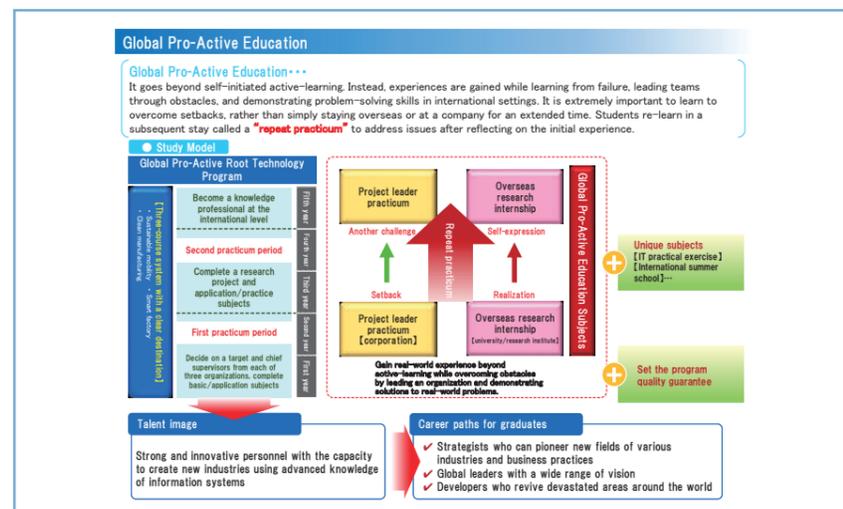
Development of human resources for root technologies able to contributing to the realization of SDGs

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

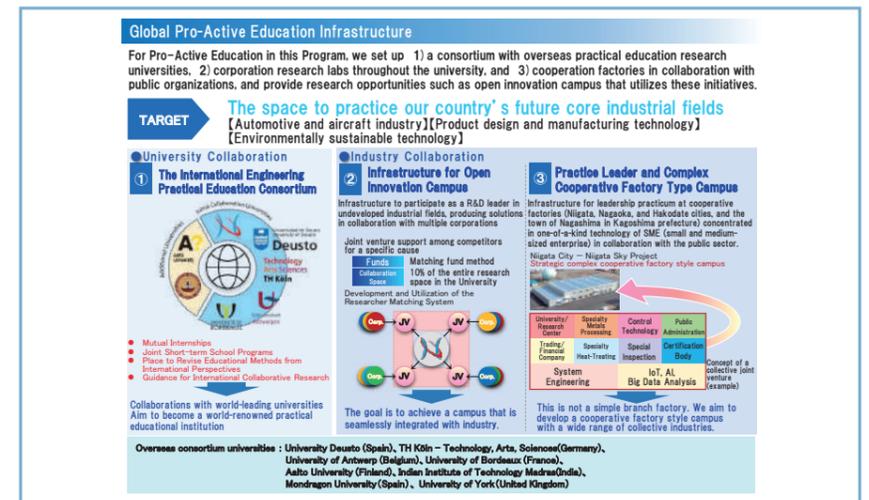


Characteristics of the teaching curriculum in global pro-active education, vision for human resources to be cultivated, and the professional career path of graduates

level" through "Global Pro-Active Education": 1. Ability to pioneer innovative academic fields to 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



Establishing an environment for realizing global pro-active education

which advanced European industry members and academia collaborate, and share experiences to 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 of 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.

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.

Student's Voice



OKAWA Ayahisa
 4-year major program in science of technology innovation

JP-DE industry-academia research on complex porous ceramics for environmental purification

As first step toward realizing my dream of fully actualizing my research skills internationally, I conducted research on the process of creating new ceramics at the Friedrich-Alexander Universität Erlangen-Nürnberg (FAU) in Germany. The Fraunhofer Institute (ISB) is located on the campus of FAU, and Siemens, a multinational general electrical equipment company, is located nearby. Participating in these joint projects allows me to deepen my understanding of German industry-academia collaboration.

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



MATSUO Seichi
President, Nagoya University

A Program to Catalyze the Fusion of Chemistry and Biology – Cultivating Science and Doctoral Students of the Future

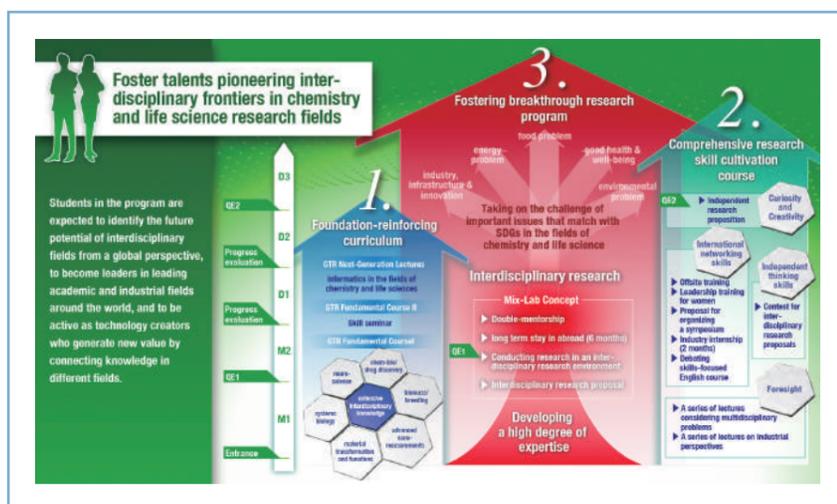
A university's role is to promote excellent research and cultivate talented individuals with multifaceted abilities. As part of its Leading Graduate School Programs, Nagoya University has created the Graduate Program of Transformative Chem-Bio Research (GTR), based on the top-notch research findings of Institute of Transformative Bio-Molecules (ITbM), as part of WPI (World Premier International Research Center Initiative), and cultivation of talent in the Integrative Graduate Education and Research Program in Green Natural Sciences. The world is changing rapidly and dramatically as science and technology advance. This program provides interdisciplinary and international environments that will generate novel ideas and perspectives in science. We promote this project wholeheartedly, with the goal of training doctoral students with the capacity to promote original sciences, command a global perspective, and create networks. We believe that this project will cultivate future world leaders.

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



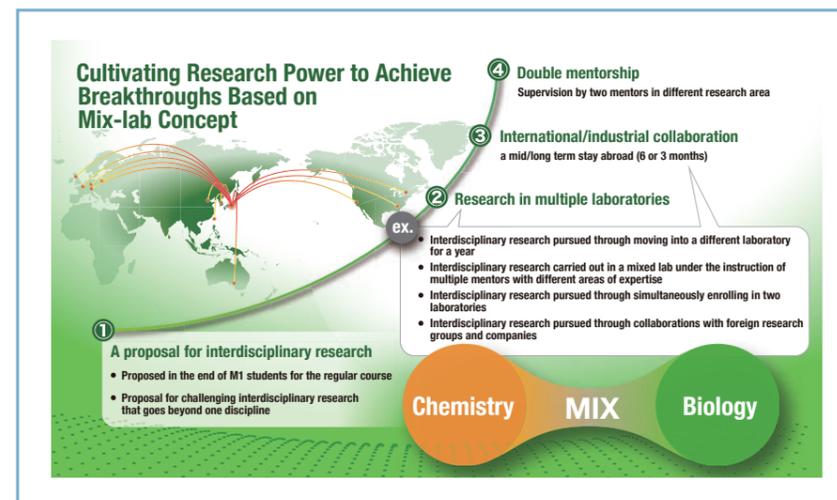
Three powers fostered by GTR: basic knowledge across chemistry and life science, comprehensive research power to advance, and research power to break through only acquired by active involvement in interdisciplinary research.

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]** 60 (FY2018), 30 (FY2019), 30 (FY2020), 30 (FY2021)
- [Number of anticipated program graduates]** 30
- [Number of people engaged in the program]** 62
- [Students' affiliated schools and departments]** 4 graduate schools, 12 departments
 <Graduate School of Science> Material Science (Chemistry), Biological Science, 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 companies, 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

(As of November 2021)

Message from WISE Cooperating Institution

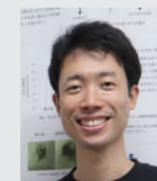


SHINOZAKI Kazuo
Senior Advisor, RIKEN Center for Sustainable Resource Science

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.

Student's Voice



KINOSHITA Satoru
Nagoya University, Graduate School of Science, Division of Biological Science, 3rd year of Ph.D. course

GTR helps students grow to overcome limitations in research

I joined GTR to gain the ability to develop my own research. A fascinating aspect of GTR is that I can broaden my research from various perspectives through discussions with people in different fields, especially when I have identified a new and interesting aspect of my research. In addition to my research experiences, I also had valuable opportunities such as joining an entrepreneurship training camp in the U.S. and launching several student-initiative events. I have learned a lot since GTR started.

[Office and section in charge] The GTR Student Support Office **[Inquiries]** 052-789-2954

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



MATSUO Seiichi
President, Nagoya University

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

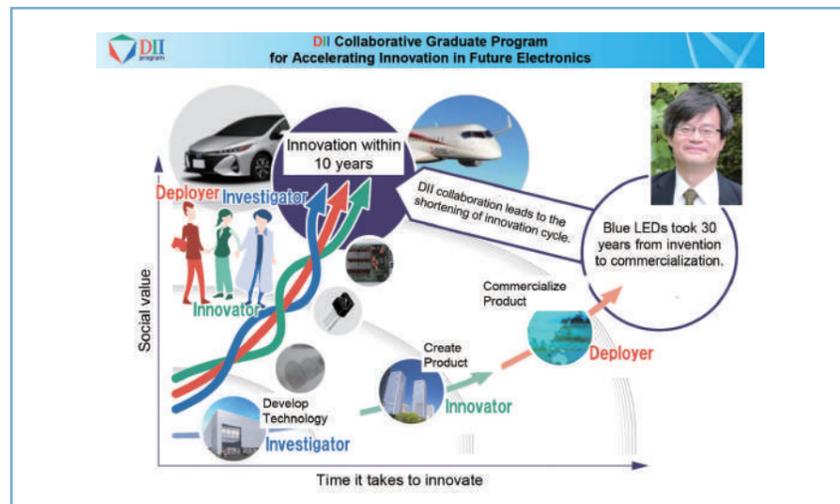
Making effective use of scientific discoveries in society is extremely difficult and takes time. It is also difficult to achieve on your own. To overcome these challenges, the DII (Deployer-Innovator-Investigator) program fosters leaders in the field of electronics from three types of perspective: human 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]

15 (FY2018), 20 (FY2019), 20 (FY2020), 20 (FY2021)

[Number of anticipated program graduates] 18-23

[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 SANSO CORPORATION / Tokyo Electron Ltd. / TOYODA GOSEI CO., LTD. / TOYOTA MOTOR CORPORATION / Nissan Motor Co., Ltd. / Furukawa Electric Co., Ltd. / Mitsubishi Electric Corporation / Nanjing University / Japan Venture Capital Association / NC State University / Forschungszentrum Jülich

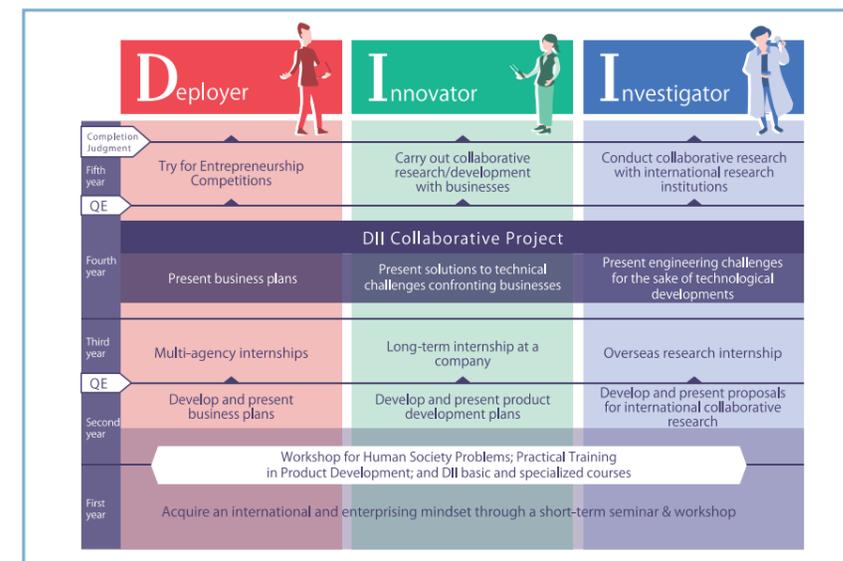
(As of October 2021)

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 international perspectives, foresight, and planning



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

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



KOIDE Yasuo

Special Mission Researcher, National Institute for Materials Science (NIMS) Managing Director, Center for Nanotechnology Platform

Expectations for fostering challenge spirit and execution in facing risk

Many companies originating from universities has been increasing along with the government policy which promotes the start-up company. I believe that the motto of fostering an entrepreneurial spirit through the further development of specialized fields and the cooperation of different types of people is one of the strategies of graduate school education. As I interact with the participating graduate students, I realize that their challenge spirit is growing day by day, and I look forward to the results of this program.

Student's Voice



SAWADA Satoru

Department of Aerospace Engineering, Graduate School of Engineering, Nagoya University, 1st year Doctor's Program

Environment to learn implementation of technology based on social issues

My initial interest in only the technical aspect of things, has now morphed to encompass the application of technology to tackle social issues. I decided to join this program to experientially learn about the implementation of technology. This program has continually provided me with opportunities to encounter new set of values through collaboration with those from different countries and areas of expertise. I am delighted to participate and witness the creation of new values from a broader perspective.

[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 Doctoral Program
[URL] <http://www.e-taketsu.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.

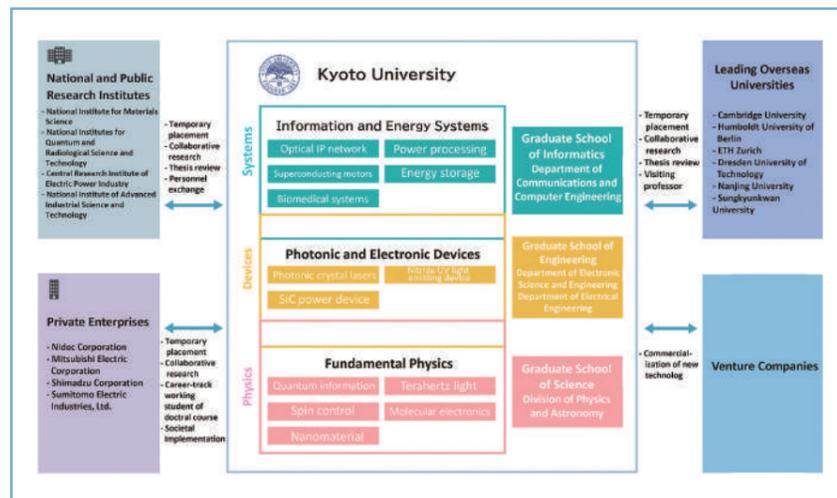
Objective

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]
FY2019-FY2021 Master 15, Doctor 5 (each year)
[Number of anticipated program graduates] 5-20
[Number of people engaged in the program] 38
[Students' affiliated schools and departments]
3 graduate schools, 4 departments
<Graduate School of S 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.

Corporation / Shimadzu Corporation / Sumitomo Electric Industries, Ltd.

(As of November 2021)

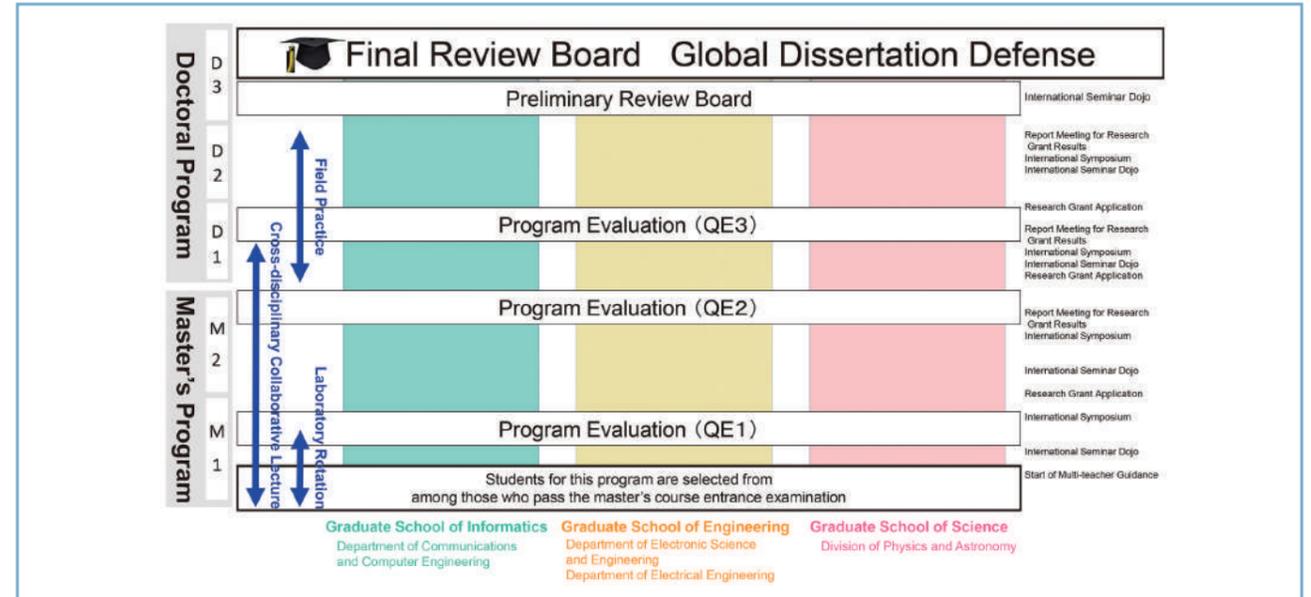


Image of Master's / Doctoral Education and Degree Examination

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



"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



OHSHIMA Takeshi

Director, Department of Advanced Functional Materials Research/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, 1st 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.

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 aims to be a world-leading university that contributes to social transformation. 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 at large and to make innovations. Currently, 11 third year students, 24 second year students, and 32 first year students are enrolled in the program. The courses offered will help them 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. Osaka University aims to achieve true innovation through this program.

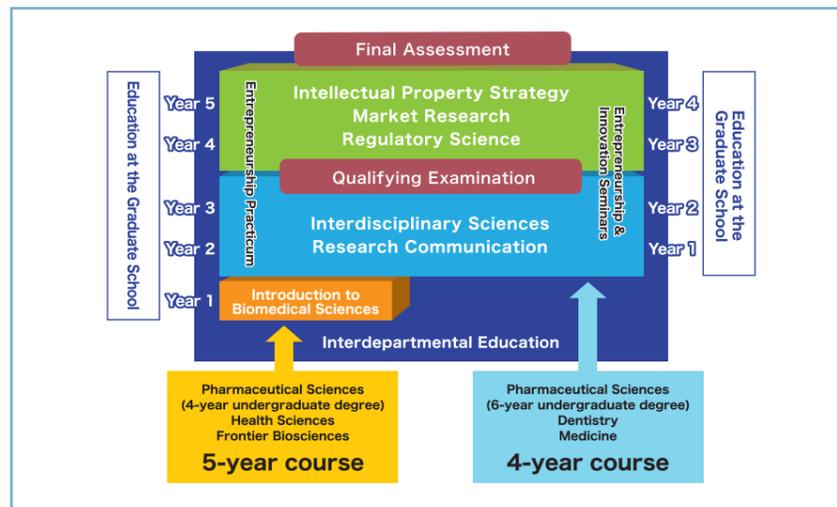
Professionals with research & entrepreneurial skills

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 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



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

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

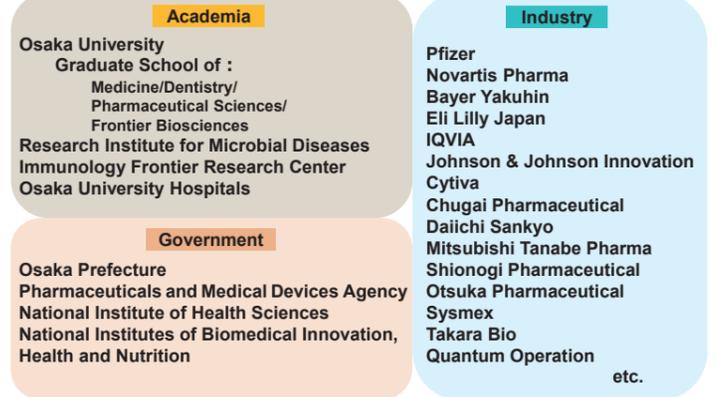
At the end of the 3rd year of the 5-year program (the 2nd year of the 4-year program), students will take the Qualifying Examination (QE). In the QE, practical research skills acquired through practice will be assessed by examining originality and international competence in research that will lead to 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 addition to offering the conventional specialized education provided in graduate schools.

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

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.

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. In AY2021, students visited 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]
15 (FY2018), 30 (FY2019), 30 (FY2020), 30 (FY2021)
[Number of anticipated program graduates] 20
[Number of people engaged in the program] 114
[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. / Bayer Yakuhin, Ltd. / 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 / 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

(As of June 2021)

Message from WISE Cooperating Institution



SHIMIZU Takeshi
IQVIA Solutions Japan K.K. Management Consulting Senior Principal, Head of Management Consulting

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
First 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'

Now, "genome editing" is drawing attention worldwide as it is thought to bring a revolution to life science. The Nobel Prize in Chemistry 2020 was awarded to two female scientists, who have developed a new method for genome editing through which scientists can rewrite the genetic code of life at will.

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.

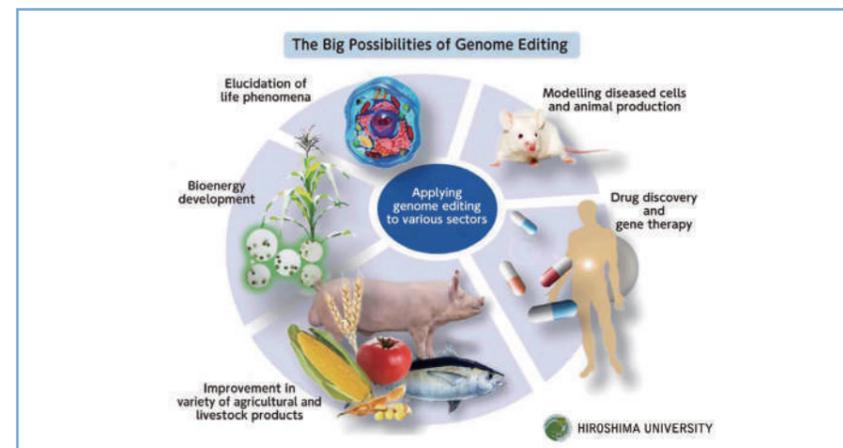
What are the capabilities trained by the program?

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 applications.

Hiroshima University is one of Japan's

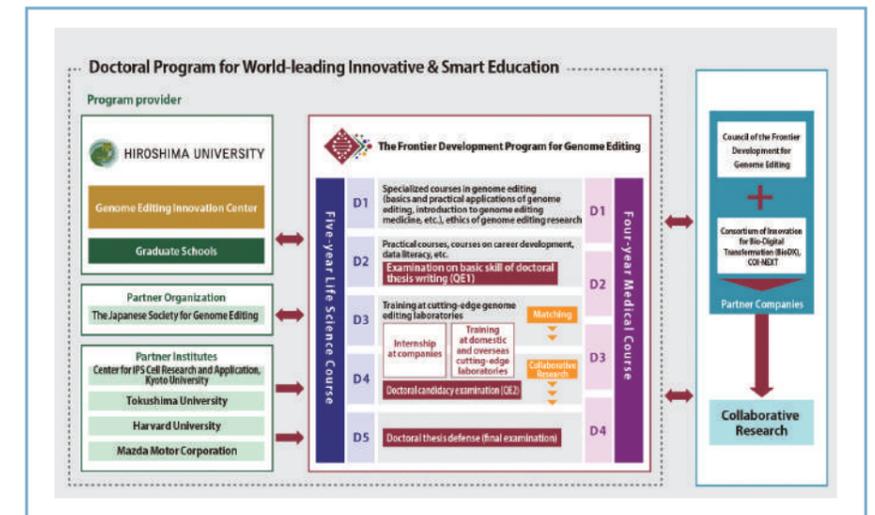


Genome editing is expected to be an available technique to use from basic research to various applicable fields (Development of biofuels from algae, improvement of useful species, drug discovery, and gene therapy)

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.

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.



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)

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.

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 Understanding and Curing Disease" and "How Can Genome-Edited Organisms be Released from the Genetically Modified State?" 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.

DATA

[Number of students recruited]
11 (FY2018), 11 (FY2019), 11 (FY2020), 11 (FY2021)
[Number of anticipated program graduates] 1-11
[Number of people engaged in the program] 59
[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

(As of November 2021)

Message from WISE Cooperating Institution



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

Genome editing technologies show great promise

Mazda Motor Corporation collaborated 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 such as gasoline and diesel fuel, for the realization of a carbon neutral automobile society.

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



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

Aiming to become a highly innovative genome-editing researcher

I am aiming to become a researcher who can use genome-editing technologies to make scientific breakthroughs. This program provides opportunities to meet with entrepreneurs from gene-editing technology ventures, in addition to formal lectures and practical training on the latest genome-editing technologies themselves. I believe this is a singular opportunity to contemplate various aspects of my research and future career from multiple points of view.

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 Medicine, 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
 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

DATA

- [Number of students recruited]** 5 (FY2018), 23 (FY2019), 48 (FY2020), 54 (FY2021)
- [Number of anticipated program graduates]** 5-15
- [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
 (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
[WISE Cooperating Institutions]
 4 universities, 1 Incorporated Administrative Agency, 2 National Research and Development Agencies, 1 Corporate Company
 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

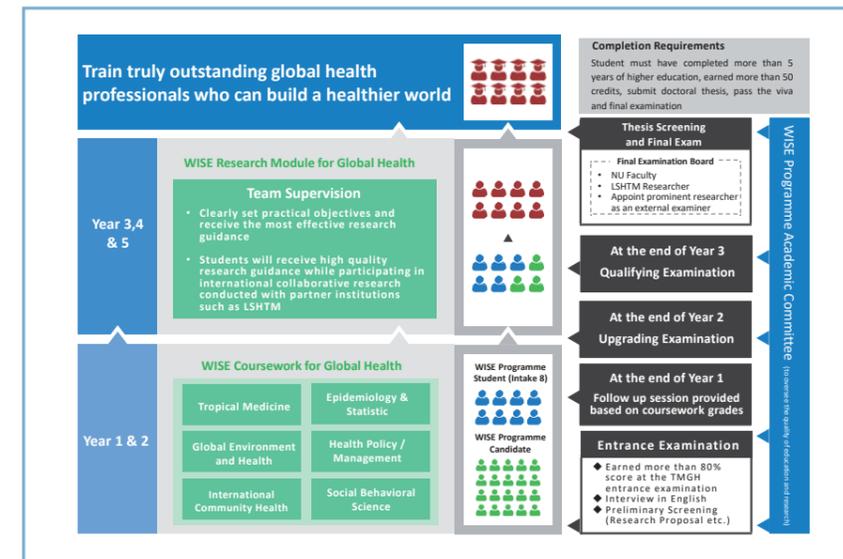
(As of November 2021)

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. 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 new disease in this unprecedented times, we will be establishing 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.

Message from WISE Cooperating Institution



Liam Smeeth
Director of London School of Hygiene and Tropical Medicine

Addressing global health challenges through high-quality 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 2

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.

[Office and section in charge] Administrative Office for Nagasaki University WISE Programme **[Inquiries]** 095-819-7583



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 (Engineering), Doctor of Philosophy in Engineering, Doctoral Degree (Engineering), Doctoral Degree (Philosophy), Doctor of Philosophy at the Graduate School of Information Science and Technology
 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.

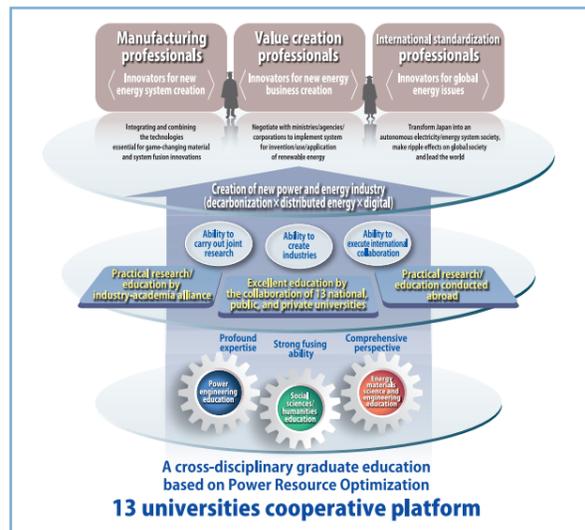
This program provides an inter-university platform for collaborative education and research among 13 national, public, and private universities to enable the creation of new industries that will contribute to Japan's future vision of achieving "Society 5.0" and 2050 carbon neutrality. The program promotes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



Students compete to design the best communication control for demand response using actual equipment from the International Standardization Education Center, and recognize the challenge of "standardization of technology".

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]
49 (FY2018), 26 (FY2020), 26 (FY2021)
[Number of anticipated program graduates] 10-26
[Number of people engaged in the program] 60
[Students' affiliated schools and departments]
 Waseda University 3 graduate schools, 7 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
 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 (Tohoku 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 Sciences 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 / University of Tennessee / 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

(As of November 2021)

Message from WISE Cooperating Institution



FUJUYAMA Yuichiro

Executive Officer, General Manager of Central Technical Research Laboratory, ENEOS Corporation

The chance to collaborate with the leading minds of tomorrow

Reaching the goal of a decarbonized economy will require building energy systems that are carbon free at every stage. ENEOS is stepping up its efforts to develop advanced energy technologies in order to lay the groundwork for a future green society to the benefit of all who inhabit it.

Innovation happens when people of different cultures with diverse perspectives come together, and we look forward to working closely with the fine candidates coming up through this program.

Student's Voice



ONABUTA Yusuke

Ph.D. 3rd-year student, Department of Applied Chemistry, Faculty of Advanced Science and Engineering, Waseda University

A Chance with PEP: Deepening and Overviewing Our Research

I have been interested in the technology usage on the real world, so I decided to join this program. This program expanded my world by various approaches, such as practices in the factories, simulation training in the classes. In addition to my research topic related to the experimental analysis of the Zn secondary battery, I have learned how the electricity distribution system works in detail. This is the experience that deepens my knowledge not only for the experiments but also for the device application for the real world.

[Office and section in charge] PEP Program Office **[Inquiries]** 03-5286-3238

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 of social progress in anticipation of the New Normal Producing leaders equipped with the latest executive skills, capable of handling a wide range of risks

The COVID-19 crisis demands a "New Normal," which our university is addressing by advancing education, research, and social synergy as we "strive for creativity and innovation" while leading social progress. Now, as in the past, our university implements diverse degree programs as part of a positive cycle of education, research, and social synergy aimed at developing highly specialized human resources.

The WISE Program for Sustainability in the Dynamic Earth covers the fields of environmental studies, earth science, and disaster science. For three years it has produced knowledge professionals who are equipped with the latest executive skills and capable of handling a wide range of risks, making this degree program central to our graduate school innovations.

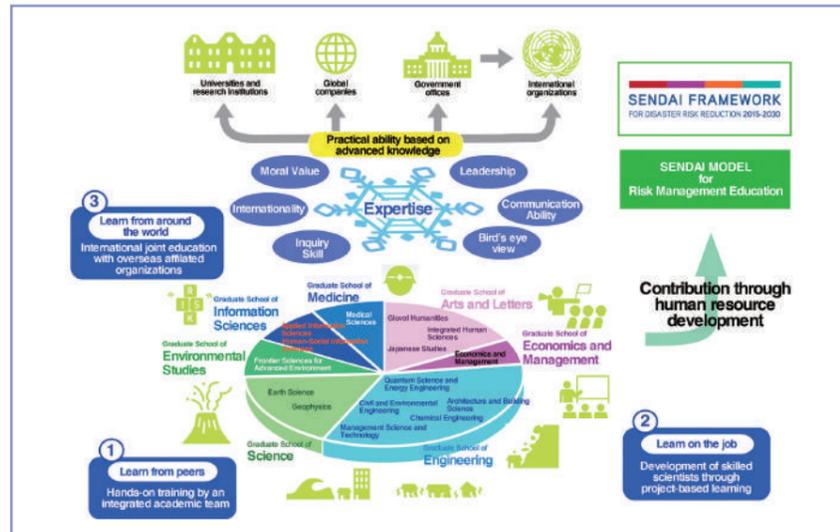
Study the Earth, Discover the future

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



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.

ability to understand humans and society and communicate 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



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

to conduct research education and achieve international contributions.

Through the three educational policies unique 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



Monthly meeting: a student-designed homeroom as an opportunity to learn from peers and improve abilities required in the program

This program holds a monthly meeting in which all program students participate. Students from various scientific, cultural, and regional backgrounds work together to plan each meeting based on the philosophy and policies of the program. In the COVID-19 situation where chances to meet face-to-face have been limited, this meeting held in a hybrid format is an important opportunity to interact with and learn from peers. The monthly meeting is also useful as it can help improve the abilities that are supposed to be acquired through the program. We invited those who had participated in the disaster response for the 2011 Great East Japan Earthquake to give seminars. These seminars were valuable opportunities to learn about challenges after the disaster and cultivate awareness and ethical sensitivity as a student studying in the affected area.

Message from WISE Cooperating Institution



MIYOSHI Nobuhiro
 General Manager
 Infrastructure Engineering Dept.
 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



OTSUKA Hideto
 1st year of Doctoral Program in Geophysics, Graduate School of Science

Acquiring "snow crystal-like" human traits

"Snow crystal-like" skills such as leadership, communication ability, bird's eye view, and inquiry skills are required for PhD students to contribute to human societies in the future. Through this program, we can connect with people from different backgrounds, to help them acquire the above skills. I am very satisfied with this program because the experiences here can stimulate my interest in different research fields and help to improve my skills. I will make continuous efforts to become a PhD holder with "snow crystal-like" skills.

[Office and section in charge] WISE Program for Sustainability in the Dynamic Earth Office **[Inquiries]** 022-795-5591

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.

Asia-Eurasia × Digital Humanities: Challenge of Humanities

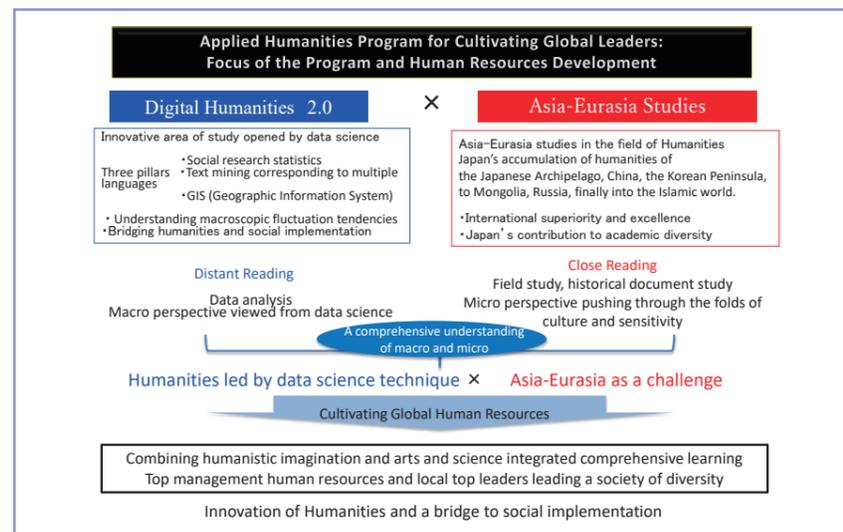
Humanities is the study of thoughts, words, behavior, ways and history of society that link people together. It is a seemingly roundabout way of gaining a fundamental understanding of people. Yet, what we see in front of us is a complex world in which people of increasingly diverse backgrounds move and 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

DATA

[Number of students recruited] 10 (FY2020), 10 (FY2021)

[Number of anticipated program graduates] 2-10

[Number of people engaged in the program] 70

[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, 3 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

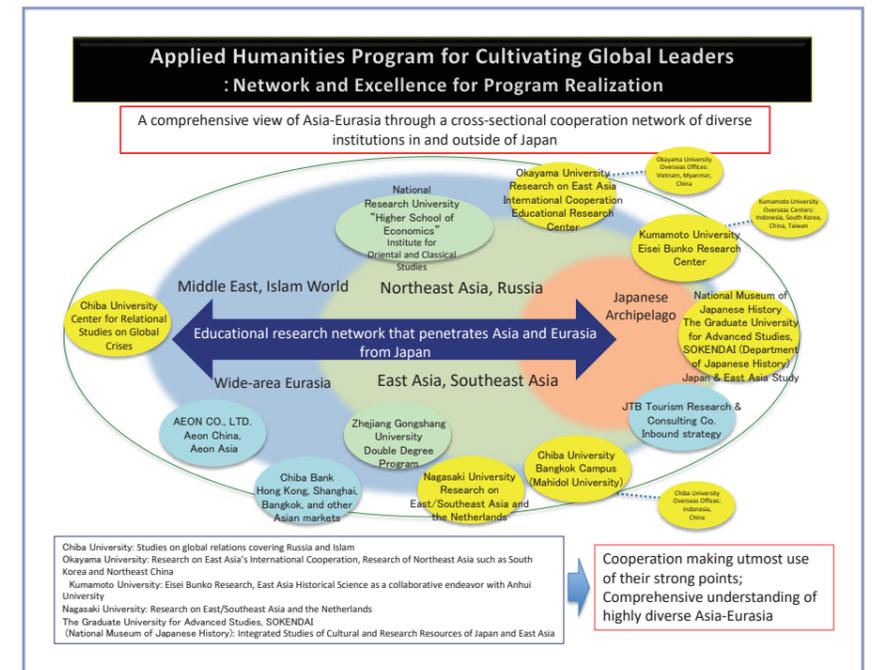
(As of October 2021)

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., and Chiba 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 Asia and Eurasia regions.



Excellent educational program implemented within a wide-area network

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.

Good Practice



We create opportunities for students to present their research and engage in academic exchange in diverse partnerships with universities in Japan and overseas

This programme aims to promote a variety of domestic and international collaborations to create new value, with a bird's eye view to the Asia-Eurasia region. Although face-to-face exchanges had to be limited due to the Coronavirus pandemic, active online exchanges were conducted not only with domestic partner institutions but also with partner institutions in Russia and China. In particular, we co-hosted the online academic symposium "Academic Discussion Forum for Outstanding Graduate Students of Japan and China" with Zhejiang Gongshang University, together with Chiba University, Okayama University, Kumamoto University, Nagasaki University, and the Graduate University for Advanced Studies, SOKENDAI.

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 global 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 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.

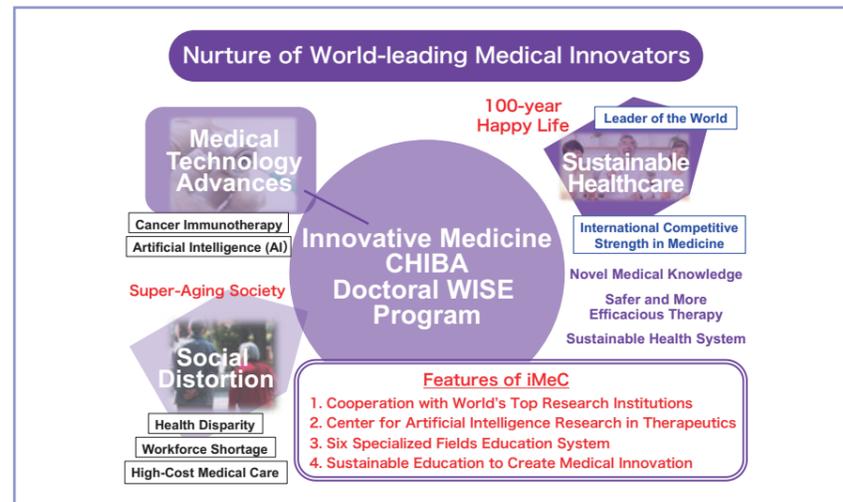
Nurture of World-leading Medical Innovators

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]
15 (FY2020), 15 (FY2021)

[Number of anticipated program graduates] 5-15

[Number of people engaged in the program] 63

[Students' affiliated schools and departments]

4 graduate schools, 10 departments
<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]

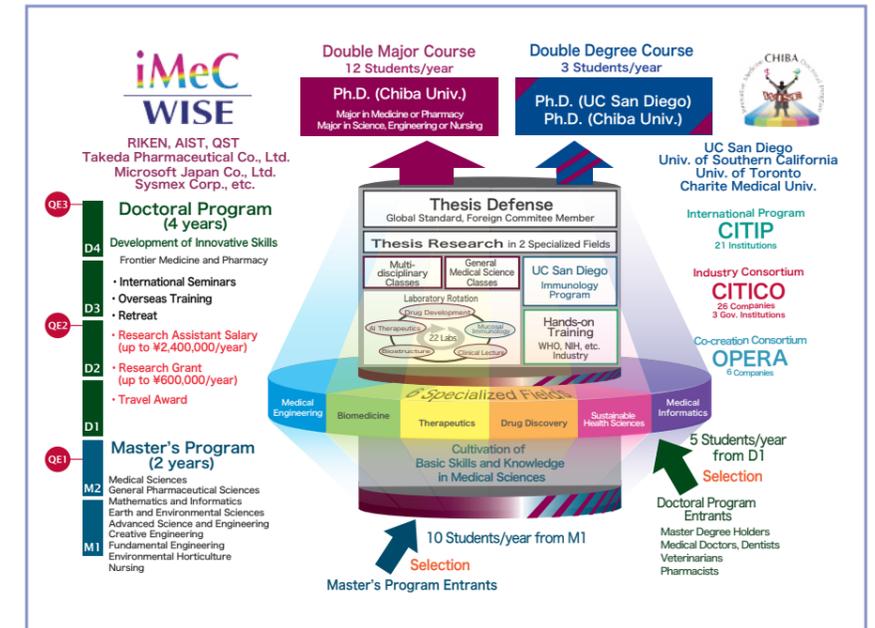
4 universities, 3 public research institutions, 8 companies
University of California San Diego / University of Southern California / Charité – Universitätsmedizin

/ University of Toronto / Institute of Physical and Chemical Research / National Institute of Advanced Industrial Science and Technology / National Institute of Radiological Sciences / 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 2021)

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 multidimensional 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



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.

program.

Ten students for the Master's Program and five 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. Dr. Yoshino became a Nobel laureate, and Dr. Shinozaki was awarded International Prize for Biology, after their lectures.

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



KAIZUKA Yuta
D1, Frontier Medicine and Pharmacy, Graduate School of Medical and Pharmaceutical Sciences, Chiba University

iMeC WISE program emphasizes student's initiative

I have become a member of this program, because I wanted to implement novel cancer drugs that I have been studying since my undergraduate years. This program strongly encourages students to take the initiative. We make appointments with prominent leaders in various fields and invite them to give lectures. I believe that such experiences will help us to successfully develop new therapies in the future.

[Office and section in charge] WISE Program Office, Academic Affairs Division, Inohana Campus Administration, Chiba University **[Inquiries]** 043-226-2817

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 in 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, to learn, and to 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 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.

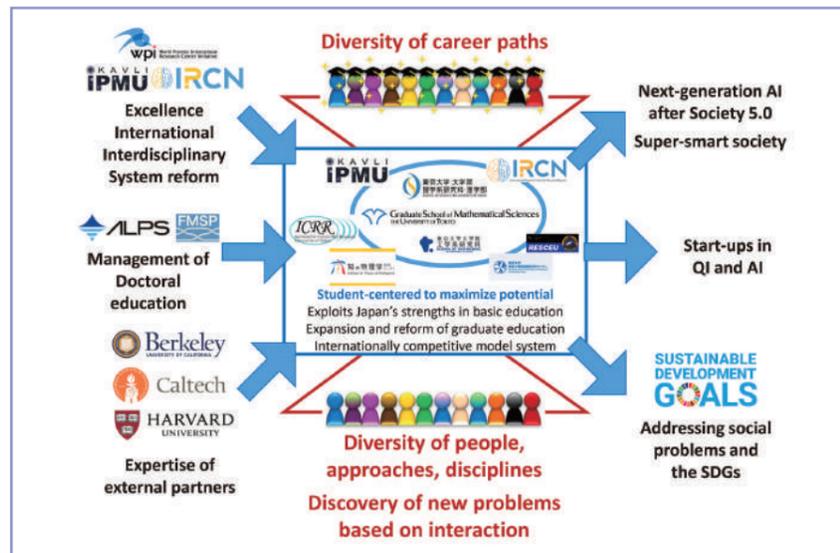
Advancing social innovation through basic science

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

internationally competitive model for graduate education in Japan.

Connecting science and society through educational reform

FoPM builds on UTokyo'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

	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				

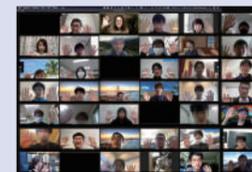
Coursework through which students develop skills for their future careers and our future society

well 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: A seminar by an expert in diversity education. In this seminar students learn the importance of respectful interaction and collaboration with people of different genders and backgrounds, and how this can give them a new perspective on their research.

4PM Seminar: A place for free interaction between FoPM students. After a lecture by an invited speaker, students give short presentations to explain their research to students working in different specialist fields, then discuss and evaluate each other's research. In the second half of the seminar, students are divided randomly into small groups to continue the conversation and break down barriers between research groups.

Message from WISE Cooperating Institution



OKAMOTO Tatsuaki
NTT Fellow

Anticipating original ideas from basic science specialists

At NTT we build new technological platforms by connecting information and people, and undertake research in cryptographic theory and blockchain. There is an urgent need for a new theory of communication that can withstand the evolution of quantum computing, and the strategic development of such research requires a team of researchers with different specializations. We anticipate that FoPM will train professionals with a broad perspective and the ability to come up with original ideas.

Student's Voice



NAGASAWA Shunsaku
Graduate student (D1), Kavli IPMU, Department of Physics, Graduate School of Science

Maximizing our ability and possibilities to be a "scientist"

I applied for the FoPM program because I want to gain the skills necessary to work as a "scientist" beyond the boundaries of my specialized field. In the coursework, we learn about a wide range of topics, not only AI and quantum computing but also social issues such as diversity. In addition, through the interaction and research talks with course students in the monthly 4PM seminar, we encounter the various ways of thinking in other fields and learn how to explain the importance of our research to people in other fields.

[Office and section in charge] WINGS Desk, Academic Affairs Office of the Graduate School of Science **[Inquiries]** 03-5841-4078

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>



先端ビジネスロー
国際卓越大学院プログラム
The World-leading Innovative Graduate Study:
Advanced Business Law Program

Message from the President



FUJII Teruo
President, The University of Tokyo

This program will train 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 rapid change.

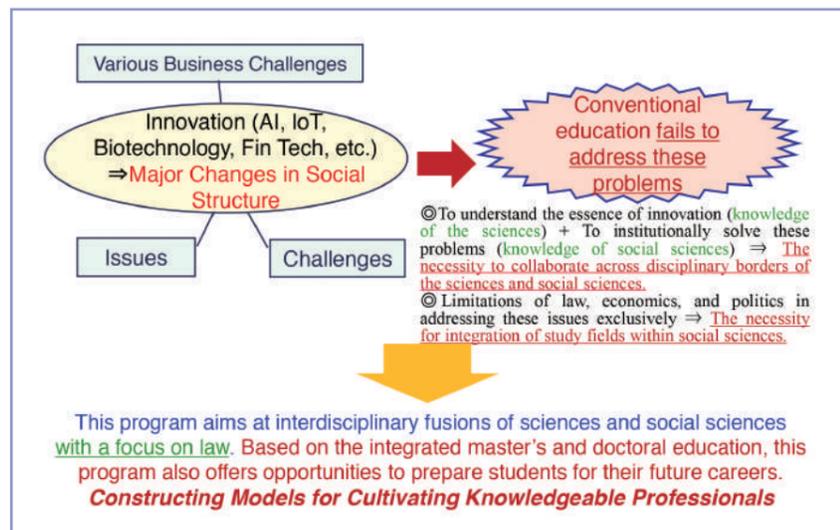
Coping with various business challenges

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 promote innovation by rewarding the scientific

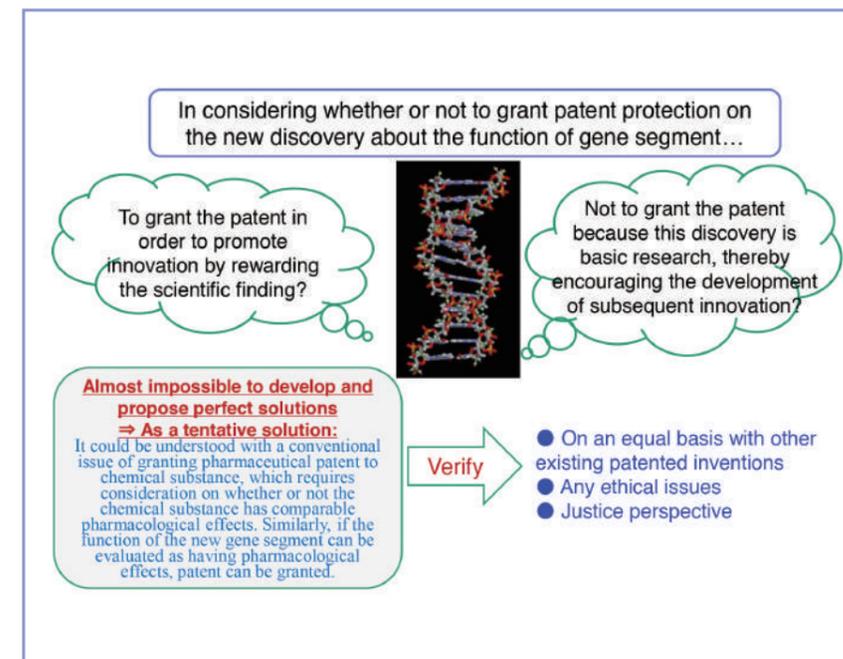


To propose specific solutions to various challenges businesses face as innovations advance, an interdisciplinary approach that integrates sciences and social sciences, fuses different topics from social sciences is indispensable.

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 possible approach, and enlighten students with



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.

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



TODA Yuji
Corporate Officer & General Manager, Intellectual Property Division, Hitachi, Ltd.

Expectations for creating innovative human resources

Hitachi, Ltd. endeavors to provide global digital solutions by leveraging its strength of operational technology and related products as well as information technology, such as artificial intelligence and big data analysis. For this program to enhance human resource development in terms of technological innovations, Hitachi will support this program by providing practical business knowledge.

Student's Voice



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

Learning many things from theories and practices

Besides my work experience as a lawyer, I wanted to learn more about the protection of fashion design, especially from an economic perspective, so I enrolled in this program to study theories and practices through interdisciplinary education. In addition to various courses, there are many opportunities for me to participate in domestic and foreign online seminars. Studying in such a favorable environment, I have made every effort to realize my goals.

[Office and section in charge] Advanced Business Law Program Office [Inquiries] 03-5841-1513

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 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 “super-skilled PhD holders 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-professional super-skilled PhD holders, who can lead industry, government, and academia in the forthcoming Super Smart Society.

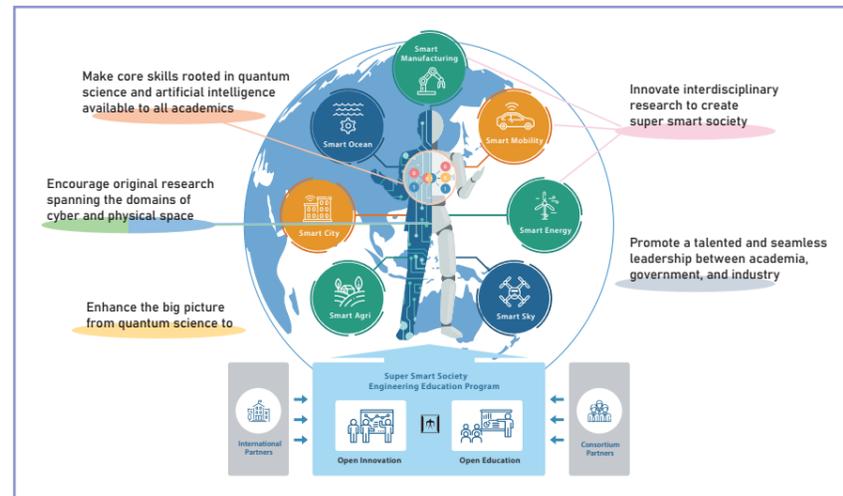
Image of graduates: Who leads a Super Smart Society?

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

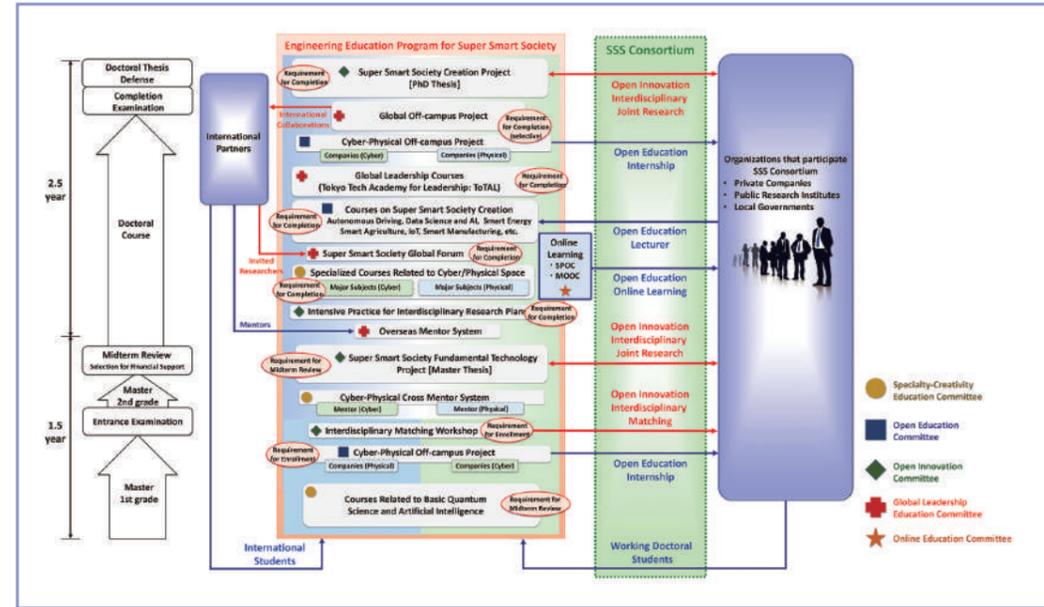
DATA

[Number of students recruited] 25 (FY2020), 35 (FY2021)
 [Number of anticipated program graduates] 10-25
 [Number of people engaged in the program] 112
 [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, 15 overseas universities, 16 corporations, 2 local / public bodies
 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 / Hitachi Industrial Equipment Systems Co., Ltd. / Yokogawa Electric Corporation / Koden Electronics Co., Ltd. / KDDI Corporation / SoftBank Corp. / Huawei Japan / SHO-BOND Corporation / DENSO Corporation / Kawasaki City / Ota City / Google LLC / SOLID Gear Inc. / CEA Leti / Georgia Institute of Technology / 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 / Asurion LLC / RWTH Aachen University

(As of November 2021)



(Figure 2) WISE Program for Super Smart Society

Features of WISE Program for Super Smart Society

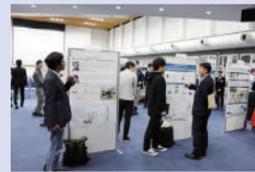
The program is the core of the University's SSS Promotion Project, and the main feature is to provide education with 71 faculty members collaboratively across six schools, Institute of Innovative Research, and Institute for Liberal Arts. Thus, interdisciplinary education is realized across

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 arrows) to cultivate a broad perspective and open innovation (red arrows) 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 combing 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.

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 second year in the doctoral program, School of Engineering, Department of Electrical and Electronic Engineering

Towards a super-skilled PhD holder 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.

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

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

[Program Coordinator] SHOJI Ruri (Executive Director, Professor, Department of Maritime Systems Engineering, 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

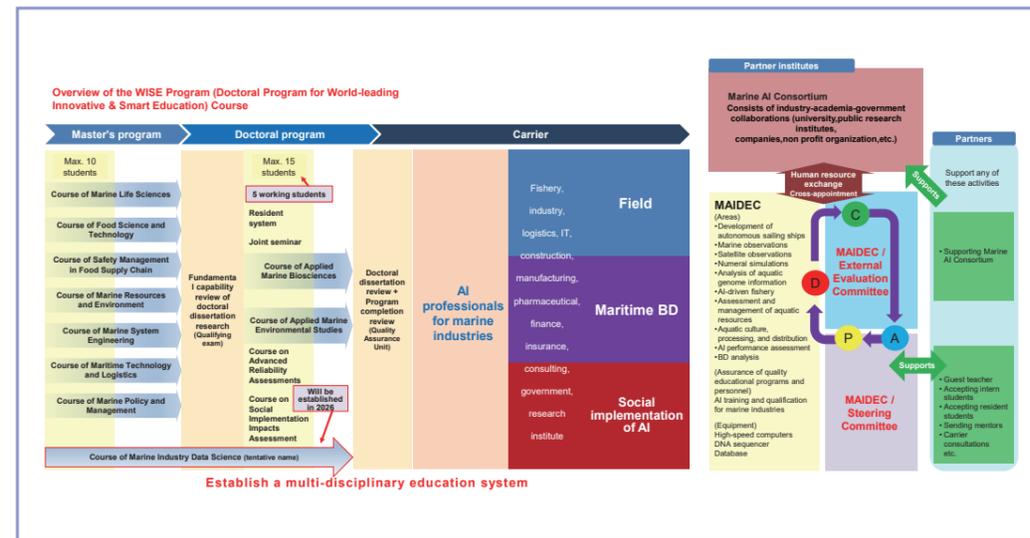
Fostering industry-ready professionals who will bring innovation to marine industries

TUMSAT's WISE Program is now in its third academic year. Members of the first batch of students admitted in April 2020 have completed "Marine AI Workshop I," a course on interdisciplinary collaboration that is a first-time initiative for TUMSAT. Students worked together across graduate courses to address challenges in a wide range of disciplines including engineering, fisheries, the environment, and life sciences. Through internship courses at Consortium partner institutes, they also tackled specific issues in the field and experienced challenges that they would never have encountered on campus. In the next academic year, they will advance to the doctoral program, where I hope that they will acquire a mentality of co-creation in a learning environment that includes working students and will deepen their specializations.

Year of selection **FY 2019**



In such a distinguished education and research system, WISE Program students aim to be advanced technical experts who can propose sophisticated solutions to complex challenges such as watch task automation of navigation officers, self-propelled vessels capable of automatic takeoff and landing, labor-savings in fishing and aquaculture using robots, and realization of high-production smart fisheries using automated and optimized water quality management based on weather forecasts and ocean information systems.



Education and research system to sustain excellence

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.

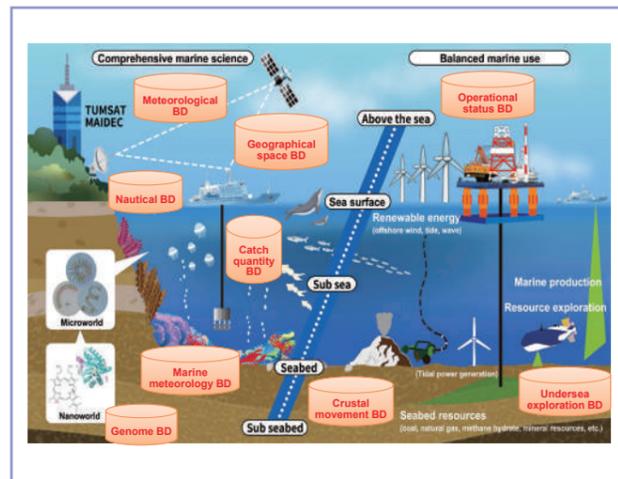
The WISE Program is established as a 5-year integrated graduate school course at TUMSAT.

The master's program provided 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.



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.

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-Maru, which is a strength of TUMSAT, the Field Science Center, and advanced navigation systems. On November 1, 2020, we established a marine AI consortium with partner institutes to advance the WISE Program via industry-government-academia collaboration.

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: Online study sessions are held weekly with the program director and program students. They are aimed at testing out and exploring the latest knowledge and technologies related to marine AI using actual models.
- 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



TABATA Hideo
Chairman, IDEA Consultants, Inc.

We train experts who transform society by leading the marine industry

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



IMAI Ryota
2nd year of doctoral program at Course of Maritime Technology and Logistics

Full speed ahead using problem solving in the marine industry

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] 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



YAMAZAKI Koetsu
President, Kanazawa University

Fostering innovative individuals to pioneer new domains and revitalize Japan's global competitiveness

Kanazawa University is promoting graduate education reform for the development of human resources who lead academia and industry as a major objective. It is this Program that is being pursued with the aim of developing human resources with social implementation capabilities based on multidisciplinary academic knowledge and imagination, making use of the world-class research environment of the WPI Center, Nano Life Science Institute. Graduate students are strengthening their abilities to create new value with an awareness of issues and with the highest motivation while being inspired by the participating companies and researchers, and I am confident of their growth. While maximizing their expertise, they grow into human resources with doctorate degree who boldly challenge and open up unexplored fields by drawing out a wide range of potential through interdisciplinary activities, and thus I expect that they will become the driving force for the revival of international competitiveness.

Personnel who can develop for solutions to health issues

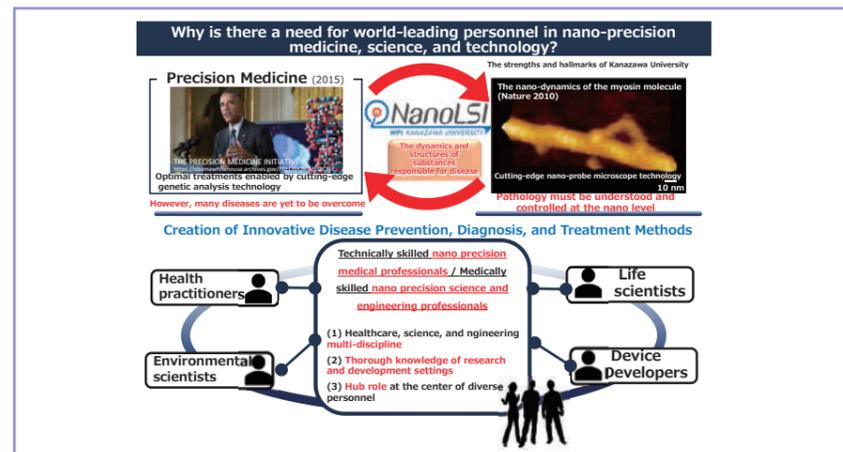
Cutting-edge technologies such as genetic analysis from the United States in 2015 have proposed a precision medicine that aims to deliver optimal patient-tailored treatment. While this has grasped the world's attention, many diseases are still not sufficiently controlled. We believe a major factor contributing 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



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] 12 (FY2020), 12 (FY2021)

[Number of anticipated program graduates] 12

[Number of people engaged in the program] 80

[Students' affiliated schools and departments] 4 graduate schools, 14 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

<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, 8 companies
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

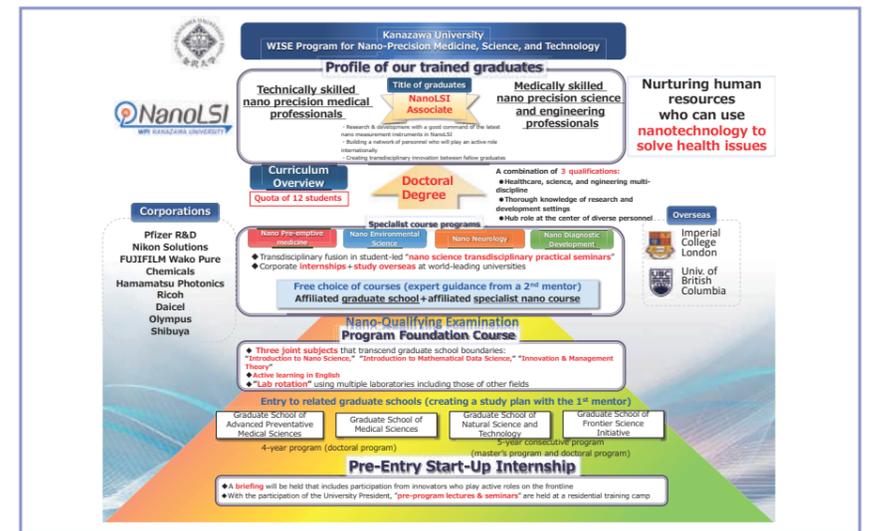
(As of November 2021)

professionals who will create innovative methods of prevention, diagnosis, and treatment through the understanding and control of pathology at the nano level.

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



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.

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 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, Business Development Center, Innovation and Business Development Headquarters, 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 third 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
2nd year Master's 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 Program Office, Kanazawa University [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



MATSUO Seichi
President, Nagoya University

Novel medical system to create a high-quality aging society

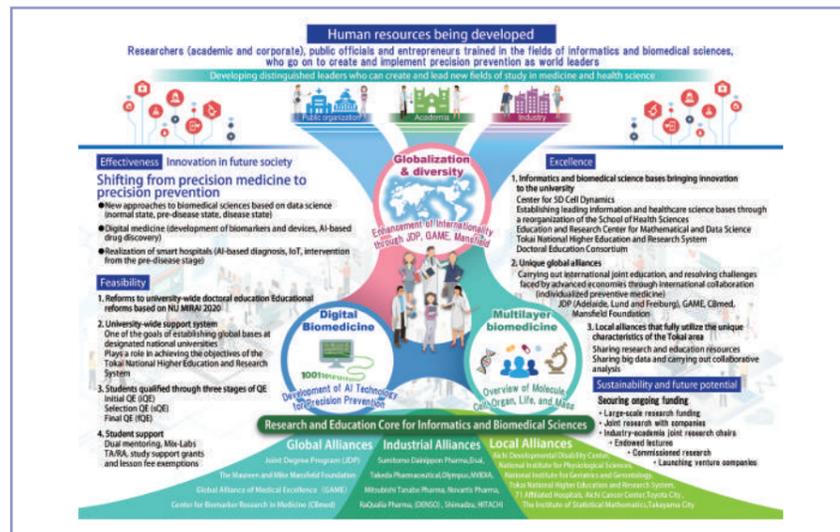
As a result of rapid developments of electronic medical devices and biomedical/life sciences, mass vaccination made many infectious diseases formidable threats. Cancers and other life-threatening diseases are also becoming curable by early diagnosis and treatment. On the other hand, rapid aging of the population causes serious social problems in developed countries. The problems make it an urgent necessity to create environments that are required for elderly people to carry out high quality of health and social lives. To implement these environments, it is necessary to develop a novel medical field in which diseases are predicted and prevented before people get ill. In this program, it is planned to develop cutting-edge researches of individual prevention and to nurture scientists who carry out the researches.

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 implement the findings to society. Thus, global

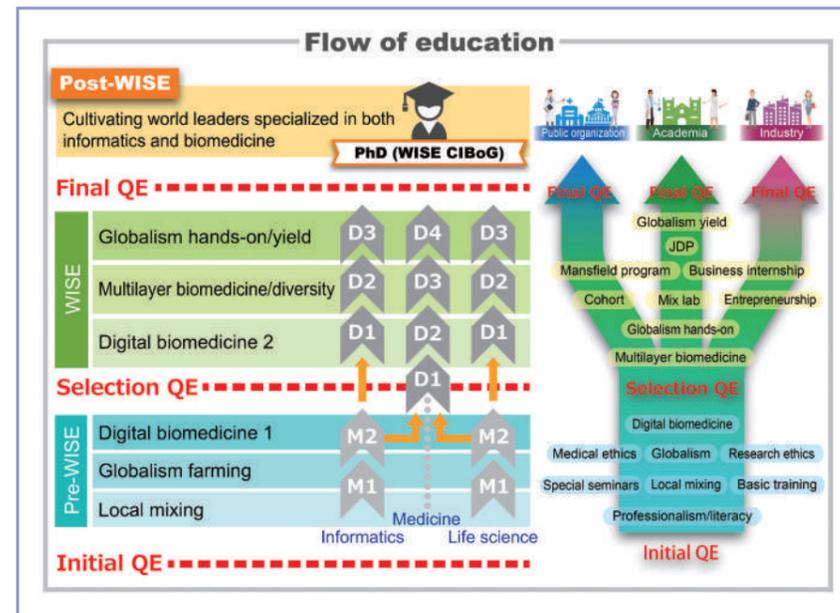


The CIBoG program create a research base for informatics and biomedical sciences by collaborating with regional institutes to develop a new field of biomedical sciences that aims to implement individual prevention on the global society.

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 Tsurumi 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.

Good Practice



CIBoG Retreat (NAGOYA Global Retreat) Researchers from Nagoya and surrounding areas can gather to present their research and build meaningful relationships with each other

More than 150 graduate students and young researchers from Nagoya University and neighboring research institutes will participate in the CIBoG Retreat, where they will present their research and have a meaningful relationship with each other. The NAGOYA Global Retreat started in 2008, and was renamed the CIBoG Retreat in 2019, and has been held 14 times since then until 2021. All the events are conducted in English, and graduate students and young researchers can train themselves to give presentations and answer questions in English. The organizing committee, consisting mainly of young researchers from neighboring institutions, manages the event while gradually updating the content.

DATA

[Number of students recruited]
 10 (FY2019), 23 (FY2020), 19 (FY2021)
 [Number of anticipated program graduates] 15-20
 [Number of people engaged in the program] 108
 [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 Resources
 [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 / 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 Dainippon Pharma Co., Ltd. / Mitsubishi Tanabe Pharma Corporation / Takeda Pharmaceutical Co., Ltd. / CBmed / Hitachi Co., Ltd. / Astellas Pharma Inc

(As of November 2021)

Message from WISE Cooperating Institution



TAKAHASHI Takashi, MD, PhD

Acting Director, Aichi Cancer Center Research Institute

System decreasing the number of cancer patients in the aging society

As the advent of aging society, both the numbers of cancer patients and cancer deaths are increasing. It is urgent to develop biomedical systems to prevent and treat cancers. A huge amount of genome data analyzed using AI leads us to a dramatic development in the fields of cancer prevention and medical treatment. Through the development, people will be individually predicted susceptible cancer and effective treatment. I, therefore, expect this program to cultivate researchers capable of integrating informatics and biomedical sciences.

Student's Voice



KIMURA Kazue

Graduate School of Pharmaceutical Sciences, first 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.

[Office and section in charge] Office of CIBoG [Inquiries] 052-744-1946

Graduate Program for Medical Innovation

[Program Coordinator] WATANABE Dai (Professor, Graduate School of Medicine, Kyoto University)
[Fields of diplomas] Doctor of Medical Science, Doctor of Public Health, Doctor of Human Health Sciences, Doctor of Pharmaceutical Sciences, Doctor of Pharmaceutical 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

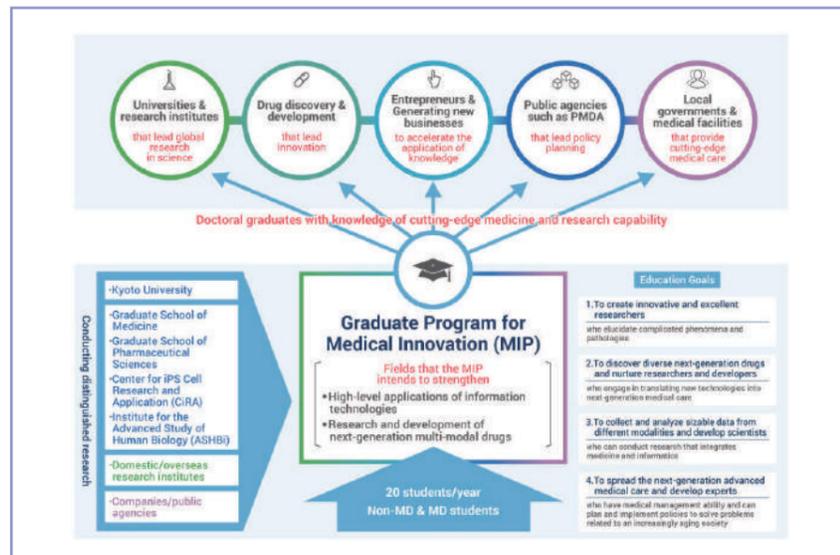
In 2021, Kyoto University established the Graduate School Education Support Office to enhance its liberal arts and general education courses, and centrally manage its diverse graduate degree programs. The new office promotes collaboration and cooperation among graduate schools in diverse aspects of education 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] 20 (FY2020), 20 (FY2021)
[Number of anticipated program graduates] 3-18
[Number of people engaged in the program] 104
[Students' affiliated schools and departments] 2 graduate schools, 7 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

[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

Tohmatu 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.

(As of November 2021)

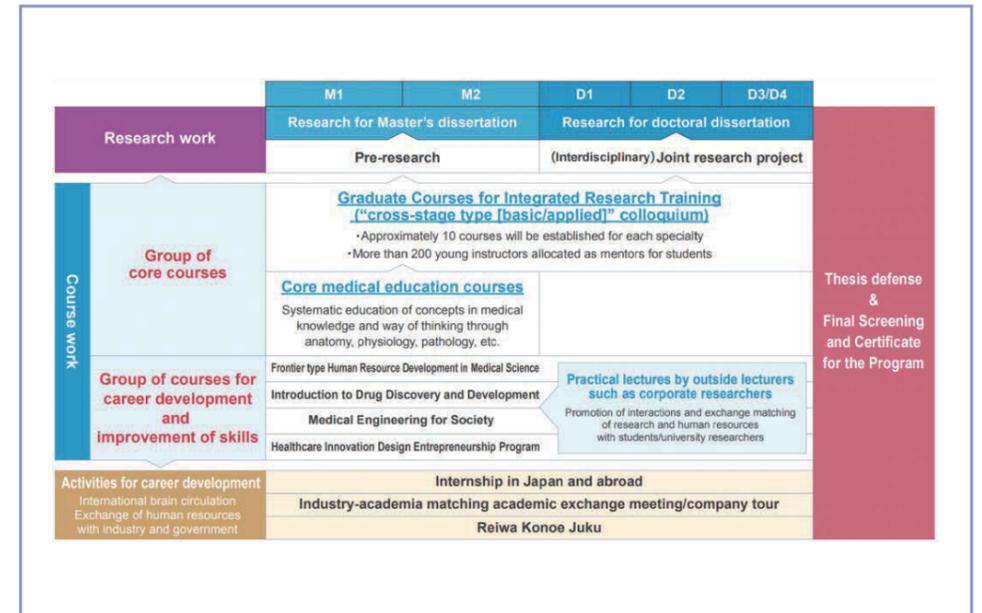
an increasingly aging society

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-



Curriculum of the Graduate Program for Medical Innovation

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.

Good Practice



Thirteen lectures help students equip themselves with problem-solving techniques that boost their self-confidence and enable them to explore new areas in each stage of their life

Students will learn the Lean Six Sigma method (LSS method; a globally standardized methodology to clarify problems and quickly propose realistic solutions in a process- and data-oriented way). Students and academic supervisors of all faculties with diverse values are involved in the interactive lectures. This course aims to develop human resources that can contribute to transforming society for the better. A student who took this course analyzed the current status and challenges of an academic society for students and junior researchers that he operates, as well as planned and ran an event jointly with this program after completing the course. He commented, “The analysis showed the effectiveness of the cross-disciplinary activities we launched.”

Message from WISE Cooperating Institution



KONO YUKO
Clinical Professor of Medicine, Clinical Professor of Radiology, University of California San Diego (UCSD)

The Graduate Program for Medical Innovation fosters world-class experts!

Current and future healthcare fields need world-class experts who are able to think critically, and have a broad vision, flexible mindset, and creativity. The Graduate Program for Medical Innovation provides students with opportunities for collaboration with overseas research institutes and private enterprises to foster future world-class experts. The University of California San Diego also has a collaborative research facility that is expected to play a key role in fostering excellent human resources.

Student's Voice



HASHIZUME YUKI
First-year Doctor's student, Department of Medical Science, Graduate School of Medicine

Be an innovator! The program helps me explore knowledge in new fields

Who can be called a medical innovator? Broad knowledge of medicine may be one of the requirements to be a medical innovator. I think, however, the most important thing is a passion to venture into a new world. This program supports individual students in acquiring the knowledge and skills required for research, as well as in exploring new things through its unique lectures and collaborative research projects. I am inspired by the program to try new research activities.

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 social issues through the fusion of knowledge

Osaka University has envisioned “the creation of a society that fosters a sense of purpose in life through co-creation with society” as the key concept of the OU Master Plan 2027, a mid- to long-term management plan for FY2022 and beyond. Through such co-creation, we aim to cultivate individuals capable of tackling various social issues. This program combines quantum beam application with fundamental research in science, medicine, and information sciences to create new values. Examples include targeted alpha therapy to promote longevity and strategies for soft errors, which contribute to a safe and secure super-smart society. PQBA has been scaled up significantly due to the addition of the Graduate School of Medicine, Division of Health Sciences, and new partner institutions and corporations. This expansion translates to higher expectations to produce “true opinion leaders,” who will create a society where everyone can enjoy a comfortable and happy life.

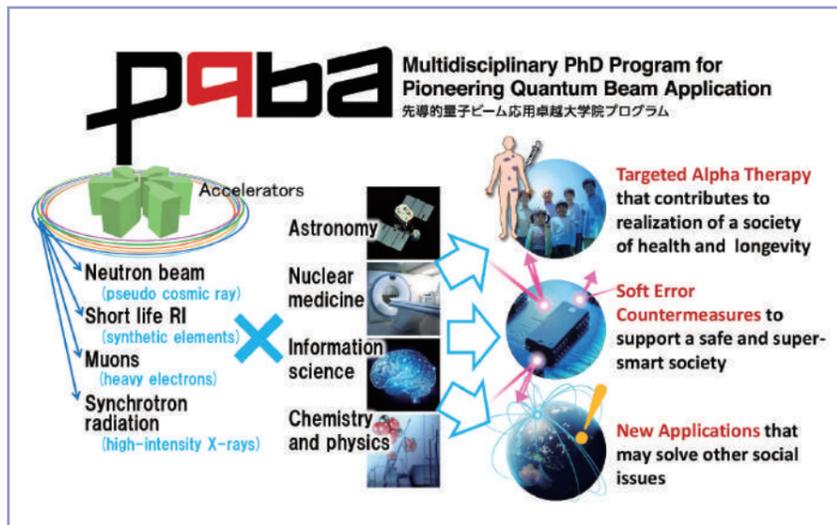
Pioneering quantum beam application to solve social issues

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



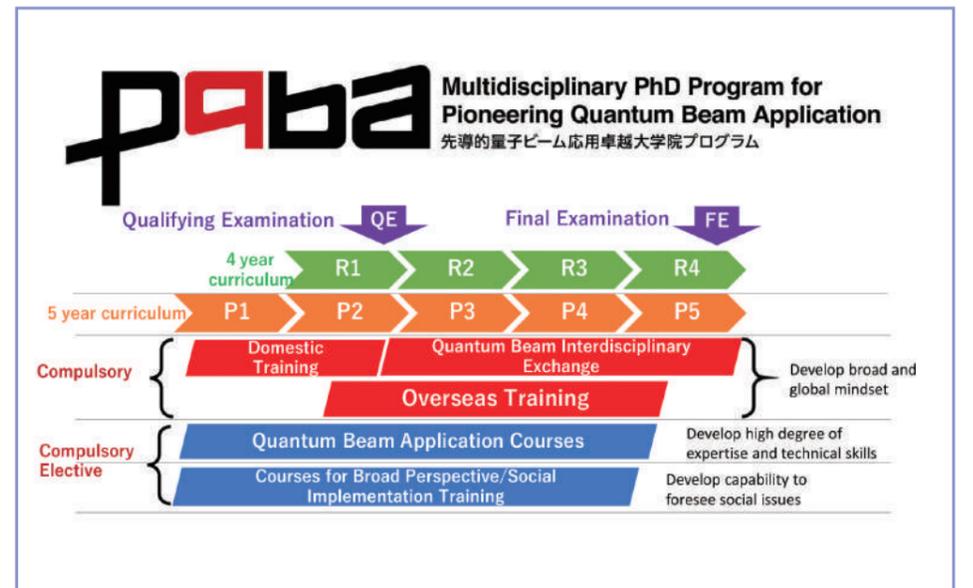
Characteristic quantum beam and expertise to create new value to solve social issues.

in cooperation with domestic and foreign universities, institutions, and companies 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



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

- implementation of advanced technologies
 - * Ability to develop and capitalize on human 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.

DATA

[Number of students recruited]
16 (FY2020), 14 (FY2021)

[Number of anticipated program graduates] 3-15

[Number of people engaged in the program] 131

[Students' affiliated schools and departments]

3 graduate schools, 5 departments
 (Graduate School of Science) Physics and Chemistry
 (Graduate School of Medicine) Medicine and 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, 2 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 / 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 / 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 2021)

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



NGUYEN Van Hoang Viet
Third year in the Doctoral course, Physics Department, Graduate School of Science

Great internship experience

The program started when I nearly finished the 1st year of my PhD. With my supervisor's encouragement and a feeling that my study on the medical application of nuclear physics is well-aligned with the program perspective, I decided to take the last chance for students in D1 grade to apply for the program. The overseas internship that I just finished was an amazing experience. I got a chance to visit a new country, know an inspiring professor, make friends with kindhearted people, and learn great scientific and cultural lessons.

[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 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 excellence across the scopes of multi-disciplinary energy science (profound expertise), big data



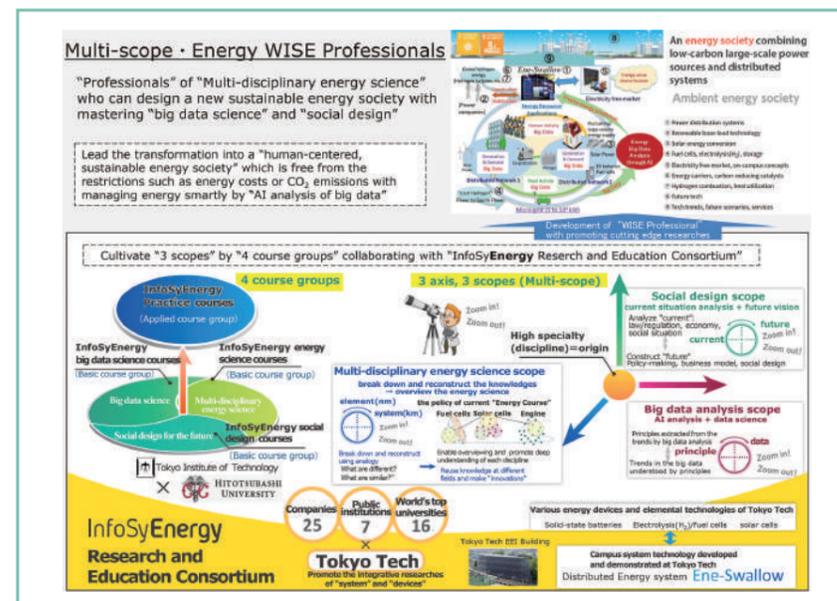
There are four InfoSyEnergy courses that train its students to become thriving Multi-scope·Energy WISE Professionals who will take on roles in ventures, companies, and academia to ultimately produce a society of sustainable energy.

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. All 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 15 universities – as well as business mentors from member companies to report on research outcomes and conduct discussions, the consortium aims to strengthen the feasibility of the program’s concept, enhance graduate



Alongside Tokyo Tech’s InfoSyEnergy Research & Education Consortium, its first to place joint research at the forefront, we contribute to excellent human resource development, application of research to industry, and project sustainability.

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 through 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



A kick-off ceremony and collaboration workshop with InfoSyEnergy were held during which students enjoyed guest speeches and participated in research presentations and discussions

The Tokyo Tech Academy of Energy and Informatics Kick-Off Ceremony was held on September 28 with guest speakers from the Ministry of Education, Culture, Sports, Science and Technology, the Ministry of Economy, Trade and Industry, the Agency for Natural Resources and Energy, as well as some from member organizations of the InfoSyEnergy Research and Education Consortium. The ceremony was followed by an InfoSyEnergy Workshop for Education and Research Collaboration, where a PhD researcher from CEA-Liten of France and a University of Cambridge professor gave speeches on their studies, and students discussed and provided research presentations on topics related to energy and information.

DATA

[Number of students recruited]
 30 (FY2021)
[Number of anticipated program graduates] 10-25
[Number of people engaged in the program] 129
[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]
 25 companies, 5 public institutions, 14 overseas 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 / SEKISUI CHEMICAL CO., LTD. / 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 / BROTHER INDUSTRIES, LTD. / Mizuho Research & Technologies, Ltd. / Mitsubishi Corporation / Mitsubishi Electric Corporation / Japan International Cooperation Agency (JICA) / CEA-Liten RESEARCH INSTITUTE / National Institute of Advanced Industrial Science and Technology (AIST) / Thailand National Science and Technology Development Agency / Kawasaki City / Georgia Institute of Technology / HITOTSUBASHI UNIVERSITY / 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 2021)

Message from WISE Cooperating Institution



ISHII Hideaki
 Executive Officer, Corporate Senior Vice President, Toshiba Corporation

Professionals for a sustainable, carbon-neutral society

As energy forms are drastically changing toward carbon neutrality, we need to accelerate technological advancements to meet ongoing social changes in fields such as renewable energy, hydrogen and storage batteries, electrical system controls (and device technologies to support these infrastructures), and use of big data. I have high expectations that these programs will promote R&D ahead of rapid game changes, and foster the development of highly capable professionals who will become global leaders of new societies and industries.

Student's Voice



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

Finding opportunities and acquiring skills for the future

My motivation for participating in this program is to gain experience for the career path I envision: to be active as a researcher in academia. In particular, I would like to improve my ability to discuss my research in English with people in other fields through presentations and talks at the InfoSyEnergy International Forum. Also, through the curriculum, I would like to acquire programming skills and integrate them with data analysis in my own research to gain new knowledge.

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 Engineering, Doctor of Informatics, Doctor of Environmental Studies, Doctor of Economics, Doctor of Laws, Doctor of Architecture, Doctor of Sociology, Doctor of Geography, Doctor of Science
 Name of the program to be noted: Transdisciplinary Mobility Innovation Graduate Program
[URL] <https://www.tmi.mirai.nagoya-u.ac.jp>



Message from the President



MATSUO Seichi
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.

DATA

[Number of students recruited] 12 (FY2020), 12 (FY2021)
[Number of anticipated program graduates] 12
[Number of people engaged in the program] 101
[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, 18 enterprises
 Gifu University / University of Michigan (USA) / Virginia Institute of Technology (USA) / The Ohio State University (USA) / Chalmers

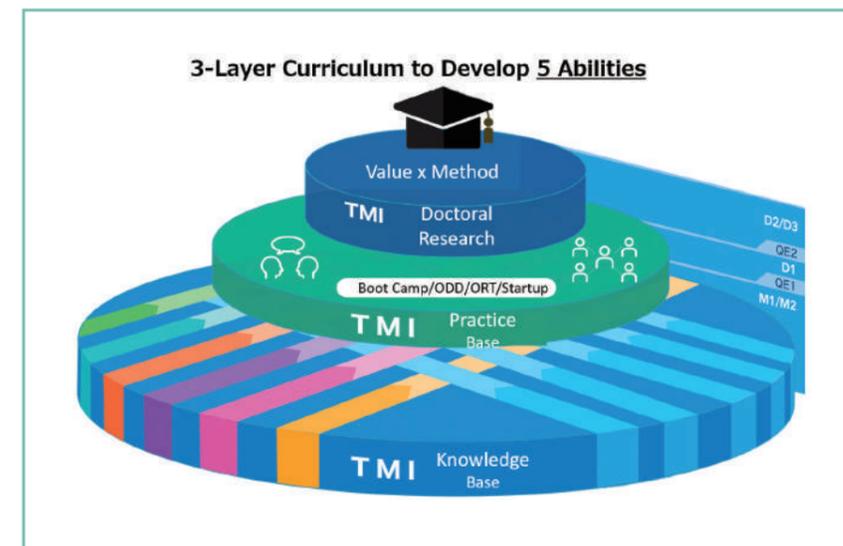
Institute of Technology (Sweden) / National University of Singapore (Singapore) / Chulalongkorn University (Thailand) / Hanoi University of Science and Technology (Vietnam) / WHILL Inc. / MTG Ventures / KDDI Research, Inc. / Cisco Systems / 01Booster, Inc. / Sohgo Security Services Co., Ltd. / Sompoo 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 2021)

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 transdisciplinary collaboration through



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".

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



Aiming to analyze diverse and dynamically changing lifestyles by actively participating in joint industry-government-academia social implementation

With the increasing complexity of social issues in recent years, local governments are required to provide appropriate administrative services to all stakeholders. Therefore, in collaboration with UTA, an international organization for promoting smart cities, and Nisshin City in Aichi Prefecture, we are participating in social experiments to analyze dynamically changing lifestyles, such as park demand forecasting and urban sensing using garbage collection vehicles. Furthermore, in anticipation of diverse lifestyles in the future, we are working on social implementation in cooperation with local governments, aiming not only to analyze the collected data but also to return it through administrative services that are intrinsically valuable to residents.

Message from WISE Cooperating Institution



GODA George
01Booster Inc. Co-founder

Expecting startups to advance the world by transdisciplinary innovation

Innovation is truly the result of a new combination of different talents. This initiative brings together a diverse group of students and companies from six different graduate schools under the theme of transdisciplinary mobility innovation that will revolutionize the world. It is highly desirable for Japan that these people co-create businesses and launch new startup companies. I'm proud to be a part of it and very much looking forward to collaborating with these activities.

Student's Voice



BITO Kana
Department of Intelligent Systems, Graduate School of Informatics, Nagoya University 1st year of Master course

To be a Leading Talent for the Once-in-a-Century Mobility Innovation

I applied for this program because I felt that in order to lead the mobility revolution and create future lifestyles, it is essential to collaborate across disciplines and work together with industry, academia, and government. In this program, there are many opportunities to discuss mobility innovation from multiple perspectives, such as group activities with students from other graduate schools, debates by professors from different fields, and mentoring programs with people from collaborating companies, and I am inspired every day.

[Office and section in charge] Office of TMI **[Inquiries]** 052-788-6114

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 for the student granted a Doctor of Informatics or a Doctor of Agricultural Science: Distinguished Doctoral Program of Platforms

[URL] <https://www.platforms.ceppings.kyoto-u.ac.jp/>



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.

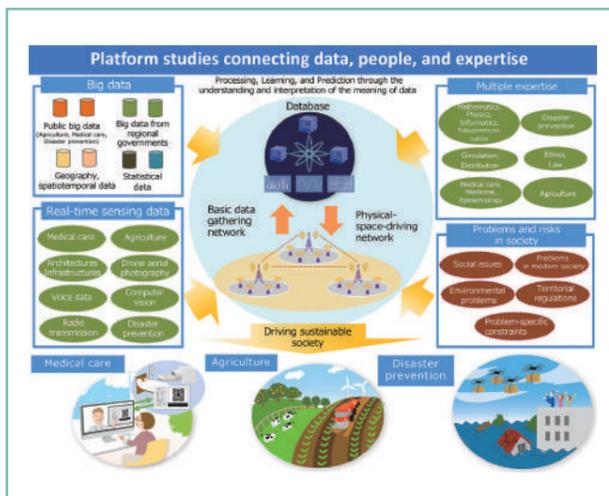
Platform Studies: A new academic field to advance society

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



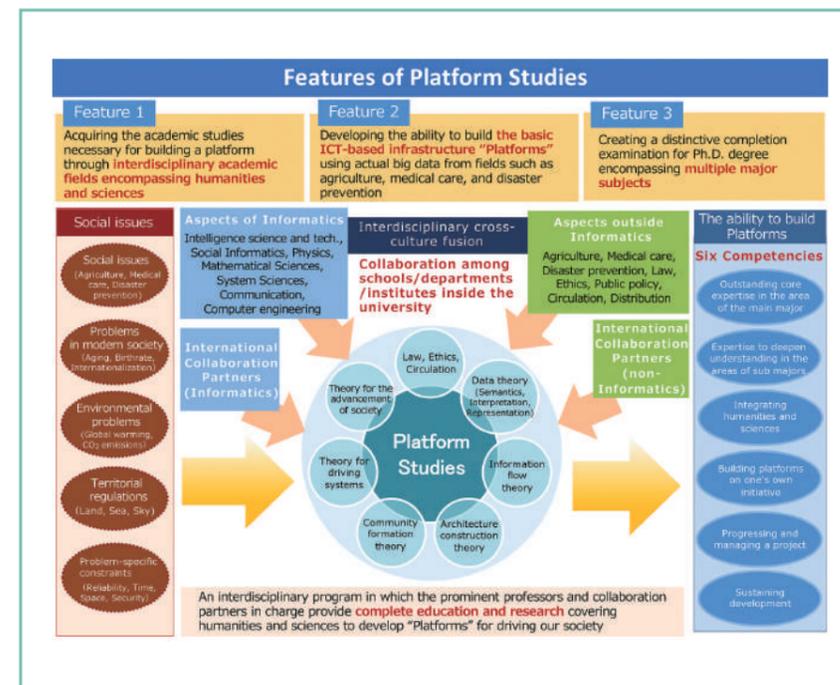
Mission of distinguished doctoral program

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



Seminars with university researchers, businesspeople, and influencers, featuring “people you can’t usually meet and content you can’t usually see”

In order to promote a deeper understanding of platform science and communicate information to the public, we hold open seminars once a month, inviting university researchers in fields related to the topic, people from companies and other organizations involved in implementation in society, and influencers directly or indirectly involved in the field of the seminar. The seminar will provide an opportunity for participants from the general public to broaden their understanding of platform science, for those in specialized fields to understand the utility of building cross-discipline infrastructure, and for students to have discussions after the seminar with speakers they would not normally have the opportunity to meet, allowing each group to broaden their knowledge.

DATA

[Number of students recruited]
15 (FY2021)

[Number of anticipated program graduates] 3-15

[Number of people engaged in the program] 93

[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, 16 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 / GOOD EAT COMPANY Inc. / 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 / wenvovator 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 2021)

Message from WISE Cooperating Institution



KOJIMA Fumihide

Director, Wireless Systems Laboratory, Wireless Networks Research Center, NICT

WISE, an all-in-one program for “platformers” to lead from Japan

A program has begun 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 will foster personnel who can drive doctoral-level research and development by using a multi-disciplinary, optimized platform to be built. As a collaborating institution, we will spare no effort to support these personnel to enable them to help solve the social risks that will occur around the world in the future.

Student’s Voice



OGAWA Mayu

The first year in the doctoral program, Division of Applied Biosciences, Graduate School of Agriculture

Platformers building new infrastructure to solve social problems

I decided to participate in this program because I believed that its goal of building new platforms would be a major step toward solving the “ocean noise problem” that I am working on in my research. In this program, we will work to create a platform alongside students, teachers, and companies who are striving to solve various problems. We believe that the cross-disciplinary perspectives fostered by this experience will serve as a driving force to continue research and solve problems.

[Office and section in charge] Office of school of Platforms **[Inquiries]** +81(0) 75-753-5072

Graduate Program of Mathematics for Innovation

[Program Coordinator] SAEKI Osamu (Director, Institute of Mathematics for Industry, 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.gpmi.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

With the aim to create and develop "new interdisciplinary fields", Kyushu University has built a framework for a Cross-Disciplinary Integrated Masters-Doctoral Program called the "Da Vinci Program", and the Graduate Program of Mathematics for Innovation is the first and leading pilot program. In this program, we will nurture "Excellent Doctoral Talents in Mathematics" who can develop new interdisciplinary fields and create innovation by making full use of the "modeling ability" based on excellent "mathematical ability", and "co-creation ability" that can cross the boundaries of organizations and fields. In addition, through this most important graduate school program in Kyushu University, we will promote and lead graduate school reform in Japan and develop and lead the world's society and industry by drawing out the potential of industrial mathematics.

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.

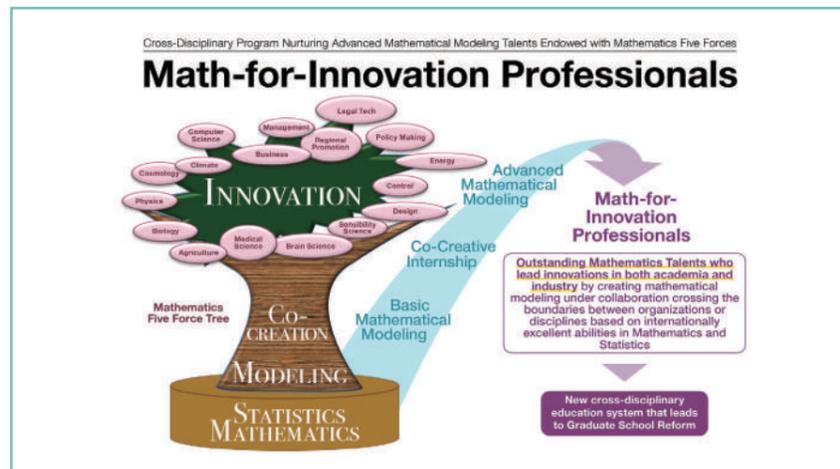
Mathematics can make great contributions to innovation. For example, in the United States GAFA is making a big impact on the world by utilizing mathematical modeling.

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 "Math-for-Innovation Professionals". In the Master's Program, students join the labs of faculty members of other fields as "Basic Mathematical Modeling".



(Figure 1) Mathematics Five Force Tree & Math-for-Innovation Professionals

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. The University has established an excellent organizational structure for this purpose.

The educational organization consists of three main graduate schools: Mathematics, Information Science and Electrical Engineering, and Economics. 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 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,



(Figure 2) WISE Doctoral System for Mature Students solves multiple problems at once, such as financial support, career development, etc.

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 allows us to solve various problems at once,

such as financial support, career development, and strengthening industry-academia collaboration. Preparations have already been made at Fujitsu Laboratories Ltd., our partner organization, and will be implemented immediately after the start of the program. 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.

DATA

[Number of students recruited]
18 (FY2021)

[Number of anticipated program graduates] 4-14

[Number of people engaged in the program] 83

[Students' affiliated schools and departments]

3 graduate schools, 4 departments
 (Graduate School of Mathematics) Mathematics
 (Graduate School of Information Science and Electrical Engineering) Information Science and Technology, Electrical and Electronic Engineering
 (Graduate School of Economics) Economic Engineering
 * We are going to establish the "Joint Graduate School of

Mathematics for Innovation" through the collaboration of the three graduate schools on the left in April, 2022.

[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 (The Netherlands) / Zuse Institute Berlin

(As of November 2021)

Message from WISE Cooperating Institution



ANAI Hirokazu
Director, Artificial Intelligence Laboratory, Fujitsu Research, Fujitsu

Innovation based on Artificial Intelligence and Mathematical Technology

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



CHEN Lin
Graduate School of Information Science and Electrical Engineering Department of Electrical and Electronic Engineering D1

Aiming at International Doctorate in Mathematics

In the Graduate Program of Mathematics for Innovation, I can solve my research problems of gas sensors while learning mathematics and statistics through the guidance of faculty members specialized in mathematics and young mentors. I decided to join this program because I thought that I could improve my research by adding the perspective of mathematics, a different field. Another major attraction is the internship that allows me to study abroad and participate in joint research with companies.

▶ **For inquiries about the overall WISE Program**

**University Promotion 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
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<https://www.jsps.go.jp/j-takuetsu-pro/index.html>
(Only in Japanese)

