

TOHOKU UNIVERSITY



2027

Faculty of Pharmaceutical Sciences
Graduate School of Pharmaceutical Sciences





Achieving healthy longevity for humankind through the interplay of matter and life.

Preserving human health is our eternal challenge. Since ancient times, humans have known that the body reacts to what we eat, drink, and apply to our skin. Medicine has been developed based on this relationship between matter and humans.

Today, more rational approaches are being taken to discover and utilize medicines. Pharmaceutical Sciences is the cutting-edge discipline for this pursuit, conducting interdisciplinary and integrated research and education based on chemistry and biology, while also playing a vital role in healthcare.

Pharmaceutical Sciences encompasses understanding life phenomena and elucidating the mechanisms of disease to create substances with pharmaceutical potential, as well as conducting research and education on the proper use of medicines.

The Tohoku University Faculty of Pharmaceutical Sciences was established in 1972, evolving from the Department of Pharmaceutical Sciences of the Faculty of Medicine, which was founded in 1957. As the only national institution for pharmaceutical research and education in the Tohoku region, our Faculty and Graduate School have produced leaders active in diverse fields spanning from research and development, education and healthcare to administration. Our

alumni are active globally in pharmaceutical, chemical, food, and materials-related companies, as well as in universities, hospitals, and public institutions.

Society has high expectations for graduates with a pharmaceutical background, as they explore the relationship between matter and life.

The Faculty of Pharmaceutical Sciences offers two undergraduate programs: a four-year program in Pharmaceutical Sciences, aimed at educating future professionals in drug discovery, and a six-year program in Pharmacy, which trains future pharmacists and healthcare professionals.

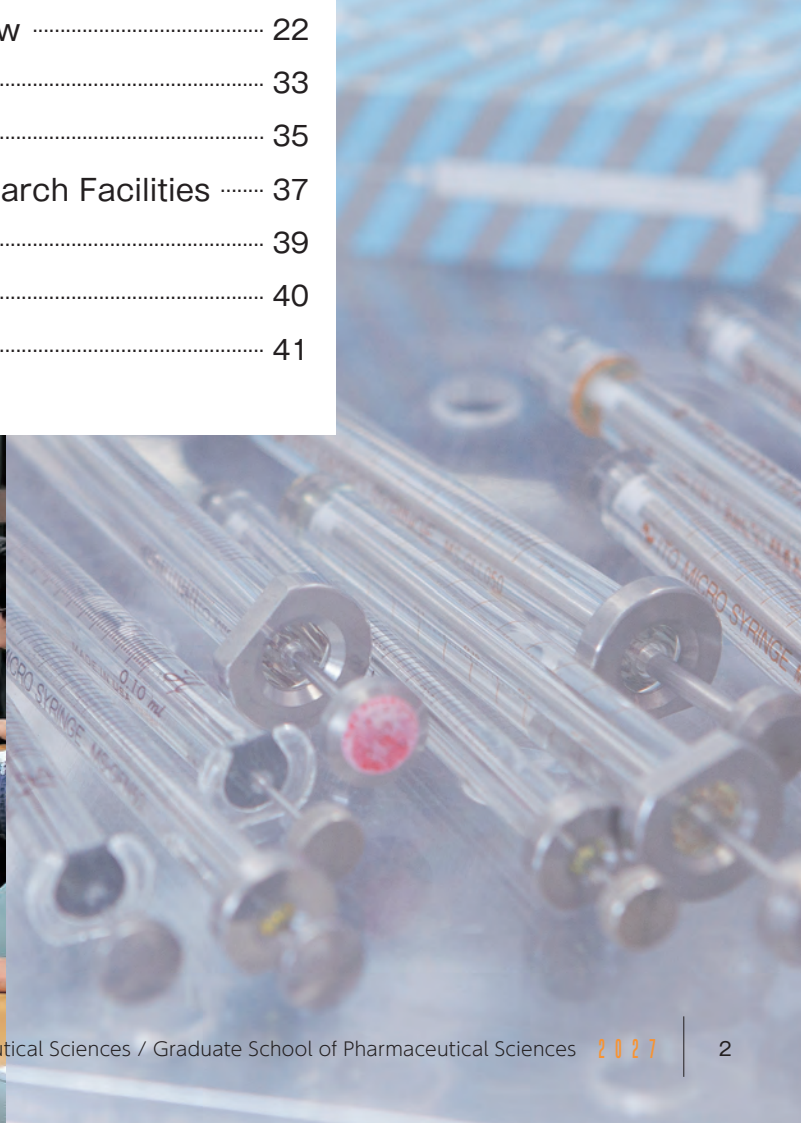
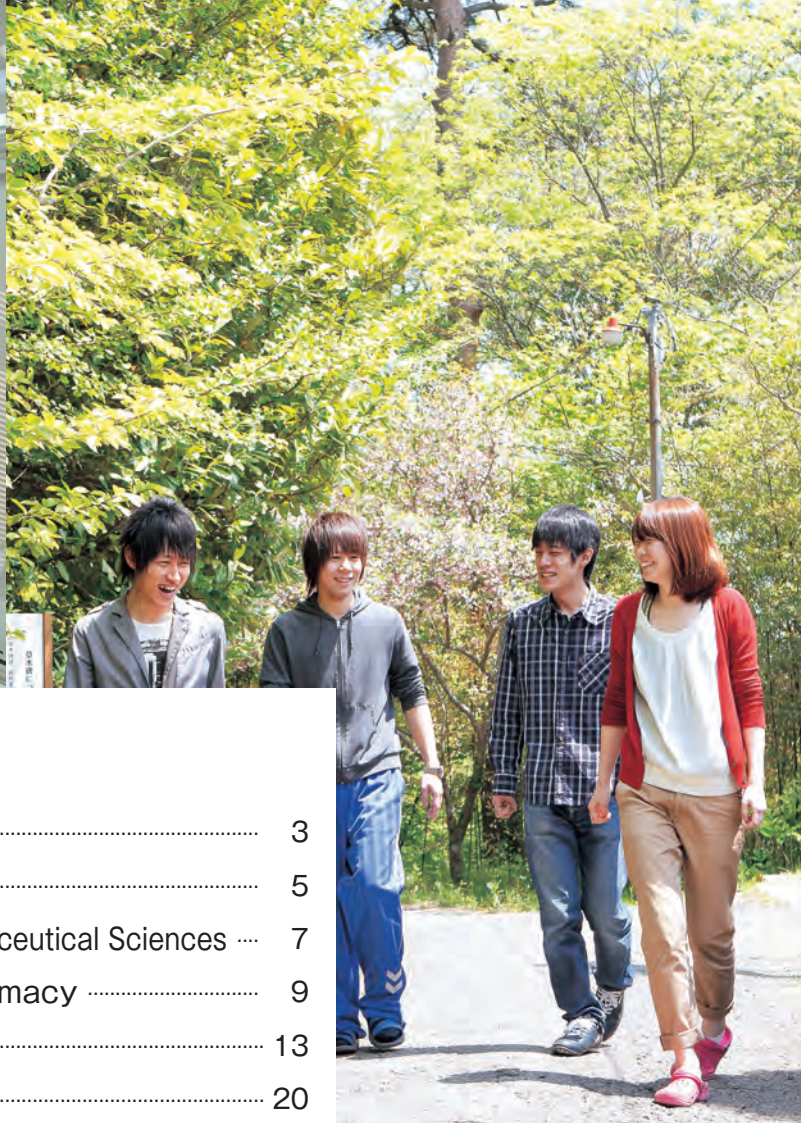
We conduct integrated research and education in the traditional field of medicinal chemistry, the rapidly advancing field of life pharmaceutical sciences, and clinical pharmacy, a field significantly contributing to healthcare.

We welcome young, ambitious minds brimming with intellectual curiosity and wisdom, who possess keen and flexible international perspectives and who vigorously tackle societal challenges to join us. Together, we aim to build a future that realizes healthy longevity for all humanity.



Faculty of Pharmaceutical Sciences
Graduate School of Pharmaceutical Sciences
Tohoku University

DOI Takayuki
Dean



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Faculty of Pharmaceutical Sciences

At the Faculty of Pharmaceutical Sciences we teach and research in three integrated disciplines: Materials science based on organic and physical chemistry, Life Sciences based on biochemistry and molecular biology, and Medical Science, which consists of the analysis of diseases and drug therapy.

Our goal, in conjunction with the education and research conducted by the Graduate School of Pharmaceutical Sciences, is to train individuals who can contribute to the development of Pharmaceutical Sciences from an international perspective, and who possess vast knowledge and high ethical standards in pharmaceuticals, enabling them to demonstrate leadership in the implementation and development of appropriate drug treatment.

We are looking for individuals fueled by intellectual curiosity who have a strong interest in research and development, related to producing new drugs, and those who possess a strong desire to ensure the safe and optimal use of drugs, as well as those who have a strong vocation for contributing to the advancement of human health through medicine.

+ What is Pharmaceutical Sciences?

Pharmaceutical Sciences is the study of the creation, development, and production of drugs to their management, administration, and evaluation of their efficacy in medical settings.

Drugs are the fruit of centuries of human intellect, and the development of new medicines and methods of treatment have contributed to eradicating many illnesses over the course of history. However, there still isn't an effective cure for illnesses such as cancer, AIDS, diabetes and dementia, so there is a high demand for new drugs and treatments.

In order to create new drugs, we must understand the nature of molecules, cells, and structure of organisms, and the many processes that occur in the life of a human from birth to death. We study the mechanisms of the nervous system, endocrine system and immune system to further understand how diseases develop and to clearly identify the effects of candidate substances meant for treatment.

Moreover, it is necessary to develop methods to accurately and efficiently synthesize drugs with complex chemical structures.

It is imperative that we clarify how drugs work and develop methods that deliver them efficiently to their target sites. At the same time, we must understand the changes drugs undergo within the body after absorption and how they are subsequently excreted. There is also a strong demand in the field of pharmaceutical sciences for developing reasonable methods for effectively and safely using beneficial drugs in medical settings.

Additionally, members of the public strongly expect pharmacists to be knowledgeable about proper medication administration and guidance, and play an active part in medical teams.

Recently, the field of pharmaceutical sciences has expanded significantly, with the effects of environmental substances on living organisms also becoming an important subject of research.

+ Find your purpose

The pharmaceutical sciences contribute to the advancement of humanity through exploring the phenomenon of life, creating and using new drugs to cure diseases. By studying pharmaceutical sciences, you will unravel the various interwoven phenomena of life and be able to contribute to the advancement of human knowledge.

You will discover and explore substances that support and regulate vital activities, opening new paths for participating

in the development of new pharmaceuticals. By studying pharmaceutical sciences, you will also be able to support advancements in medical care by developing methods for the appropriate and efficient use of drugs. Individuals who have studied pharmaceutical sciences let their curiosity and creativity shine, and have many opportunities to contribute to human health and wellbeing.

Pass the Japanese National Examination for Pharmacists

Students who graduate from the Department of Pharmacy (6-year program) are eligible to sit the Japanese National Examination for Pharmacists.

Get your Teaching License

Upon completing the required subjects and acquiring the prescribed credits necessary for obtaining a teaching certificate, students can acquire the Type 1 teaching certificate in science for junior and senior high school.

Become a Pharmacist

To become a pharmacist in Japan, students must pass the national examination and receive a pharmacist license from the Minister of Health, Labour and Welfare. Upon obtaining the pharmacist qualification, graduates obtain the qualifications and professional roles of supervising pharmacists while handling toxic and dangerous substances as well as narcotics.



+ Curriculum

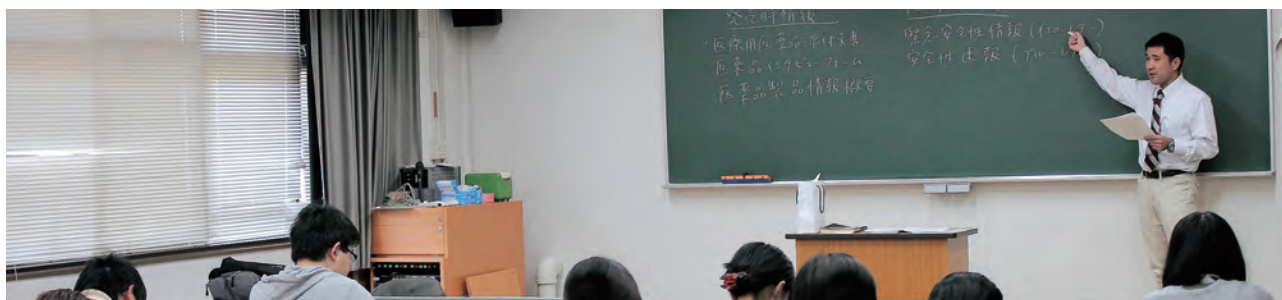
In order to research pharmaceuticals, extensive basic knowledge is essential:

At the Faculty of Pharmaceutical Sciences of Tohoku University, we first conduct basic education in the three fields of biology, organic chemistry and physical chemistry as a foundation. Based on this foundation, we then expand to teaching pharmaceutical sciences and pharmacy. The curriculum at Tohoku University consists of university-wide education subjects covering general basic education, and specialized education subjects that vary by each faculty. Classes are conducted in terms of semesters lasting half a year, and quarters, which further divide each semester into two parts. The general education subjects are completed in the third semester of the second academic year, while the special education subjects commence in the first semester and continue to increase in number until graduation.

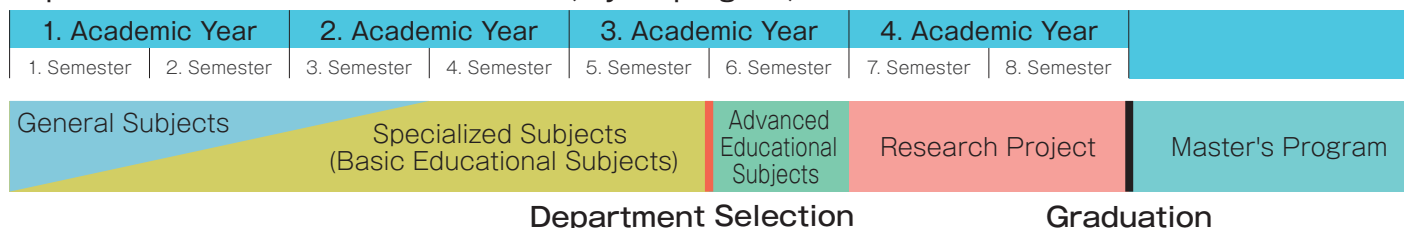
At our faculty, we offer a four-year study program at the Department of Pharmaceutical Sciences, which focuses on training pharmaceutical researchers and technicians in drug discovery science, and a six-year study program at the

Department of Pharmacy, which focuses on training highly qualified pharmacists. However, at the time of admission, selection is conducted without distinguishing between the two departments. After enrolling, students receive a basic education in both fields of study up until the fifth semester, covering the core subjects (centered around the three pillars of biology, organic chemistry and physical chemistry) shared by both departments. The curriculum is designed to enable students to thoroughly acquire the fundamentals of pharmacy.

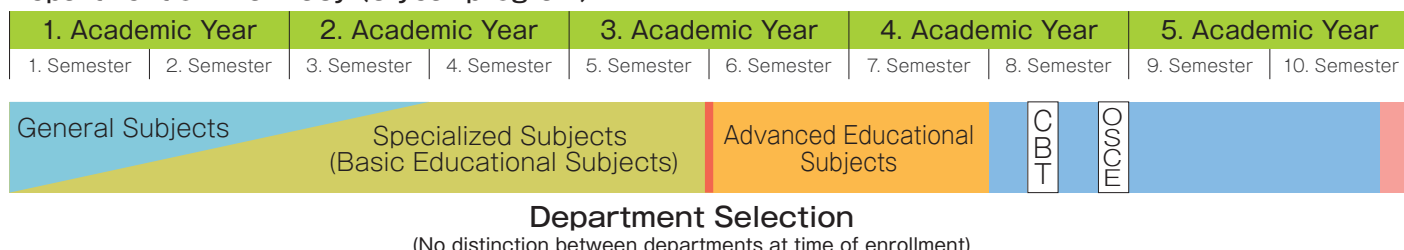
Furthermore, practice training is conducted in the fourth and fifth semester. During the practice training, students will consolidate the theoretical knowledge acquired thus far through experimentation, while simultaneously learning the foundations of experimentation techniques. After completing the fifth semester, students are allocated to either the Department of Pharmaceutical Sciences (capacity: 55 students) or the Department of Pharmacy (capacity: 20 students) based on their preferences and academic performance. From the sixth semester onwards, students will undertake their studies under the respective departmental curricula.



Department of Pharmaceutical Sciences (4-year program)



Department of Pharmacy (6-year program)



+ Department Introduction

Educational Goals

The Faculty of Pharmaceutical Sciences comprises two departments: the Department of Pharmaceutical Sciences (four-year program) and the Department of Pharmacy (six-year program). Building upon undergraduate and graduate-level education and research, our faculty cultivates individuals capable of participating in research and development within pharmaceutical sciences – with the goal elucidating life phenomena and creating novel pharmaceuticals – as well as individuals who can contribute to the advancement of healthcare as pharmaceutical specialists.

For Aspiring Scientists

Department of Pharmaceutical Sciences (4-year program)

In this four-year program, our students acquire not only the intellectual foundation and knowledge required of those engaged in pharmaceutical sciences, but also a broad understanding of pharmaceutical sciences as a whole. Furthermore, through practical training and graduation research, they learn experimental methods and analytical techniques, establishing the fundamental skills required to become researchers or technical experts in drug discovery science. Students can further hone their knowledge and skills acquired in this department by progressing to the master's program (two years) and doctoral program (three years), enabling them to excel in society as researchers and engineers in drug discovery science.

For Aspiring Pharmacists

Department of Pharmacy (6-year program)

In this six-year program, our students acquire foundational knowledge in pharmaceutical sciences and clinical pharmacy along with the ethics, education, and knowledge expected of healthcare professionals. Furthermore, through practical training in laboratories, hospitals, and pharmacies, they cultivate a spirit of research and gain the technical skills and knowledge required for pharmacist practice, preparing them for the Japanese National Examination for Pharmacists. The knowledge and skills acquired in this department not only provide a foundation for obtaining pharmacist qualifications or excelling in healthcare settings as highly skilled pharmacists with strong research ethos but also serve as a basis for progressing to a four-year doctoral program to become pharmaceutical research specialists.

Graduate School (5 years)

(2 years)

Doctoral Program (3 years)

6. Academic Year

11. Semester | 12. Semester

Graduate School (4 years)

Research Project

Doctoral Program
(Pharmacy Course) 4 years

Graduation

Japanese National Examination
for Pharmacists

Common Examination { **C B T** (Computer Based Testing, examines basic knowledge)
OSCE (Objective Structured Clinical Examination, skill and attitude assessment)



Department of Pharmaceutical Sciences

interview



Department Chair

KONNO Tomohiro

Q1: What does the Department of Pharmaceutical Sciences teach?

The Department of Pharmaceutical Sciences equips students with a broad knowledge of all aspects of pharmaceuticals to train researchers and specialists who develop and bring new drugs to the market. To create novel drugs, it is crucial to understand the properties of the molecules, cells, and tissues that make up living organisms, grasp the mechanisms of the nervous, endocrine, and immune systems, and understand the mechanisms of diseases. Building upon this foundation, the next step is to seek out candidate substances for medicinal use.

We search for new drug candidates within nature, as well as through chemical synthesis by artificially synthesizing numerous candidate molecules. This process requires that we develop methods for the precise and efficient synthesis of organic molecules with complex chemical structures.

Furthermore, it is crucial that we identify how drugs exert their effects, develop methods to deliver them efficiently to their target sites, and understand how drugs undergo transformation and how they are excreted within the body. At our department, students learn numerous experimental methods and analytical techniques relevant to drug discovery research not only through lectures but also practical training and graduation research. This forms the foundations to become researchers and specialists in drug discovery science.

Q2: What career paths are available after graduating?

The most common pathway for graduates is to pursue further studies at our graduate school, with most students progressing to our two-year master's program. Upon completing this stage, some graduates enter employment as researchers or engineers at pharmaceutical or chemical companies, or research institutes. Others further proceed to our three-year doctoral program to obtain a PhD, subsequently working at pharmaceutical or chemical companies, research institutes, or research and educational institutions such as universities. Our graduates are also active in a wide range of fields, utilizing their broad knowledge of pharmaceutical sciences. This includes roles in companies specializing in chemistry, food, and cosmetics, as well as positions within government bodies involved in health and environmental affairs. Graduates also work as civil servants in areas such as the review of pharmaceuticals and medical devices, and patent administration.

Q3: What is your message to prospective students?

The development of just one single drug can save countless lives. Today, many groundbreaking medicines created in Japan are used worldwide, and there remains a pressing need to continue developing new drugs. To safeguard irreplaceable lives and health, we invite you to channel your passion into cutting-edge drug discovery research.

+ Curriculum (4-year program)

Following departmental allocation after the fifth semester, students undertake advanced education courses to deepen their knowledge of drug discovery in the sixth semester. Furthermore, spanning a period of one and a half years from the sixth semester until graduation in the fourth year, students are assigned to research laboratories in small groups to carry out research projects. A research topic is assigned to every student individually, where they get to experience both the joy and the challenges of tackling an unfamiliar subject, making it the most fulfilling period of their undergraduate life. In August of the fourth year, graduate school entrance examinations are held. Successful candidates can progress to the two-year master's program, enabling them to undertake more advanced research.

Graduates of the Department of Pharmaceutical Sciences may also enter the workforce immediately upon completion of their studies. If they decide to complete the two-year master's program, graduates can pursue careers as researchers or technical specialists in drug discovery, working in research, development, or production roles within companies and other organizations.

Students who further progress to the three-year doctoral program (Ph.D. course) to pursue advanced research will find opportunities awaiting them to fully utilize their abilities as internationally applicable pharmaceutical researchers within research institutes and educational establishments.

Academic Year	Semester	Courses
1	1	General Education Subjects [Cultivating knowledge and skills across a broad range of academic disciplines] Academic Learning/ Ethics/ Mathematics/ Physics/ Chemistry/ Biology/ Science Experiments/ Information Education/ Languages/ etc.
	2	
2	3	Basic Educational Subjects [Developing the essential knowledge and ways of thinking required in the field of pharmaceutical sciences] Introduction to Pharmaceutical Sciences/ Organic Chemistry/ Natural Products Chemistry/ Structure Analysis of Organic Compounds/ Medicinal Chemistry/ Drug Discovery Chemistry/ Advanced Organic Chemistry/ Analytical Chemistry/ Physical Chemistry/ Radiochemistry/ Structural Chemistry/ Functional Morphology/ Biochemistry/ Immunology/ Pharmacology/ Health Chemistry/ Pharmaceutics/ Environmental Health/ General Training in Physical Chemistry/ General Training in Organic Chemistry/ General Training in Life Sciences/ General Training in Biopharmacy and Pharmacy Practice
	4	
3	5	Advanced Educational Subjects [Learning the fundamentals required to become researchers and technical experts in pharmaceutical sciences] Natural Products Chemistry/ Bioorganic Chemistry/ Advanced Organic Chemistry/ Digital Pharmacology/ Introduction to Clinical Medicine/ Drug Design and Development/ Diagnostic Imaging Pharmacology/ Pharmaceutic Laws/ Advanced Training in Pharmaceutical Sciences
	6	
4	7	Research Training (Researcher Educational Subjects) [Laying the foundation for a career as a pharmaceutical researcher by exploring unfamiliar topics]
	8	



Department of Pharmacy

interview



Department Chair

TOMIOKA Yoshihisa

Q1: What does the Department of Pharmacy teach?

Until the fifth semester, students acquire the fundamental knowledge and skills needed in pharmaceutical sciences, including organic chemistry, physical chemistry, analytical chemistry, life sciences, pharmacology, pharmacognosy, and biochemistry, as well as the development of the professionalism required of healthcare practitioners and researchers.

Based on this foundation, students then acquire more clinically and practically oriented knowledge, skills, and attitude as part of the pharmacy program. This includes courses on communication skills, interpreting prescriptions and understanding clinical test values, as well as subjects covering the laws and statistics essential for pharmacists.

Additionally, our department offers numerous lectures delivered by practicing pharmacists and doctors. During the practical training starting in the latter half of the fourth academic year, students are assigned to both a pharmacy and a university hospital for two and a half months each to gain practical experience and insight into the duties of a pharmacist.

Compared to pharmacy departments at other universities, the Department of Pharmacy at Tohoku University is characterized by the significant amount of time students spend engaged in research. Under the motto 'research first', we train pharmacist-scientists, i.e. pharmacists who can pursue not only traditional pharmacy practice but also fundamental and clinical research.

Q2: What career paths are available after graduating?

In spring 2012, the program transitioned to a six-year system, enabling graduates to pursue careers as pharmacists in hospitals or pharmacies. Other possible paths include careers in R&D in pharmaceutical companies, careers in national or prefectural governments in administrative positions, or careers as pharmaceutical reviewers. Students can also continue their studies at our graduate school to pursue a doctoral degree. We look forward to our students' future endeavors as leaders in various fields, utilizing their acquired knowledge and skills as pharmacists.

Q3: What is your message to prospective students?

The Department of Pharmacy at Tohoku University's Faculty of Pharmaceutical Sciences offers not only the studies required to become a pharmacist but also gives you the opportunity to fully pursue research in your field of interest within a world-leading educational and research environment. We strongly encourage you to join us if you want to work as a pharmacist while also engaging in basic or clinical research.

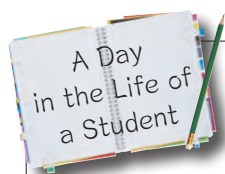
+ Curriculum (six-year program)

From being allocated to the Department of Pharmacy in the sixth semester until the end of the fourth academic year, students take advanced educational subjects in pharmacy, specialized pharmacy practice, and basic practice in medical pharmacy to solidify their foundations as healthcare professionals. Furthermore, in the latter half of the fourth year, the CBT (Computer-Based Test, examining basic knowledge) and OSCE (Objective Structured Clinical Examination, assessing skills and attitude) are conducted as common examinations. We offer preparatory seminars for both tests. Only students who pass both the CBT and OSCE may subsequently undertake the practical training courses. During practical training in hospitals and pharmacies, students acquire the knowledge, skills, and awareness necessary to practice as pharmacists.

On top of this, students undertake research projects within their assigned laboratories for approximately one year from the end of the fifth academic year until graduation. Each student fosters a spirit of research by developing their own unique topic and tackling unknown challenges.

At the end of the sixth year, students undertake preparatory exercises for the Japanese National Examination for Pharmacists and take the actual examination. Upon passing the Japanese National Examination for Pharmacists and graduating from Tohoku University, they can work as pharmacists with a strong research ethos in hospitals and other medical settings. Alternatively, our students may choose to pursue a doctoral program at our graduate school, where they train to be researchers who advance medical pharmacy-related research within healthcare institutions as well as research and educational organizations.

Academic Year	Semester	Courses
1	1	General Education Subjects [Cultivating knowledge and skills across a broad range of academic disciplines] Academic Learning/ Ethics/ Mathematics/ Physics/ Chemistry/ Biology/ Science Experiments/ Information Education/ Languages/ etc.
	2	
2	3	Basic Educational Subjects [Developing the essential knowledge and ways of thinking required in the field of pharmaceutical sciences] Introduction to Pharmaceutical Sciences/ Organic Chemistry/ Natural Products Chemistry/ Structure Analysis of Organic Compounds/ Medicinal Chemistry/ Drug Discovery Chemistry/ Advanced Organic Chemistry/ Analytical Chemistry/ Physical Chemistry/ Radiochemistry/ Structural Chemistry/ Functional Morphology/ Biochemistry/ Immunology/ Pharmacology/ Health Chemistry/ Pharmaceutics/ Environmental Health/ General Training in Physical Chemistry/ General Training in Organic Chemistry/ General Training in Life Sciences/ General Training in Biopharmacy and Pharmacy Practice
	4	
3	5	Advanced Educational Subjects [Acquiring specialized knowledge and professional attitudes in pharmacy] Health Chemistry/ Pharmaceutical Statistics/ Food Hygiene and Safety/ Introduction to Clinical Medicine/ Clinical Pharmacy Practice/ Pharmacotherapeutics/ Infectious Diseases/ Pathology/ Genetics and Molecular Biology/ Bioorganic Chemistry/ Medical Informatics/ Kampo Medicine/ Clinical Pharmacology/ Clinical Laboratory Medicine/ Clinical Pharmaceutics/ Personalized Medicine/ Pharmaceutic Laws/ Advanced Medical Science/ Clinical Communication Skills/ Pharmaceutical English/ Natural Products Chemistry/ Advanced Organic Chemistry/ Digital Pharmacology/ Drug Design and Development/ Diagnostic Imaging Pharmacology/ Advanced Training in Pharmacy
	6	
4	7	On-site Training Subjects [Learning the fundamental knowledge, skills, and attitudes required of a pharmacist] General Training in Biopharmacy and Pharmacy Practice/ Basic Training in Biopharmacy and Pharmacy Practice/ Community Pharmacy-based Clinical Clerkship/ Hospital-based Clinical Clerkship
	8	
5	9	Research Training (Researcher Educational Subjects) [Laying the foundation for a career as a pharmacist researcher by exploring unfamiliar topics]
	10	
6	11	Practice in Pharmaceutical Sciences
	12	
		Japanese National Examination for Pharmacists

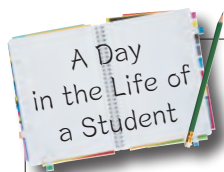


A Day in the Life of a Pharmaceutical Sciences Student

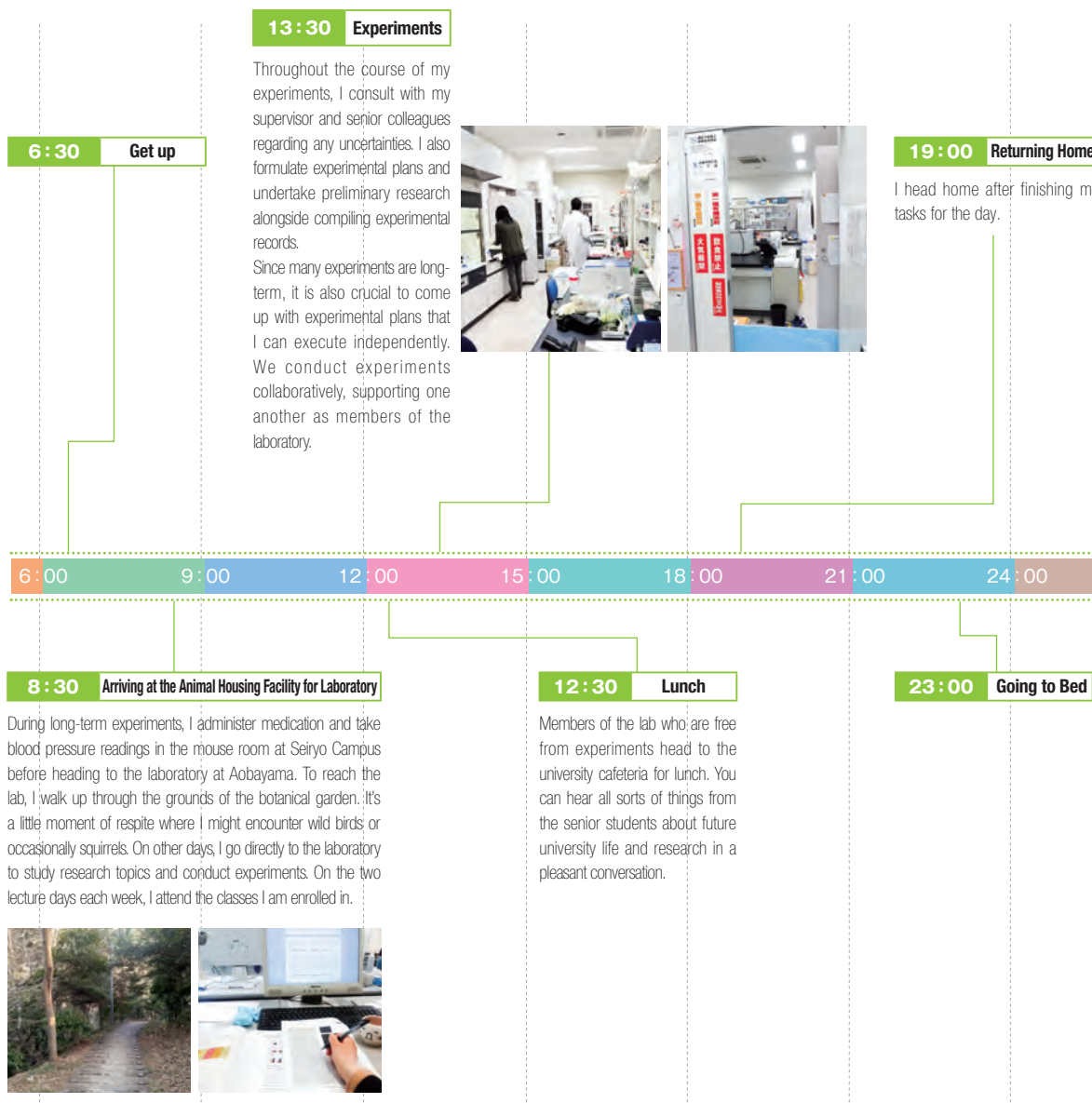


One-week schedule (example)

	Mon	Tue	Wed	Thu	Fri
1. Period	Bioorganic Chemistry	Advanced Organic Chemistry 2	Advanced Training in Pharmaceutical Sciences	Advanced Training in Pharmaceutical Sciences	Advanced Training in Pharmaceutical Sciences
2. Period	Pharmacognosy 2	Digital Pharmacology	Advanced Training in Pharmaceutical Sciences	Advanced Training in Pharmaceutical Sciences	Advanced Training in Pharmaceutical Sciences
12:00-13:00	lunch break				
3. Period	Drug Design and Development	Introduction to Clinical Medicine	Advanced Training in Pharmaceutical Sciences	Advanced Training in Pharmaceutical Sciences	Advanced Training in Pharmaceutical Sciences
4. Period	Imaging Diagnosis	Pharmaceutic Laws	Advanced Training in Pharmaceutical Sciences	Advanced Training in Pharmaceutical Sciences	Advanced Training in Pharmaceutical Sciences



A Day in the Life of a Pharmacy Student



One-week schedule (example)

	Mon	Tue	Wed	Thu	Fri
1. Period	Advanced Training in Pharmacy 1	Advanced Training in Pharmacy 1	Pathology	Food Hygiene and Safety	
2. Period	Advanced Training in Pharmacy 1	Advanced Training in Pharmacy 1	Pathology	Bioorganic Chemistry	
12:00-13:00			lunch break		
3. Period	Advanced Training in Pharmacy 1	Introduction to Clinical Medicine	Pathology	Pharmaceutical Statistics Human Genomics	Frontier Medical Science
4. Period	Advanced Training in Pharmacy 1	Pharmaceutic Laws	Pathology	Infectious Diseases	Advanced Training in Pharmacy 1



Basic Educational Subjects

During the first year of undergraduate study, students primarily take university-wide general education subjects focused on providing core character-building and expertise needed for the modern world. The specialized basic educational subjects of the Faculty of Pharmaceutical Sciences commence at the same time and steadily increase through the second academic year to the first half of the third year. They form the foundation of essential knowledge and thinking methods required for those engaged in the field of pharmaceutical sciences.

Introduction to Pharmaceutical Sciences 1,2

Introduction to Pharmaceutical Sciences 1 serves as an orientation to the various subjects studied in the Faculty of Pharmaceutical Sciences. Through a series of classes covering topics ranging from "What is a drug?" to "Drug Discovery" and "Proper Drug Use," students learn how the science of drugs is built upon the accumulation of research across a broad range of fields, and how crucial theoretical backings are to turn chemical substances into drugs that support human health. In Introduction to Pharmaceutical Sciences 2, students hear from graduates who are active in society as researchers, technicians, or pharmacists, sharing their insights based on their real-world experiences. Additionally, field trips to research institutes, manufacturing plants, hospitals, and pharmacies provide a meaningful insight into pharmaceutical research and healthcare practice. These early experiential learning opportunities help students visualize concrete paths for their future careers and motivate them to further study pharmaceutical sciences.

Functional Morphology 1, 2

In this class students learn about the functions of the cells, tissues, and organs that constitute living organisms and their relationship with morphology. While incorporating relevant histology and physiology content, students will understand the roles played by the blood, hematopoietic, and lymphatic systems; the respiratory system; the digestive system; the heart; the vascular system; the kidneys; the endocrine system; and the central and peripheral nervous systems in maintaining homeostasis within the body. The content of this class serves as a foundation for studying subjects related to pathophysiology and pharmacotherapy.

Organic Chemistry 1-4

Living organisms primarily consist of organic compounds, and most pharmaceuticals are also organic compounds. This is why organic chemistry, which systematically studies the structures and reactions of organic compounds, forms the foundation of pharmacology. In this course, students study chemical bonding theory as a basis, the properties of organic compounds and functional groups, and the basic theories of chemical reactions. They will also learn about the interaction between each functional group's biological components and their function as pharmaceuticals.

Physical Chemistry 1-3

To clarify the effects of drugs on living organisms, it is necessary to understand the structure, properties, interactions, and reactions of the biological molecules responsible for life activities and the drugs acting on them. Physical chemistry is the discipline that serves as the entry point to fundamentally understanding these matters. Physical chemistry consists of quantum chemistry, which is essential for understanding the structure and properties of individual molecules, and thermodynamics, which deals with the flow of energy in substances made up of collections of molecules. Through this course, students will acquire fundamental knowledge of quantum chemistry and thermodynamics as well as theoretical thinking skills. In addition, the purpose of this course is to learn the theoretical aspects of spectroscopic and electrochemical methods used to elucidate the structures, properties, and interactions of biomolecules and drugs, and to understand the maintenance of life activities by biomolecules as well as the manifestation of drug actions by focusing on molecular structure and chemical equilibrium.

Biochemistry 1, 2

To understand the functions of biological systems targeted by drugs and to respond appropriately to pathological conditions, a biochemical understanding of the various components that constitute living organisms and their functions is essential. This course covers the functions and intracellular metabolism of biomolecules such as sugars, amino acids, proteins, lipids, and nucleic acids, as well as related metabolites, focusing on their biochemical reactions and their metabolism within cells. This course further explores how the metabolic pathways of these substances are interconnected and deepens students' understanding of the respective roles they play in living organisms.

Biochemistry 3, 4

This course covers the structures and functions of diverse proteins, including myoglobin, hemoglobin, enzymes, secretory proteins, glycoproteins, extracellular matrix proteins, and plasma proteins. This course further deepens students' understanding of proteins that play essential roles in biological reactions, particularly those involved in intracellular signal transduction and gene expression, which are critical for understanding disease onset and the mechanisms of drug action.

Analytical Chemistry 1-3

Analytical chemistry in pharmacy is not only fundamental to drug discovery—including drug design, efficacy, and pharmacokinetic analysis—but also serves as a foundational discipline in life sciences. In this course, students learn quantitative methods for analyzing the purity and content of pharmaceuticals, the principles of various chromatography that is crucial for separating and analyzing drugs and bioactive molecules in body fluids, and the fundamentals of mass spectrometry. Additionally, students study the principles and practical applications of various high-resolution, high-sensitivity analytical methods to understand qualitative and quantitative changes of drugs within the body, as well as to analyze biomolecules such as proteins and peptides whose behavior changes due to drug effects.

Pharmacology 1-4

Pharmacology is the science that studies the effects of drugs on living organisms and explores why drugs work. In this course, students learn about basic extracellular signaling molecules and intracellular signaling mechanisms. Furthermore, students learn about drugs that act on the peripheral nervous system, the circulatory system, the kidneys and urinary system, the central nervous system, and the respiratory and digestive systems. Additionally, this course teaches about drugs acting on the inflammatory and immune systems, the endocrine system, drugs for treating infectious diseases, anticancer drugs, and their clinical effects.

Pharmaceutics 1, 2

For drugs to exert therapeutic effects, they must reach their target tissues. Understanding the pharmacokinetics of drugs is essential not only in the molecular design of new drugs but also in the formulation of dosing regimens for clinical drug therapy. This course provides an understanding of the kinetic mechanisms governing the dynamic state of drugs within the body, including the regulatory factors of absorption, distribution, metabolism, and excretion. It also covers the fundamentals and applications of physical pharmaceutics, with a focus on dosage form theory.

Natural Products Chemistry 1

Natural organic compounds (natural products) produced by plants and microorganisms have contributed to dramatic advances in pharmaceutical research, such as drug development. This course covers the classification, chemical structures, biosynthesis, and pharmacological actions of natural products. Building upon organic chemistry, this course teaches the fundamental knowledge necessary for applications in drug discovery and life sciences. Furthermore, by exploring the history of natural products chemistry research and recent cutting-edge trends, students also learn about the connections between natural products chemistry research and other fields of study.

Structure Analysis of Organic Compounds

Most pharmaceutical agents are organic compounds, and organic synthetic chemistry plays a critically important role in drug discovery. For researchers engaged in pharmaceutical sciences, a solid understanding of the structures of small-molecule organic compounds and their derived physicochemical properties is essential.

In this course, students will learn how to determine the structures of organic compounds based on actual spectra obtained from various spectroscopic methods. The course aims to develop fundamental skills for identification and structural confirmation of chemical compounds.

Structural Chemistry

Understanding drug mechanisms at the molecular structural level is crucial for designing new pharmaceuticals. In this course, students learn the measurement principles of various spectroscopic and diffraction methods used for molecular structure analysis, deepening their understanding of techniques for analyzing the structures of diverse molecules ranging from small molecules like drugs to large molecules like proteins. Furthermore, students learn about the close relationship between the function and structure of molecules that make up living organisms, such as proteins and nucleic acids, and acquire the ability to think about the functional expression of biomolecules and its regulation by drugs at a molecular structural level.

Health Chemistry 1

In order to maintain and promote human health and prevent disease, health chemistry as a research field focuses on understanding the nutrients essential for human health and developing strategies to protect people from various types of stress, such as environmental stress, chemicals, and drugs. Its key research themes evolve in response to contemporary needs. This course aims to deepen students' understanding of nutrient digestion and absorption, energy metabolism, the pharmacokinetics of chemical substances, chemical toxicity, as well as chemical safety assessment and regulation.

Advanced Organic Chemistry 1,2

This course provides an in-depth study of reaction chemistry and synthetic strategies essential to modern organic synthesis and drug discovery. Students will learn reaction principles based on the electronic structures and bonding characteristics of main-group elements, as well as those related to the structure and bonding of transition metals. Furthermore, students will learn the fundamentals of retrosynthesis based on these principles and develop the ability to rationally design and construct target molecules.

Organic Reaction Chemistry

This course provides an in-depth study of organometallic chemistry reactions and organic reactions utilizing non-metallic heteroatoms. Students will broadly explore the chemistry of organometallic compounds and heteroatoms, gaining a profound understanding of their utility in organic synthesis.

Radiochemistry

In this course, students acquire a precise understanding of fundamental knowledge related to radiation and radioisotopes, master the techniques required for their handling, and study the characteristics, manufacturing methods, management practices, and applications of radiopharmaceuticals used in nuclear medicine diagnostics.

Medicinal Chemistry / Drug Discovery Chemistry

From the history of drug discovery to current advanced drug research, in this course, students learn the drug discovery process required to advance drug candidate compounds to clinical trials. This includes screening for hit compounds, structural development, and patent acquisition. Additionally, students learn about the functions and structural characteristics of drug target molecules, study the mechanisms of action through which drugs bind to and function on target molecules at a molecular level, and acquire fundamental knowledge essential for drug discovery based on representative drug development case studies.



Immunology

The essential concept of Immunology is the recognition of self and non-self. The primary objective of this course is to understand the mechanisms for distinguishing between countless foreign substances (non-self) and self, as well as the mechanisms for repertoire making of immune receptors. In this course, students learn fundamental concepts related to immunity, including immune cells, antibodies, the complement system, and cytokines. They will also understand the pathophysiology of various diseases caused by immune disorders, such as allergies, autoimmune diseases, and immunodeficiencies from the aspects of immune system and immune cells.

Environmental Health Sciences, Food Hygiene and Safety (Environmental Health Sciences is a subject in Basic Educational Subjects)

Contributing to the maintenance and promotion of health and the prevention of disease is one of the important tasks for those with a background in pharmacy. In this course, students deepen their understanding of chemical substances and microorganisms that can affect human health, in addition to learning about the impact of lifestyle habits on health and disease prevention measures. Students examine the properties and toxicity of environmental pollutants, the uses and characteristics of food additives, natural toxins found in plants and animals, and bacteria responsible for food poisoning. Furthermore, the course provides an overview of global environmental issues such as global warming and depletion of the ozone layer.

General Training in Physical Chemistry

Training in Analytical Chemistry: This training provides practical experience of quantitative analysis utilizing chemical equilibrium reactions, which are essential for pharmaceutical quality control. Students acquire the fundamental theories and techniques of quantitative analysis required across various life science fields, including the pharmacokinetics of drugs and biological components.

Training in Physical Chemistry: The objective of this training is to master experimental methods by studying fundamental physical and chemical methods that are applied in pharmaceutical research such as spectroscopy and electrochemical methods and understanding their principles.

General Training in Organic Chemistry 1, 2

This course provides a multifaceted approach to organic compounds, as students study their synthesis while also deepening understanding of reactions. Students acquire basic techniques for organic chemistry experiments essential for synthetic chemistry, along with safe handling practices for reagents and equipment.

General Training in Life Sciences

Grasping life phenomena at the molecular level, this course teaches methodologies for understanding biological phenomena at the molecular level and the biochemical mechanisms of drug action. Students learn how to handle procedures for biological samples, cells, and microorganisms and acquire fundamental techniques in biochemistry and molecular biology.

General Training in Biopharmacy and Pharmacy Practice

In this course, students acquire the necessary skills by gaining an understanding of the mechanisms of action of pharmaceuticals used in clinical settings and their efficacy evaluation methods, the detoxification response to drug toxicity and analytical techniques for gene polymorphisms of detoxification metabolic enzymes, and the design and analysis methods for pharmaceutical administration.

Advanced Educational Subjects

Department of Pharmaceutical Sciences

The advanced educational subjects are taken in the sixth semester. Students learn the fundamentals required to become researchers and technical experts in pharmaceutical sciences.

Natural Products Chemistry 2 (Also offered as a course in the Department of Pharmacy)

Natural products produced by plants and microorganisms have made substantial contributions to the development of numerous pharmaceuticals. Moreover, natural product chemistry is a rapidly advancing field in which progress in genomic analysis technologies and synthetic biology has greatly deepened our understanding of the biosynthesis of natural products.

In this course, students will study the biosynthesis of representative natural products from the perspectives of genes, enzymes, and organic reactions. Furthermore, by incorporating examples of cutting-edge research, the course will explore future directions for next-generation natural product-based drug discovery.

Bioorganic Chemistry (Also offered as a course in the Department of Pharmacy)

In this course, students study the applied chemistry of organic substances directly relevant to human health in relation to pharmaceuticals. This includes nutrition chemistry, cosmetic chemistry, fermentation chemistry, food chemistry, pesticide chemistry, medical materials chemistry, and polymer chemistry.

Introduction to Clinical Medicine (Also offered as a course in the Department of Pharmacy)

Students learn medical concepts and study the interdisciplinary areas between medicine and pharmaceutical sciences. Specialists in various fields – including hematology, rheumatology and collagen diseases, metabolism and diabetes, geriatrics, surgery, otorhinolaryngology, ophthalmology, cardiology, respiratory diseases, gastroenterology, nephrology and hypertension, endocrine diseases, reproductive medicine, infectious diseases, and palliative medicine – will explain disease diagnosis, pathogenesis, pathology, and drug therapy.

Digital Pharmacology (Also offered as a course in the Department of Pharmacy)

In order to elucidate how drugs act on the body, a well-structured research plan and appropriate experimental and data analysis methods are essential. In this course, which builds on a foundation of basic knowledge in pharmacology, students will gain hands-on experience with the experimental techniques and data analysis methods used in actual research settings. Furthermore, through practical exercises, students will learn how to summarize their findings into a research paper and how to present their results clearly and effectively.

Drug Design and Development (Also offered as a course in the Department of Pharmacy)

In drug development, it is critically important to appropriately evaluate the pharmacokinetics and toxicity of candidate compounds selected through pharmacological screening and non-clinical studies using experimental animals, in order to ensure their safety and efficacy in humans. Furthermore, even after market approval, continuous monitoring and evaluation of adverse effects through post-marketing surveillance are essential. In this course, students will learn the fundamentals of pharmacokinetics and toxicity relevant to drug development. In addition, through lectures delivered by researchers from pharmaceutical companies, students will gain an understanding of the overall process and current practices of new drug development. The course also covers regulatory science, including the approval and application processes for pharmaceuticals, as well as systems for post-marketing surveillance.

Diagnostic Imaging Pharmacology (Also offered as a course in the Department of Pharmacy)

Students learn about various radiopharmaceuticals used in clinical diagnosis, covering everything from their manufacturing and preparation methods to their applications in diagnostic imaging. This course aims to provide an understanding of the principles and applications of molecular imaging. Particular emphasis will be placed on detailed introductions to the latest radiopharmaceuticals for PET (positron emission tomography).

Advanced Training in Pharmaceutical Sciences

During the training, students acquire the ability to accomplish research projects by organically integrating their practical knowledge and fundamental experimental techniques learned in the basic educational subjects. The practical training involves a research topic assigned to every student by the faculty members in their assigned field.

Advanced Educational Subjects

Department of Pharmacy

Through the advanced educational subjects, students acquire specialized knowledge and attitudes related to medical pharmacy from the sixth to the eighth semester.

Pharmaceutical Statistics

Statistics are utilized across various fields as a method for making objective and accurate judgements. Within medicine, it serves numerous purposes including evaluating drug efficacy, developing pharmaceuticals, and verifying diagnostic accuracy. This course covers the fundamentals and applications of medical statistics, equipping students with practical statistical skills.

Health Chemistry 2

In order to maintain and promote human health and prevent disease, health chemistry as a research field focuses on developing strategies to protect people from various types of stress, such as environmental stress, emerging infectious diseases, and drugs. Its key research themes evolve in response to contemporary needs. This course aims to deepen students' understanding of the pathogenesis and prevention of infectious diseases caused by microorganisms, immunity and food allergies, as well as the epidemiology and prevention of lifestyle-related diseases, such as cancer, cardiovascular disease, and diabetes.

Infectious Diseases

To understand infectious diseases, it is necessary to comprehend the properties of both the host and the microorganism, learn the progression of disease establishment as manifested in their mutual relationship, and understand the environmental factors involved. This course provides an understanding of infectious disease-causing pathogenic microorganisms from their morphology, classification and characteristics, to the practical aspects of chemotherapy and infection prevention.

Pathology

Knowledge of pathology is essential to understanding the various diseases subject to drug therapy. Moreover, pathology is indispensable when considering drug toxicity and safety. In this course, specialists in both basic and clinical pathology deliver lectures to enable students to grasp fundamental concepts of human disease from a pathological perspective.



Genetics and Molecular Biology

This course explores the structure and function of chromosomes which house various genes, as well as chromosomal abnormalities, to help students understand heredity and genetic disorders at a macroscopic level. Students also examine the mechanisms of information transmission from the genome – where coding regions and gene expression occur – through to protein translation. Furthermore, students learn methods for identifying disease genes and study the genetic mutations and pathological mechanisms underlying several representative hereditary diseases.

Introduction to General Pathophysiology of Various Forms of Illness

Students learn medical concepts and study the interdisciplinary areas between medicine and pharmaceutical sciences. Specialists in various fields – including hematology, rheumatology and collagen diseases, metabolism and diabetes, geriatrics, surgery, otorhinolaryngology, ophthalmology, cardiology, respiratory diseases, gastroenterology, nephrology and hypertension, endocrine diseases, reproductive medicine, infectious diseases, and palliative medicine – will explain disease diagnosis, pathogenesis, pathology, and drug therapy.

Clinical Pharmacy Practice

This course examines the fundamental concepts, practical methodologies, and current practices essential for pharmacists working within healthcare settings where pharmaceutical products are administered, specifically hospital pharmacies and community pharmacies. The course draws upon real-world examples from university hospital pharmacy departments. Students also gain an understanding of the ethical responsibilities of pharmacists and risk management. The curriculum covers medication counselling, patient care, and prescription queries, alongside knowledge of social security systems and pharmaceutical economics.

Medical Informatics

To enhance the quality of healthcare, both patients and healthcare staff must utilize medical information appropriately. This course covers medical information obtained throughout the process from drug development to clinical use. Students study methods for collecting, processing, and providing medical information necessary for collaboration with healthcare staff and for patient guidance. They further gain an understanding of how to utilize this medical information to optimize drug therapy.

Kampo Medicine

This course teaches the characteristics of kampo medicine and its unique foundational concepts such as "sho" (diagnosis), as well as precautions for kampo prescriptions and kampo medicines. Furthermore, students study the key functions of each crude drug and its active constituents within the therapeutic effects of Kampo medicines. Additionally, they learn about the considerations required when prescribing Kampo medicines alongside western medical treatments.

Clinical Pharmacology

In recent years, the variety of pharmaceuticals has diversified, including the development of biopharmaceuticals. In this course, specialists from hospital pharmacy departments, clinical pharmacology, and clinical medicine will provide an overview of drug therapy from a medical perspective in addition to an overview from a pharmaceutical perspective aimed at drug discovery applications.

Pharmacotherapeutics 1-3

In this course, students familiarize themselves with the theoretical and practical aspects of pharmacotherapy from a disease perspective through exercises and practical examples and explore future prospects for pharmacotherapy. Pharmacotherapy 1 covers hematological and hematopoietic disorders, malignant tumors, otorhinolaryngologic diseases, eye diseases, infectious diseases, neurological and muscular disorders, and psychiatric disorders as target diseases. Students will learn the purpose, rationale, methods, dosage, and expected effects of the drugs used. Pharmacotherapy 2 covers bone and joint diseases, respiratory and thoracic diseases, allergic and immunological disorders, skin diseases, organ transplantation, and general anesthesia. Pharmacotherapy 3 covers cardiovascular diseases, renal and urological diseases, endocrine and metabolic diseases, and gastrointestinal diseases.

Clinical Laboratory Medicine

The role of clinical laboratory testing in medical practice lies in objectively capturing the physiological changes that occur because of disease states in various conditions, thereby serving as a basis for diagnosis or as an indicator for treatment. Furthermore, understanding clinical laboratory tests is also crucial for comprehending the pathophysiology of diseases. In this course, students examine the role of clinical laboratory tests in understanding the pathophysiology of various diseases, whilst considering their relationship with tailored drug therapy that accounts for genetic, age-related, physiological factors and complications.

Clinical Pharmaceutics

In clinical pharmacotherapy, understanding the pharmacokinetics of drugs and determining the appropriate dosage and dosing interval is of paramount importance. Clinical pharmacology builds upon the fundamental knowledge acquired in pharmacology, aiming specifically to understand the factors influencing pharmacokinetic variability in humans and to comprehend the principles of dosage design theory.

Personalized Medicine

Even with the same diagnosis and prescription, the efficacy of medication and the risk of side effects can vary significantly depending on each patient's individual background (age, kidney and liver function, concomitant medications, etc.). In this course, students learn how to analyze data such as prescription information and clinical laboratory values to propose prescriptions tailored to each patient's specific needs.

Pharmaceutic Laws 1, 2 (1 is also offered as a course in the Department of Pharmaceutical Sciences)

Pharmacy students learn about of the Pharmacy Act, the Act on Securing Quality, Efficacy and Safety of Products Including Pharmaceuticals and Medical Devices, other pharmaceutical-related regulations and hygiene-related regulations, which are essential for their future social activities as pharmacists.

Advanced Medical Science

In this course, students will systematically study the latest trends in advanced medical technologies – such as those for malignant tumors, pediatric genetic disorders, and hereditary eye diseases – based on genomic medicine and personalized medicine. Furthermore, students will deepen their understanding of future-oriented medicine utilizing biobanks, and cultivate the comprehensive perspective and practical skills necessary to lead the next generation of healthcare.

Clinical Communication Skills

In this course, students learn how through dialogue with patients, residents, and other healthcare professionals, they can improve their understanding of the other person's psychology, position, and environment. This enables them to formulate treatment plans based on each patient's symptoms and examination findings and to present specific prescription examples.

Pharmaceutical English

Pharmaceutical English is essential for acquiring advanced knowledge and information in the field of pharmacy from an international perspective, and for facilitating global information exchange from a professional standpoint. This course teaches terminology and expressions used in the specialist field, whilst honing the skills required for international communication.

Advanced Training in Pharmacy 1, 2

Through organically integrating the practical knowledge and fundamental experimental techniques acquired in the practical trainings of the basic educational subjects, students develop the ability to accomplish research projects. In practical sessions students are assigned topics by the faculty members in their field of study.

On-site Training Subjects

Department of Pharmacy

In the fourth year, introductory education for pharmacy and hospital placements is provided through General Training in Biopharmacy and Pharmacy Practice 1 & 2 and the Basic Training in Biopharmacy and Pharmacy Practice. Furthermore, through the participatory "Community Pharmacy-based Clinical Clerkship" and "Hospital-based Clinical Clerkship" in the fifth year, students acquire the fundamental knowledge, skills, and attitudes required of a pharmacist.

General Training in Biopharmacy and Pharmacy Practice 1

In preparation for the practical placements in medical pharmacy, namely the "Community Pharmacy-based Clinical Clerkship" Placement and the "Hospital-based Clinical Clerkship" Placement, students must first pass the Computer-Based Test (CBT) for knowledge assessment. In General Training in Biopharmacy and Pharmacy Practice 1, students review and refine the fundamental knowledge required for practical placements through practice-oriented exercises designed to mirror the CBT format.

General Training in Biopharmacy and Pharmacy Practice 2

Prior to undertaking the "Community Pharmacy-based Clinical Clerkship" Placement and the "Hospital-based Clinical Clerkship" Placement, students undergo an Objective Structured Clinical Examination (OSCE) to assess whether they have acquired the skills and attitudes required for interacting with actual patients. In General Training in Biopharmacy and Pharmacy Practice 2, students learn the fundamental skills and professional conduct required in clinical settings beyond purely academic knowledge through practical exercises designed to prepare them for OSCE-style assessments.

Basic Training in Biopharmacy and Pharmacy Practice

In this training, students acquire the fundamental knowledge, skills, and attitudes required for pharmacist duties to participate in healthcare and health insurance services and pave the way for the next generation. The training covers the dispensing and compounding of drugs, medication counselling, and other core responsibilities within the university setting to prepare the students for their pharmacy practice placements in community pharmacies and hospital settings.

Community Pharmacy-based Clinical Clerkship

To understand the social role and responsibilities of pharmacies and become capable of participating in community healthcare, students undertake practical training (hands-on learning) in pharmacies. Through this training, students acquire fundamental knowledge, skills, and attitudes regarding insurance drug dispensing, the supply and management of pharmaceuticals, providing information, health consultations, and interactions with medical institutions and the local community.



Hospital-based Clinical Clerkship

The practical training (hands-on learning) in hospitals helps students understand the duties and responsibilities of hospital pharmacists and enables them to participate in team-based healthcare. Through the training students acquire the fundamental knowledge, skills, and attitudes required for pharmacist duties, including dispensing and compounding medicines, and providing medication counselling.



Researcher Educational Subjects

Practice in Pharmaceutical Sciences (Department of Pharmacy only)

As the culmination of a six-year pharmacy degree program, students undertake practical exercises in preparation for the Japanese National Examination for Pharmacists, to become practicing pharmacists equipped with advanced specialist knowledge that meets the standards required of healthcare professionals.

Research Training

In the Department of Pharmaceutical Sciences, students undertake a graduation research project (individual research project) spanning one and a half years during their third and fourth years. In the Department of Pharmacy, this project is undertaken during the fifth and sixth years. The individual research project is a unique topic assigned to each student. By taking on the challenge of grappling with an unfamiliar topic, students lay the foundations for becoming pharmaceutical researchers.





Graduate School of Pharmaceutical Sciences

Each year, many students graduating from our faculty proceed to postgraduate studies. Postgraduate entrance examinations encompass a wide range of selection processes, including general admission, special admission for international students, and special admission for working adults.

Our educational philosophy is to utilize pharmaceutical sciences to cultivate individuals capable of contributing to human welfare and development. To achieve this, postgraduate education is conducted in accordance with the following goals:

+ Our Educational Goals

We strive to train inventive pharmaceutical researchers and technical experts with extensive knowledge and skills across the pharmaceutical field and international competitiveness.

Our master's program builds upon the knowledge acquired during the undergraduate education at our faculty and enables students to further deepen their knowledge as well as gain

practical skills spanning from the discovery to the appropriate use of drugs.

Additionally, our doctoral program produces outstanding researchers by training them to independently advance cutting-edge drug discovery and clinical pharmacy research.



Characteristics

Our utmost emphasis is on cultivating individuals capable of leading future pharmaceutical research. This adheres to Tohoku University's traditional ethos of prioritizing creative research, which involves opening its doors widely to society and pioneering new academic fields. Our graduate school responds swiftly to the rapid advancement of life and medical sciences and the ever-increasing societal demand for

pharmacy. Furthermore, the Graduate School boasts unique features, like its location on a mountain surrounded by greenery overlooking Sendai, also known as the city of trees. Another feature are our well-equipped research facilities, such as Japan's largest medicinal plant garden. These features contribute to an environment where researchers can comfortably and freely concentrate on their work.

Education

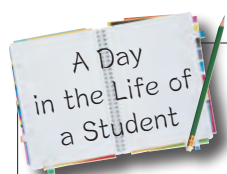
Our graduate school aims to cultivate researchers and technical experts equipped with original thinking and international competitiveness. With this goal in mind, we have established an educational framework that not only equips students with the fundamental knowledge required for pharmaceutical research but also develops the applied skills necessary to effectively utilize that knowledge. During the two-year master's program, students acquire knowledge across a broad spectrum of fields,

from drug discovery to their appropriate use. By participating in cutting-edge research within their respective specializations, they gain deep and wide-ranging knowledge and applied skills in pharmacy – the science that integrates matter, life, and healthcare. Furthermore, our doctoral course enables students to establish themselves as pharmaceutical researchers by proactively leading cutting-edge research.

Research

Our graduate school has produced researchers who have gone to receive prestigious awards such as the Japan Academy Prize, the Medal with Purple Ribbon, and the Asahi Prize, making significant contributions to the advancement of pharmaceutical science in Japan and worldwide. We continue to uphold and further strengthen this tradition. The level of scientific research funding per faculty member within the Graduate School of Pharmaceutical Sciences is exceptionally high even within

Tohoku University, which is a true testament to the vigor of our research activities. On top of this, we have established a flexible research environment that can respond swiftly to shifts in research trends, creating a framework for conducting research more effectively. We are blessed with an environment for conducting highly original research that we utilize to produce internationally acclaimed research outcomes on a daily basis.



A Day in the Life of a Graduate Student

9:00 ~ 12:00 Classes

In the classes, professors from various fields provide clear explanations of their respective research specialisms. I am highly interested in classes outside my own field, as they occasionally provide useful references for my own research. On days without lectures, I conduct my research.

13:00 ~ Research

I conduct experiments, study by reading academic papers, or summarize experimental results. I also prepare materials for upcoming internal research presentations or conferences.



22:00 Returning Home

12:00 ~ 13:00

Lunch

I have lunch with the other lab members at the university cafeteria. We sometimes discuss research, but mostly we engage in casual conversation unrelated to our work to refresh our minds.



18:00 Dinner

19:00 ~ 21:00

Research

I continue with my research. Lastly, I summarize my day's work and prepare for the following day.





Laboratory Overview



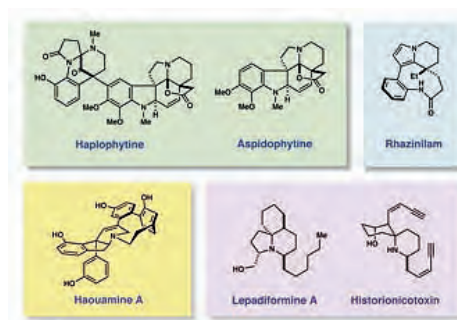
Molecular Pharmaceutical Science

Medicinal Chemistry

Prof. TOKUYAMA Hidetoshi

Pushing the boundaries of cutting-edge organic synthesis

Many of the pharmaceuticals currently in use are chemically synthesized organic compounds. Therefore, in order to develop new pharmaceuticals and ensure a stable supply to patients, the synthesis of organic compounds is one of the most important fundamental technologies in pharmaceutical development. Recently, as pharmaceutical structures have become increasingly complex, further advances in chemical synthesis are required. Our laboratory is conducting research to develop creative routes for synthesizing complex natural organic compounds that can serve as the seeds of pharmaceuticals. We are also working on the development of inhibitors of disease-related enzymes and antibody-drug conjugates that specifically recognize cancer cells.

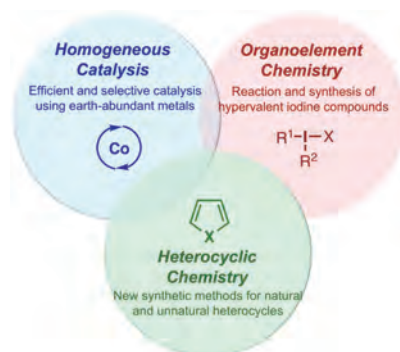


Organometallic Chemistry

Prof. YOSHIKAI Naohiko

Molecular design guided by element-centered reactivity

Synthetic chemistry offers a unique opportunity to design and create organic molecules that have never existed on Earth and to realize specific functions as pharmaceuticals, functional materials, and catalysts through precise molecular construction. The significance of this field continues to grow in response to societal demands for healthy longevity and sustainability. In our laboratory, we explore new concepts in molecular design based on transition-metal catalysis and main-group element chemistry, through both experimental and theoretical approaches. By developing efficient synthetic reactions and organic molecules with distinctive structures and properties, we aim to provide broadly applicable technologies relevant to drug discovery, process chemistry, and life sciences.



Synthetic Chemistry

Prof. IWABUCHI Yoshiharu

From serendipity to design: a challenge toward inevitability

Medicines were once shrouded in mystery, discovered by chance and passed down through generations. With the advent of methods to create organic compounds by human hands – namely, the birth of organic synthetic chemistry – humankind acquired the ability to design and produce medicines, leading to remarkable advances in pharmaceutical sciences. Among the chemical sciences, synthetic chemistry, and organic synthesis in particular, can be regarded as the disciplines that most fully express human creativity. Although the development of new medicines still requires many years of research, further advancement in organic synthesis is anticipated to be pivotal for the effective development of excellent new medicines.

In our laboratory, we focus on the stereocontrolled synthesis of bioactive substances, specifically the development of efficient assembly strategies for useful compounds. Through this work, we aim to establish genuinely effective synthetic methodologies that contribute to the discovery of new medicines and the advancement of life sciences.

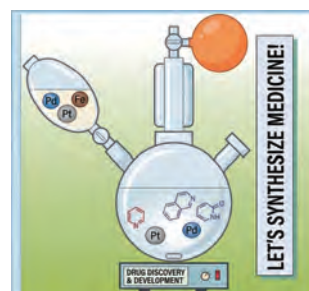


Heterocyclic Chemistry

Prof. DOI Takayuki

Middle molecule drug discovery

We focus on middle-sized molecules as pharmaceuticals as a promising alternative to conventional small-molecule drugs and macromolecule drugs such as antibodies. In particular, middle-sized molecules consisting of cyclic peptides achieve rich structural diversity and hold high potential for the development of unprecedented drugs. We are advancing research to identify seeds for drug discovery developing diversity-oriented synthetic methods that allow for efficient production of complex middle-sized molecules, followed by evaluation of their biological activities.



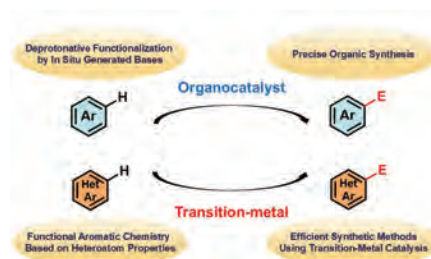
Molecular Transformation

Prof. SHIGENO Masanori

Catalytic reaction research for precise molecular transformation

The development of chemical technologies that enable efficient and controllable molecular transformations plays a central role in modern science and technology. Organic molecules in particular constitute a fundamental class of compounds that underpin pharmaceuticals, functional materials, and biologically relevant small molecules.

The establishment of innovative, general, and precise strategies for their molecular functionalization therefore represents a core challenge in contemporary synthetic organic chemistry. Our research group is engaged in the development of novel catalytic methodologies for organic synthesis. A primary focus of our work is the functionalization of carbon – hydrogen bonds in aromatic and heteroaromatic compounds – ubiquitous structural motifs that nevertheless remain challenging targets due to their inherent stability. By integrating organocatalysis and transition-metal catalysis, we design and develop efficient, environmentally benign, and precisely controlled catalytic transformations. Through this research, we seek to expand the range of accessible molecular architectures and to establish sustainable synthetic approaches.



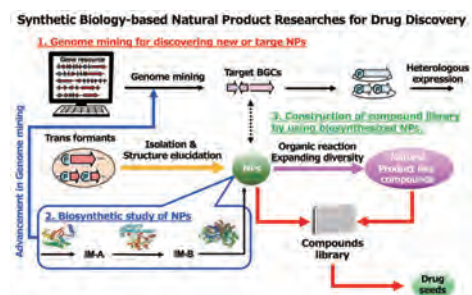


Natural Products Chemistry

Prof. ASAI Teigo

From genomic information to natural products and pharmaceutical leads

Living organisms biosynthesize natural organic compounds (natural products) that possess various chemical structures and biological activities. The functional beauty of natural products transcends human intellect and has played a vital role in the development of numerous pharmaceuticals. Natural products chemistry is a fascinating and highly adventurous field that leads to the discovery of new drugs. Our laboratory advances research into the expansion of natural product diversity through discovering novel natural products, constructing biosynthetic pathways for rare and valuable natural compounds, and expanding natural product diversity through combinatorial biosynthesis. We achieve all of this by deciphering and utilizing the genetic blueprints for natural products encoded within biological genomes. We strive to discover new pharmaceutical leads by pursuing natural product creation research that integrates tradition with cutting-edge technologies.

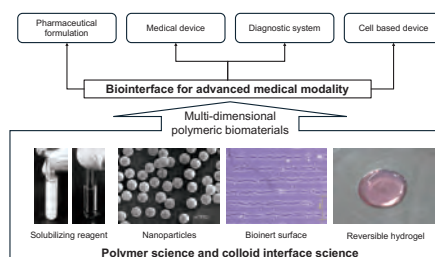


Biointerface Chemistry

Prof. KONNO Tomohiro

Exploring future-oriented medicine with advanced biointerfaces

Our laboratory conducts research on biointerfaces between biomaterials and living organisms, as well as on the development of pharmaceutical formulations and advanced medical devices. We conduct our research by creating biointerfaces grounded in polymeric biomaterials and colloid interface science, as well as elucidating the molecular science reactions occurring at these biointerfaces. This knowledge contributes to the innovation of pharmaceutical formulations and advanced medical devices, as well as the research on the development of current bioengineering fields. Biointerfaces that integrate with living organisms serve as a platform for pioneering new-era medical technologies, encompassing not only pharmaceutical formulations and advanced medical devices but also regenerative medicine, cell therapy, non-invasive medicine, and nanomedicine.

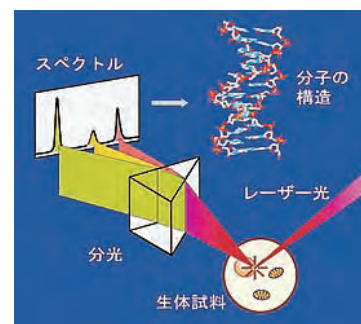


Bio-Structural Chemistry

Prof. NAKABAYASHI Takakazu

Revealing biological phenomena through precise control of light

In this laboratory, we manipulate various types of light, ranging from ultraviolet to infrared, to observe how biomolecules and proteins react inside cells. We also develop new optical methodologies to probe changes in protein structures and intracellular states. Advancing life science requires the development of cutting-edge measurement techniques capable of observing various biological phenomena. The optical techniques we develop aim to contribute to elucidating diverse physiological phenomena, understanding the functional expression of pharmacologically active compounds, and enabling cellular diagnosis and evaluation, including the detection of cancerous regions in medical applications.

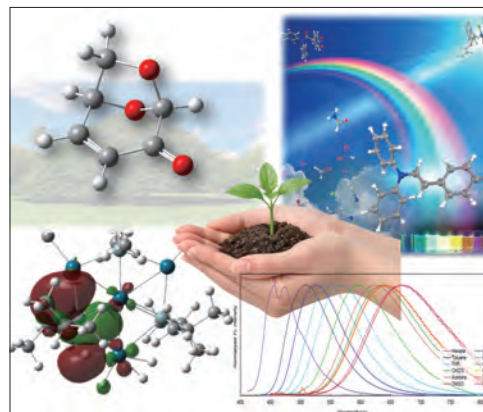


Green Chemistry

Prof. DOI Takayuki

Toward environmentally benign drug discovery

While pharmaceuticals play a crucial role in supporting our health, their synthesis often depends on limited petroleum resources and scarce precious-metal catalysts. At the laboratory of Green Chemistry, we pursue new strategies for sustainable drug discovery under the theme of 'Toward Environmentally Benign Drug Discovery'. Our research integrates the development of pharmaceuticals and biocompatible materials derived from biomass such as plants, the design of synthetic reactions that minimize the use of precious-metal catalysts, and molecular designs assisted by computational science. Through molecular-level structural analysis and prediction, we aim to maximize the potential of biomass-derived molecules and catalysts, enhance the intrinsic properties of compounds, and create diverse new functionalities.

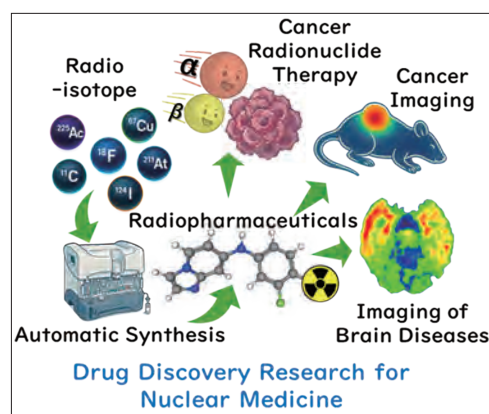


Radiopharmaceutical Chemistry

Prof. FURUMOTO Shozo

Advancing theranostics: from molecular design to clinical translation

Our laboratory focuses on developing radiopharmaceuticals that enable precision imaging and targeted therapy. We label molecules with specific radionuclides to design PET probes for cancer, neurodegenerative diseases, and primary aldosteronism, as well as targeted radiotherapeutics for cancer. Our integrated research approach, "from bench to bedside," encompasses everything from initial molecular design and radiosynthesis to preclinical evaluation and translational studies, pushing the boundaries of nuclear medicine.



Molecular Imaging, Pharmaceutical Science

Visiting Prof. ZHANG Ming-Rong

PET and SPECT are anticipated to achieve further significant advances as non-invasive molecular imaging techniques for living organisms. They are crucial for the development of novel, useful radiopharmaceuticals (labeled molecular probes). Our laboratory tackles the development of radiopharmaceuticals through a drug discovery approach by devising measurement principles suited to the biological function or target molecule under investigation, conducting molecular design of lead compounds and optimizing them further. One of our major objectives is to develop new molecular probes capable of detecting molecules and functions as well as their disruptions associated with stress defense systems. These systems play a crucial role in maintaining biological homeostasis. Additionally, we are working on the development of novel molecular probes for tumors that enable the assessment of malignancy, prediction of treatment response, and evaluation of therapeutic efficacy.





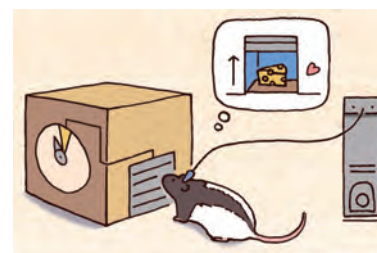
Life and Pharmaceutical Science

Pharmacology

Prof. SASAKI Takuya

Developing drugs through understanding neural circuits

Brain functions such as memory and emotion are constituted by the transmission of information through highly complex and intricate neural circuits. When these neural circuits cease to function properly, it can lead to mental disorders such as dementia and depression. Yet the precise targets for many therapeutic drugs to cure such disorders remain unclear. At this laboratory, we aim to identify the fundamental causes of these diseases and discover drug targets based on our understanding of neural circuits. In particular, we specialize in research techniques that involve recording and manipulating the activity of numerous brain cells in animals engaged in diverse behaviors, thereby analyzing the fundamental mechanisms of brain function from large-scale data. We also focus on the connections between the brain and peripheral nerves, investigating how the brain mediates information exchange between peripheral organs and influences mental functions.



Bio-analytical Chemistry

Prof. OE Tomoyuki

Understanding life phenomena

To understand life phenomena, analysis is essential. Recent advances in analytical science have been remarkable; for pure substances, analysis at ultra-low concentrations such as pg (10^{-12} g)/mL is no longer difficult. This is equivalent to dissolving a pinch (1 mg) in a competitive swimming pool (1000 tonnes of water). But what about biological samples? For example, if we filled the swimming pool with blood, it would contain 9 tonnes of salts, 80 tonnes of proteins, and various related compounds and metabolites. It is not easy to measure the minute concentration changes of substances that are constantly varying in the body. We believe that such minute structural alterations in minute biomolecules represent a valuable source of information for understanding life phenomena. This includes not only their potential as diagnostic and therapeutic markers, but also their ability to alter biological activity. As such, our research primarily targets chemical modifications (such as oxidation, glycation, and lipidation) on biologically active peptides and proteins directly related to disease.

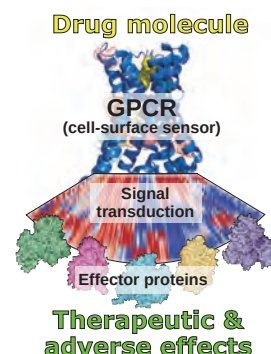


Molecular and Cellular Biochemistry

Prof. INOUE Asuka

Decoding how cells process information to develop new drugs

How do drugs produce their therapeutic effects? Of the more than 1,200 drugs currently approved for clinical use, roughly one-third act on a single family of proteins in the body. These proteins, known as G protein-coupled receptors (GPCRs), normally serve as sensors on the cell surface, relaying information about changes in the external environment into the cell. Drugs work by adjusting these sensors, restoring normal function to cells that disease has disrupted. Our laboratory investigates, at the molecular level, how drugs alter the sensing function of GPCRs. These insights help drive the development of drugs that are both more effective and safer.

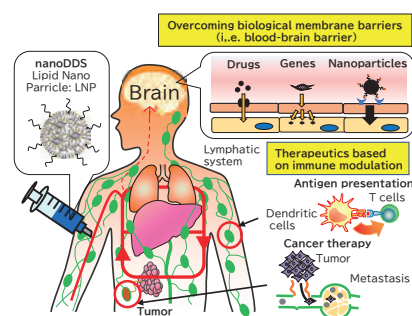


DDS Design and Drug Disposition

Prof. AKITA Hidetaka

Pioneering next-generation medicine through nanoparticle-based drug delivery

To maximize efficacy, medicines must reach their exact target organs. Yet, the body's natural defense mechanisms – biological membrane barriers – heavily restrict drug access, particularly to the brain. In addition, while our immune system is essential, its deregulation can obstruct cancer therapies and cause autoimmune disorders. In the laboratory of DDS design and drug disposition, we are tackling these hurdles by focusing on RNA and nucleic acid therapeutics. We engineer advanced lipid nanoparticles (LNPs) to ferry these molecules directly into specific intracellular compartments, pioneering new medical principles to regulate gene expression and immune responses within the body. Ultimately, our goal is to drive the creation of next-generation medicine, paving the way for safe and highly effective cancer vaccines and gene therapies.

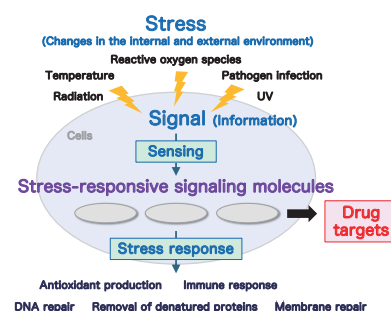


Health Chemistry

Prof. MATSUZAWA Atsushi

From elucidating the mechanisms of stress responses to drug discovery

Each cell within a living organism is constantly exposed to various environmental changes (various types of stress) such as temperature fluctuations, ultraviolet radiation, reactive oxygen species, and pathogens. Cells are able to survive by accurately sensing these various types of stress as information (signals) and responding immediately. Should this stress response mechanism stop functioning properly, it can lead to disease or death. By elucidating the mechanisms through which these stress signals are detected by specific molecules and converted into appropriate responses, we investigate the causes of diseases such as cancer, allergies, and organ dysfunction. Ultimately, this research directly leads to the development of drugs that target these signaling molecules for therapeutic purposes, thereby pioneering a new field of pharmaceutical science.





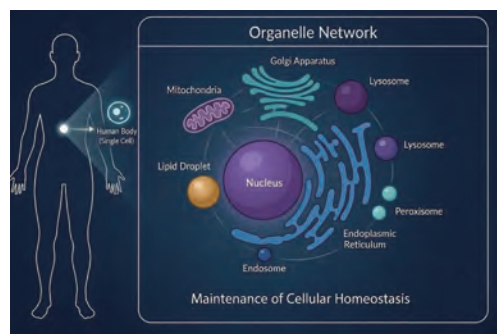
Biological Network Dynamics

Distinguished Assistant Prof. **SHIIBA Isshin**

Towards drug discovery: decoding life through organelles

The human body consists of tens of trillions of cells. Within these cells, organelles such as mitochondria and the endoplasmic reticulum play a crucial role in maintaining homeostasis. In each organ and tissue, the functions and development of specific organelles vary according to their respective roles.

In our laboratory, we elucidate at the molecular level how organelles interact within the cell, how they coordinate with each other, and how they differ from organ to organ. Based on this understanding, we research the molecular mechanisms underlying diseases related to organelle dysfunction and use these findings to identify new drug targets and develop treatment strategies.



Molecular Biology and Metabolism

Prof. **SAITO Yoshiro**

Creating pharmaceuticals through understanding the body's mechanisms

Our bodies are made of numerous elements. Among these are so-called trace elements that constitute less than 1% of the total mass of our bodies. Although they are only present in small quantities, trace elements play a vital role in maintaining our bodies in a constant state (homeostasis). Trace elements play a vital role in protecting our bodies from reactive oxygen species (ROS) and harmful substances. A reduction in their levels diminishes their protective effect which compromises health. Conversely, it has become clear that excessive levels of trace elements can exacerbate conditions such as diabetes, cancer, and brain disorders. We are conducting research to elucidate the effects of trace elements at the molecular level and to develop new therapeutic agents and preventive methods based on this understanding.



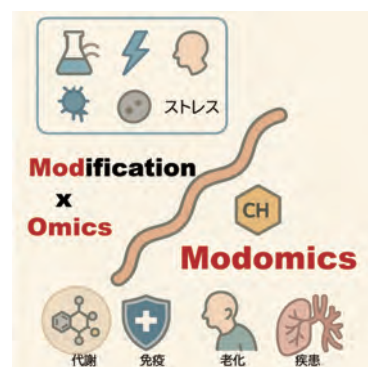
Laboratory of Molecular Biology and Metabolism,
Graduate School of Pharmaceutical Sciences, Tohoku University

Modomics Pharmacology

Prof. **WEI Fan-Yan**

Discovering drugs for age-related diseases from a Modification-Omics perspective

Various biomolecules within our body undergo dynamic chemical modifications caused by chemical, physical, and biological stresses from the external environment, or internal factors such as disease and ageing. Through these modifications, they gain new functions, thereby influencing cellular and organ functions. We have termed this comprehensive analysis of modifications "Modomics" (Modification + Omics). In our laboratory, we focus particularly on RNA modifications, conducting pioneering research into RNA Modomics and its relationship with physiological functions such as metabolism, immunity, and ageing, as well as human disease pathology. We aim to discover new drugs targeting Modomics-related diseases.

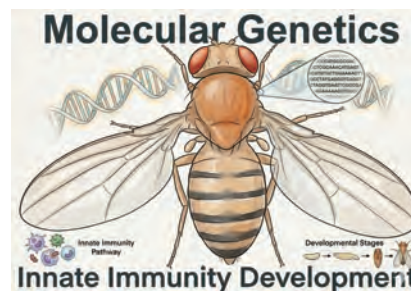


Molecular Genetics

Prof. KURATA Shoichiro

Investigating life functions as individual organisms

Pharmaceuticals affect the entire body. It is therefore necessary to understand the life phenomena occurring within an organism as a system to evaluate the efficacy of pharmaceuticals or develop drugs with novel effects. The key to understanding life phenomena lies within the principles underpinning life functions, which have been conserved through evolution and are common to all multicellular organisms. Our laboratory utilizes model organisms excelling in molecular genetics such as *Drosophila* to analyze the vital functions exhibited by multicellular organisms. Our primary focus is on innate immunity, development and regeneration. We aim to overcome infectious diseases and develop novel medical technologies through our research.



 Pharmacy

Clinical Pharmacology and Therapeutics

Prof. TAKAHASHI Nobuyuki

Integrating pharmacy and medicine to advance drug development

There are many diseases lacking effective drug therapies. Developing the drugs required in clinical practice requires a broad understanding of both pharmacy and clinical medicine.

Within this field, we develop disease models and utilize them to clarify the mechanisms of diseases in order to deliver more effective treatments to clinical settings as swiftly as possible. This includes drug discovery, testing efficacy and toxicity as well as clinical trials. Our laboratory primarily focuses on pregnancy-induced hypertension, kidney diseases, diabetes, and obesity. Ultimately, we aim to cultivate researchers capable of global engagement by leveraging a pharmacist's perspective, and to train pharmacists equipped with the skills and expertise to serve as integral members of clinical teams.



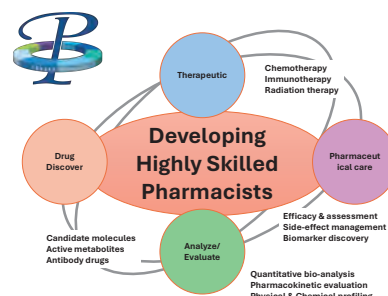


Oncology, Pharmacy Practice and Science

Prof. TOMIOKA Yoshihisa

Fighting cancer

The pathology of cancer varies from patient to patient, and there are individual differences in the therapeutic effects and the occurrence of side effects of drug therapy. The challenge lies within finding the most appropriate cancer treatment for each individual patient (including surgical therapy, chemotherapy, radiotherapy, immunotherapy, and supportive care). Our laboratory conducts research aimed at discovering and evaluating biomarkers useful for the individualization and stratification of cancer with the goal of developing future cancer therapies and therapeutic agents. We cultivate pharmacists specializing in pharmaceutical oncology who possess strong problem-identification and solving skills alongside proactive initiative. We train future pharmacists who will lead drug discovery research, pharmaceutical development, and the appropriate use of medicines in clinical settings, thereby contributing to cutting-edge personalized medicine and clinical research.



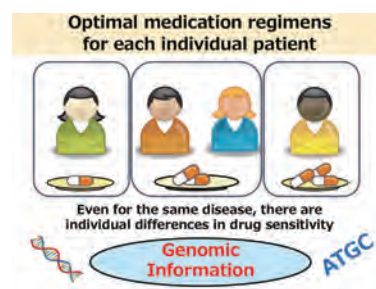
Pharmacogenomics

Prof. HIRATSUKA Masahiro

From genomic information to optimal personalized drug therapy

In pharmacotherapy, there are considerable interindividual differences in the pharmacokinetics of administered drugs, the magnitude of their therapeutic effects, and the incidence of adverse drug reactions. Factors influencing these differences include liver, kidney, and cardiac function; age; sex; circadian rhythms; diet; concomitant medications; and the use of health supplements.

In recent years, subtle variations in DNA sequences within the human genome, known as genetic polymorphisms, have emerged as an important contributing factor. By identifying individual differences in drug sensitivity based on genomic information, it is possible to implement personalized drug therapies tailored to each patient. Our laboratory aims to foster pharmaceutical researchers and pharmacists who can propose safer and more effective drug therapies by elucidating the relationship between individual differences in drug response and genomic variation at the molecular level.



Pharmacy Education and Research Center

Prof. TOMIOKA Yoshihisa

Training aspiring pharmacists and pharmaceutical scientists to pioneer the future of healthcare and society

Medicines are indispensable in today's society. Advances in science and technology have led to the development of drugs with proven efficacy and precise effects. Yet the current reality is that drug side effects, drug-related incidents and near misses still occur. Therefore, it is necessary that pharmacists and pharmaceutical scientists work alongside the public and patients to advance more effective and safer drug therapy. This Center is dedicated to identifying and resolving issues concerning drugs in contemporary society and healthcare. Based on practical experience as pharmacists, we research the individualization and optimization of drug therapy and are engaged in establishing regional collaborative systems for cancer chemotherapy. On top of this, we are developing educational programs to cultivate individuals with a problem-solving spirit who will lead future healthcare and pharmaceutical sciences.

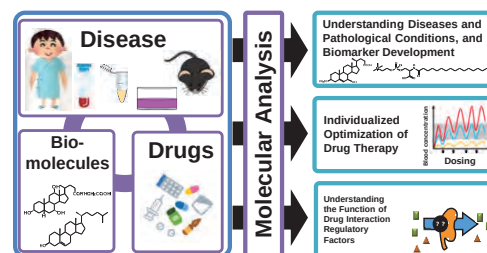


Biomolecule and Pathophysiological Chemistry

Prof. MANO Nariyasu

Practicing pharmacy in clinical settings

This laboratory, led by faculty members from the University Hospital's Department of Pharmaceutical Sciences, translates fundamental pharmaceutical research into clinical practice. In order to understand diseases and pathologies at the molecular level, develop disease biomarkers, and implement them clinically, we conduct clinical chemical research on in vivo biomolecules. This research is grounded in multi-omics studies utilizing clinical specimens and disease models. In addition, we are promoting research into the functions of drug interaction regulatory proteins such as drug-metabolizing enzymes and transporters, developing methods for measuring blood concentrations of drugs and metabolites, and conducting research on the individual optimization of drug therapy in clinical settings.

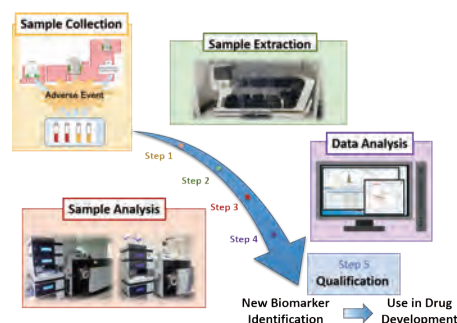


Drug Evaluation and Regulatory Science

Visting Prof. SAITO Kosuke

New approach methodologies for clinical drug safety evaluation

In our laboratory, we focus on the development of methodologies for the clinical safety assessment of drugs, with a particular emphasis on novel modalities, the development of which has advanced rapidly in recent years, utilizing a range of indicators, including biomarkers. Furthermore, to enable the effective application of these methodologies in drug development, we define and optimize their context of use and conduct comprehensive clinical and analytical validation studies for qualification. Through these research activities, we aim to foster expertise in regulatory science and to train professionals capable of contributing to drug development.





Post-graduation career paths

Department of Pharmaceutical Sciences

The Department of Pharmaceutical Sciences and the Department of Pharmacy were established in the academic year 2006. Since graduating its first cohort in the academic year 2009, the majority of graduates from the Department of Pharmaceutical Sciences have progressed to postgraduate programs at Tohoku University and elsewhere to acquire deeper and broader advanced techniques and cutting-edge knowledge for drug development research.

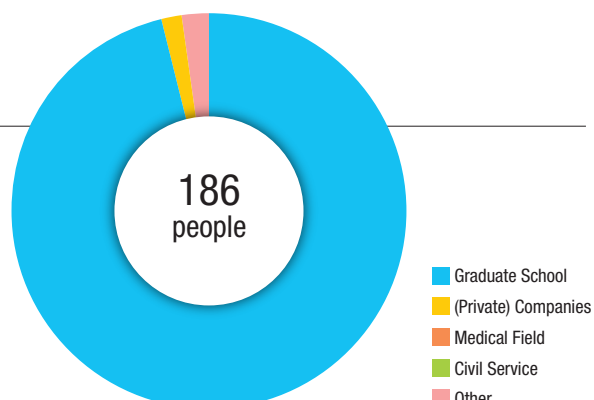
Career Paths

Continuation of Studies

Graduate School of Pharmaceutical Sciences, Tohoku University;
Graduate School of Science, University of Tokyo;
Graduate School of Pharmaceutical Sciences, Kyoto University; etc.

Entry into the workforce

The 77 Bank, Ltd., Nissin Kogyo Co.,Ltd., etc.



	2023	2024	2025	total
Graduate School	56	65	58	179
(Private) Companies	1	1	1	3
Medical Field	0	0	0	0
Civil Service	0	0	0	0
Other	2	0	2	4
Total	59	66	61	186

[people]

Post-graduation career paths

Department of Pharmacy

The Department of Pharmaceutical Sciences and the Department of Pharmacy were established in the academic year 2006, with the Department of Pharmacy graduating its first cohort in the academic year 2011. Graduates pursue careers as pharmacists in industry and hospitals, become medical technologists or take on similar roles. Additionally, some students advance to doctoral programs to pursue medical pharmacy research, developing into highly specialized pharmacists and researchers.

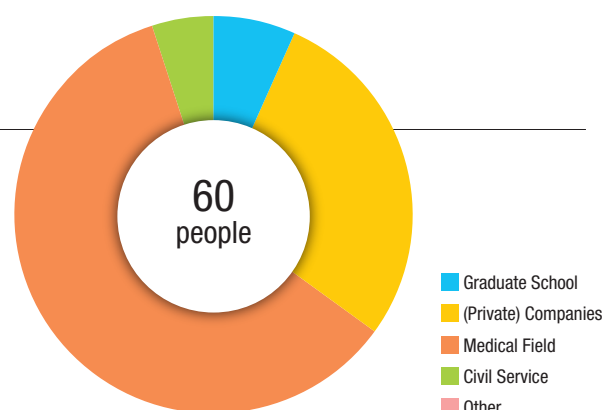
Career Paths

Continuation of Studies

Graduate School of Pharmaceutical Sciences, etc.

Entry into the workforce

Tohoku University Hospital, Pharmaceuticals and Medical Devices Agency (PMDA), NIHON CHOUZAI Co., Ltd., Daiichi Sankyo Co., Ltd., Asahi Group Foods, Ltd., etc.



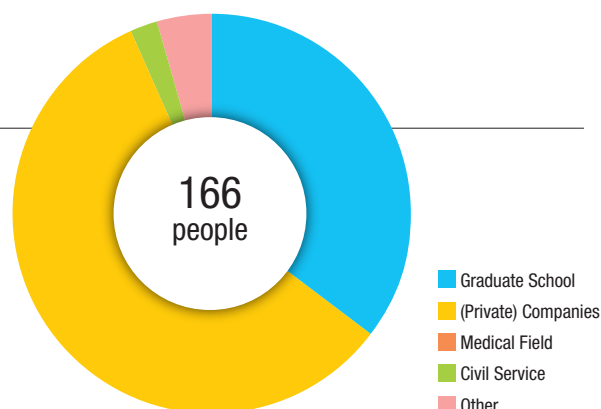
	2023	2024	2025	total
Graduate School	0	3	1	4
(Private) Companies	9	3	5	17
Medical Field	11	13	12	36
Civil Service	0	1	2	3
Other	0	0	0	0
Total	20	20	20	60

[people]

Post-graduation career paths

Master's degree (2-year program)

Graduates of the two-year master's program typically secure employment in companies within the pharmaceutical, cosmetic, chemical, textile, and food industries. The majority take up research positions, engaging in fundamental research aimed at developing pharmaceuticals and other products. Furthermore, many progress to doctoral programs to acquire more advanced specialized knowledge, skills, and capabilities. While universities and research institutions remain key employers, companies are increasingly seeking leading personnel possessing cutting-edge knowledge and technology. Consequently, the number of job openings for doctoral graduates is on the rise.



	2023	2024	2025	total
Graduate School	16	25	18	59
(Private) Companies	37	36	23	96
Medical Field	0	0	0	0
Civil Service	2	1	1	4
Other	3	1	3	7
Total	58	63	45	166

[people]

Career Paths

After completing the two-year master's course:

Continuation of Studies: Graduate School of Pharmaceutical Sciences, Tohoku University; Graduate School of Pharmaceutical Sciences, Kyoto University; etc.
Entry Into the Workforce: Chugai Pharmaceutical Co. Ltd., Daiichi Sankyo Co., Ltd., Kao Co., Otsuka Pharmaceutical Co., Ltd., Asahi Kasei Corp., Astellas Pharma Inc., Shionogi Co., Inc., Kyowa Kirin Co., Ltd., Megmilk Snow Brand Co., Ltd., etc.

After completing the three-year doctoral course:

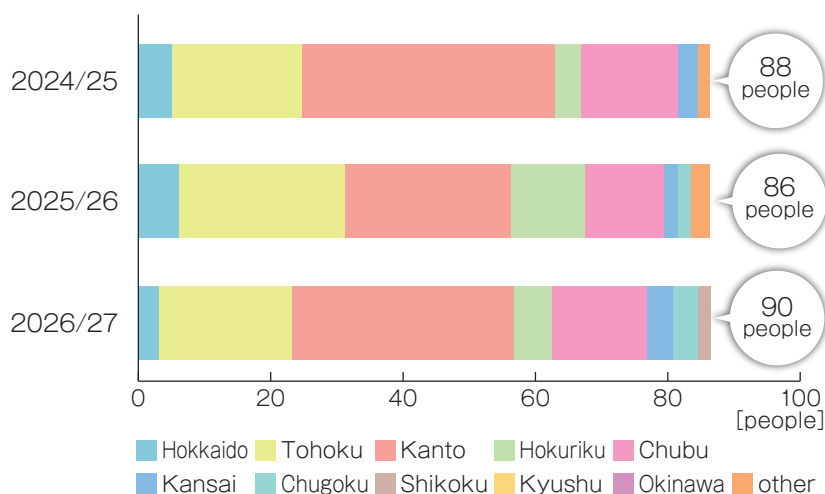
Companies: Ltd. Chugai Pharmaceutical Co. Ltd., Daiichi Sankyo Co., Ltd., Taiho Pharmaceutical Co., Ltd., Japan Tobacco Inc., Eisai Co., Ltd., Shionogi Co., Inc., etc.
Research Institutes: Tohoku University, University of Tokyo

After completing the doctoral pharmacy course

Japanese Red Cross Kyoto Daiichi Hospital, RESONAC, Tohoku University, etc.

Undergraduate students' places of origin

The graph shows the places of origin of incoming students to this faculty over the past three years. We welcome students from all across Japan. For the 2026 academic year, approximately 23% of incoming students are from the Tohoku region, and approximately 39% are from the Kanto region. Students from the Chubu and Hokuriku regions combined account for approximately 23%. While the numbers are smaller, students also enroll from regions west of Chubu and from Hokkaido every year.





Gateway College

In April 2027, Tohoku University will launch Gateway College, a new and innovative English-taught undergraduate program designed to nurture global leaders and creative thinkers. Gateway College provides what Tohoku University calls the “Student Journey,” a flexible educational model that allows students to shape their own academic paths according to their interests and goals. Instead of immediately entering a specialized field, students will first receive a broad liberal arts and interdisciplinary education before declaring their major from the third year onwards.

The Faculty of Pharmaceutical Sciences (Department of Pharmaceutical Sciences) is pleased to welcome up to five Gateway College students each academic year starting from their third year, providing them with the opportunity to pursue their studies in a dynamic and supportive learning environment.

■ Key Features

Immersion **Connect with the World’s Best and Broaden Your Perspective**

Study in a global learning environment and broaden your perspectives through lectures, hands-on classes, and global experiences that connect you with knowledge and cultures from around the world.

Inquiry **Ask Questions, Start Exploring**

Through an interdisciplinary curriculum that transcends traditional faculty boundaries, students choose their specialization after enrollment and engage in research and project-based learning from the early stages of their undergraduate studies.

Innovation **Deepen your Curiosity and Pave the Way for Graduate Research**

Through practical learning, exchange programs opportunities, and problem-solving projects, students gain valuable experience and build the ability to apply their knowledge in graduate studies and future research stages.

■ Eligibility

Tohoku University welcomes candidates who have graduated/completed or are scheduled to graduate/complete their high school education either in Japan or abroad, as well as those who have passed or are scheduled to take internationally recognized university admission examinations (e.g. IB, A Levels, Abitur, etc.) are eligible to apply.

All nationalities are welcome to apply. Prior educational background in the Japanese school system, or lack thereof, does not affect eligibility.

For more information, check out the website of the Tohoku University Admissions Center:
https://admissions.tohoku.ac.jp/en/admissions/undergraduate/gateway_college/

Admission Process for International Students

Undergraduate Programs

Degree courses taught in Japanese (Privately Financed International Students Entrance Exam)

Undergraduate programs at the Faculty of Pharmaceutical Sciences start in April and are in Japanese only. Those interested in becoming a student at our Faculty should apply via the Tohoku University Admissions Center.

Prospective international students should start preparing by undergoing the Examination for Japanese University Admission for International Students (EJU) in June or November of the previous year.

You can find more information about undergraduate admission on Tohoku University's website under the following link: https://www.tohoku.ac.jp/en/admissions/admission_undergraduate.html

Examination fee, admission fee, and tuition fees for undergraduate students at Tohoku University

Application Fee:	17,000 JPY
Admission Fee:	282,000 JPY
Tuition Fee:	900,000 JPY (per year)

*Fees apply from the 2027 Academic Year onwards. May be subject to change.

Graduate Programs

All graduate courses may be taken in English, except for the Clinical Pharmacy Doctoral Program (Doctoral Program in Pharmacy).

Admission Process

In general, international students interested in a master's or Ph.D. program are required to complete a six-month period as research students (= research student auditor) at the Graduate School of Pharmaceutical Sciences before enrolling. After this six-month trial period, they will have to pass the entrance examination to enroll in the graduate program.

What is a research student?

A research student engages in research activities under the supervision of an academic advisor at one of our laboratories for a six-months period before enrolling as a regular student. There are two main reasons for this trial period: 1) to make sure that the research interest of the student matches the research focus of the chosen laboratory before committing to a two- or three-year graduate program. 2) to make sure that the student can adjust to life in Japan.

How to become a research student

To become a research student, prospective students must contact the professor of their desired research laboratory directly and get preliminary approval. The contact information can be found on the homepage of the Faculty & Graduate School of Pharmaceutical Sciences.

Admission of research students is granted based on the student's qualifications and recommendation from the prospective supervisor. There is no written or oral examination.

Timeline for enrolling in a graduate program

For the Spring Semester:

Obtain preliminary approval by the end of June of the year preceding your intended enrollment → Enroll as a research student in October of the same year → Pass the entrance examination → Enroll in the graduate program in April of the following year.

For the Fall Semester:

Obtain preliminary approval by the end of December of the year preceding your intended enrollment → Enroll as a research student in April of the following year → Pass the entrance examination → Enroll in the graduate program in October of the same year.



Medicinal Plant Garden



Plants have been used in medical treatments throughout human history, and herbalism is still used widely today. New drugs are being developed using plant compounds as lead compounds. Furthermore, as seen with traditional Chinese medicine, where medicinal plants themselves are used as remedies, there is an extremely close relationship between medicine and plants. Tohoku University is home to Japan's largest medicinal plant garden, which contains approximately 1,200 plant species. These include important medicinal plants that are cultivated and preserved as well as tropical medicinal plants grown in greenhouses. These plants are utilized as educational resources for students and as research materials for the development of new pharmaceuticals.

Central Analytical Facility



The Central Analytical Facility is equipped with state-of-the-art analytical equipment. Specialized staff use the many instruments to analyze samples requested by our laboratories. There are also numerous instruments available for users to perform measurements themselves. To determine the structures of complex compounds, over 15 types of instruments can be utilized, including mass spectrometers, nuclear magnetic resonance (NMR) spectrometers, and circular dichroism (CD) spectrometers. Our equipment supports a wide range of research as it includes DNA sequencers, DNA synthesizers, automated nucleic acid extractors, amino acid analyzers, protein sequencers, peptide synthesizers, cell separation analyzers and image analyzers to study genes, proteins, and cellular functions.

Center for SPF Animal Research and Care



Pharmaceutical research has advanced alongside the remarkable progress that has been made in bioscience in recent years. The accumulation of knowledge in biosciences necessitates a wide range of animal experiments and demands highly accurate experimental data. Animal experiments are indispensable for developing new drugs and evaluating drug efficacy and safety. The Center for SPF Animal Research and Care was newly established in 2012 and is designed to house laboratory animals – primarily mice – in a clean environment. Animal experiments are conducted in strict compliance with the Regulations for Animal Experiments and Related Activities at Tohoku University, with full consideration for the dignity of life. This spirit is upheld through initiatives such as the establishment of a memorial monument for laboratory animals in 1975 – the first of its kind in Japan – and the annual observance of a memorial service for laboratory animals.

Research Center for Pharmaceutical Development

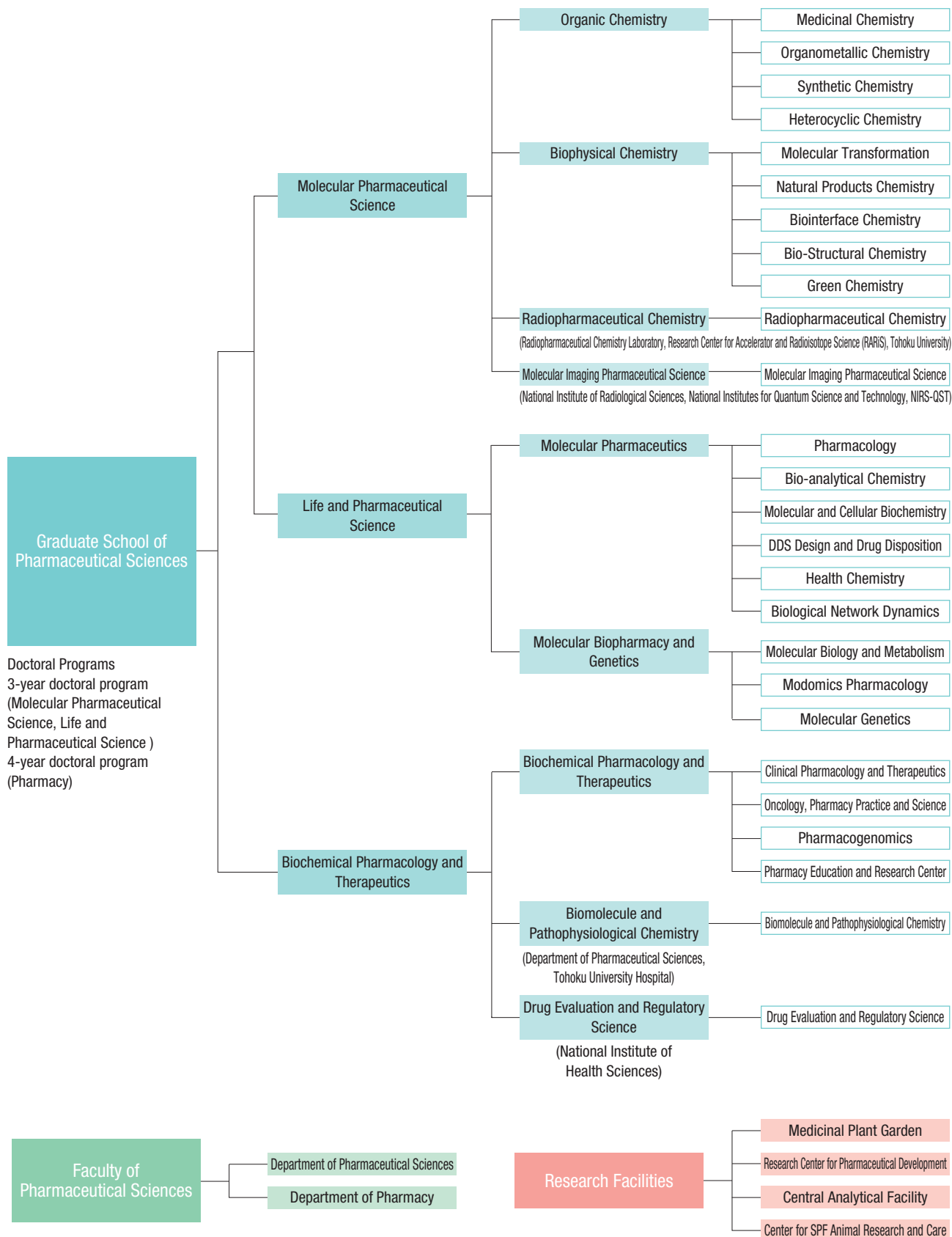


Organized in April 2019 as a hub to advance innovative drug discovery research originating from academia, the Research Center for Pharmaceutical Development (263 m²) was completed in April 2022. It supports drug discovery research by managing and operating Tohoku University's compound library, which contains over 7,500 compounds. As a shared facility, it provides a high-throughput screening room, a biological function analysis room, a cell analysis room and discussion spaces. This facilitates a comprehensive drug discovery research pipeline, ranging from high-throughput screening using robots and biochemical screening with advanced equipment to drug efficacy evaluation at the cellular and animal levels. Furthermore, two collaboration spaces serve as hubs for joint research with companies and other organizations.



Organization Chart

Faculty & Graduate School of Pharmaceutical Sciences





open campus

Open Campus

Every year, we welcome over four thousand visitors. It's an excellent opportunity to hear directly from current students and staff, so come and join us.

Dates	July 29th (Wed) & 30th (Thu) 2026
Entry	Wed: 9:30-15:30, Thu: 9:30-16:00
Opening hours	Wed: 9:30-16:00, Thu: 9:30-16:30
Venue	Lecture rooms, seminar rooms & laboratories of the Faculty of Pharmaceutical Sciences, Tohoku University.
Address	6-3 Aoba, Aramaki, Aoba Ward, Sendai City
Transportation	Sendai Subway Tozai Line From Sendai Station, take the Sendai Subway Tozai Line bound for Yagiyama Zoological Park and get off at Aobayama Station. Exiting from North Exit, it is a 10-minute walk to the Faculty of Pharmaceutical Sciences.



*We will also hold an online open campus event

You can look forward to:

- A general overview of the Faculty of Pharmaceutical Sciences, course content, career paths after graduation and the differences between departments
- A tour through the laboratories and the medical garden (Experience the places where research happens)
- Taster Session Classes (Conducted by Professors from the Faculty of Pharmaceutical Sciences)
- An overview of the current research conducted within the Faculty of Pharmaceutical Sciences

Voices of Participants (excerpts)

- >>> Since primary school, I've wanted to study Pharmaceutical Sciences. This open campus event has made my desire to enroll even stronger.
- >>> My son is a prospective student, so I was grateful that he could hear from current students who share his perspective.
- >>> I think the open campus is an engaging event that sparks interest and helps to define goals.
- >>> I thoroughly enjoyed experiencing various activities for myself, even to the extent of regretting that I haven't been more proactive in trying out more things before.
- >>> I gained a better understanding of the Faculty of Pharmacy and the entrance examinations and could also form a clearer picture of university life.



Access Guide



Access

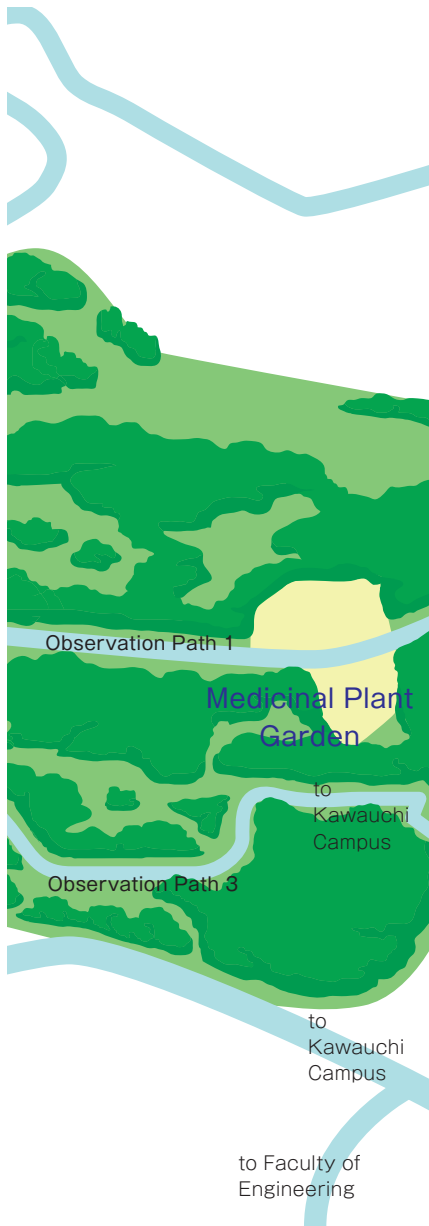
From Sendai Airport : Take the Sendai Airport Access Line to JR Sendai Station and then change to the Sendai Subway Tozai Line.

From JR Sendai Station : The most convenient way to reach Aobayama Campus is by subway. It costs approx. 1,800 JPY to take a taxi from Sendai Station.

■ Using the Sendai Subway Tozai Line

Take the Sendai Subway Tozai Line from Sendai Station to Aobayama Station. From there, it is a 10-minute walk to the Faculty and Graduate School of Pharmaceutical Sciences.

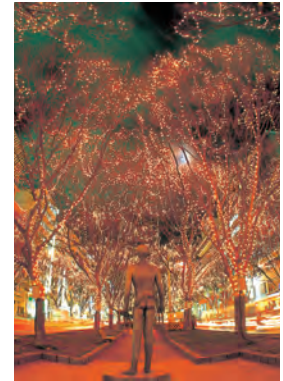
- 1 Large Lecture Hall
- 2 Education, Research & Administration Building A
- 3 Education & Research Building B
- 4 Education & Research Building C
- 5 Education & Research Building D
- 6 Medicinal Plant Garden Administration Building
- 7 Green House



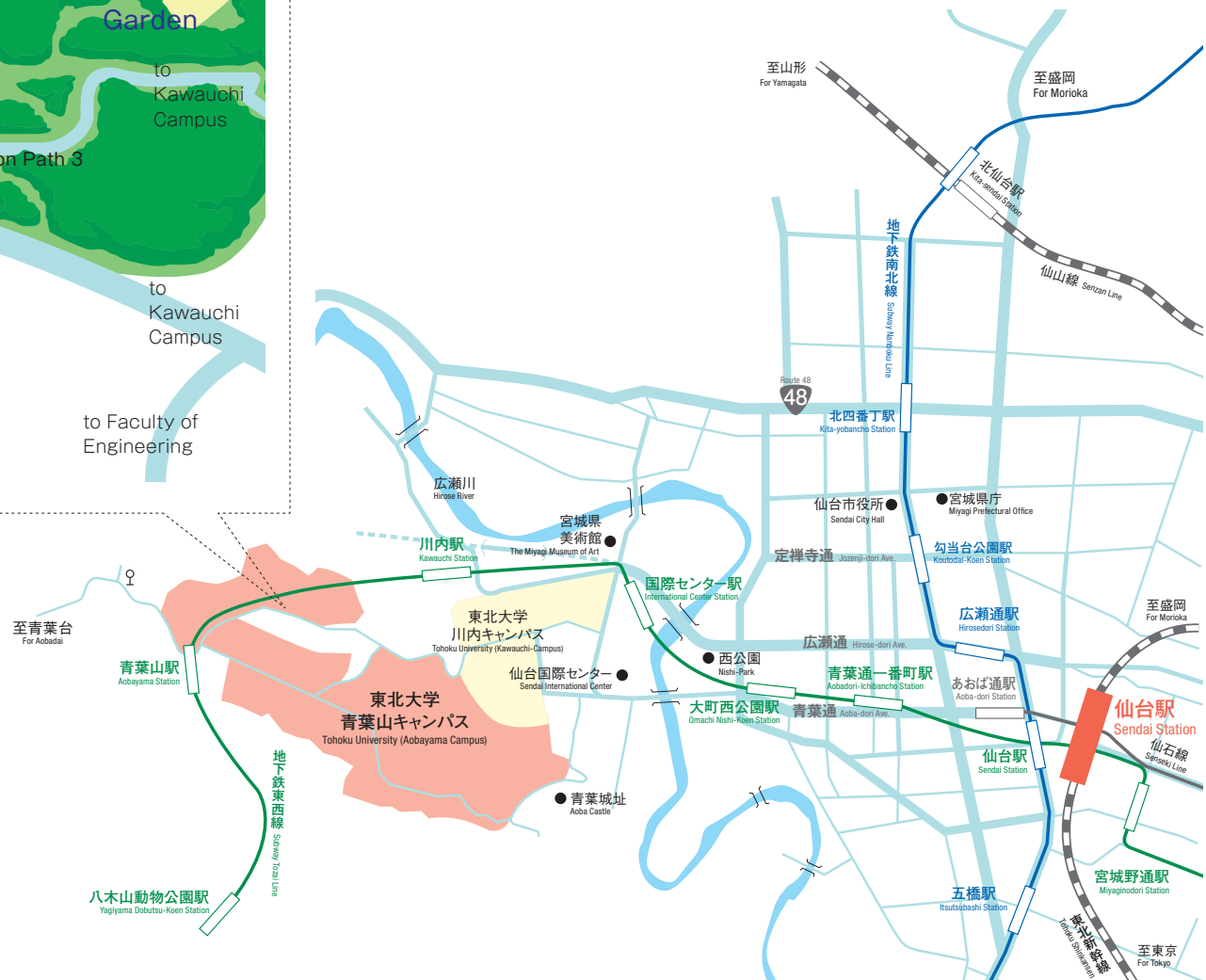
Aoba Castle Ruins



Sendai Tanabata Festival



仙台光のページェント





Faculty of Pharmaceutical Sciences

Graduate School of Pharmaceutical Sciences Tohoku University

Aoba 6-3, Aramaki, Aoba-ku, Sendai 980-8578, JAPAN

TEL 022-795-6803 FAX 022-795-6805

<http://www.pharm.tohoku.ac.jp>