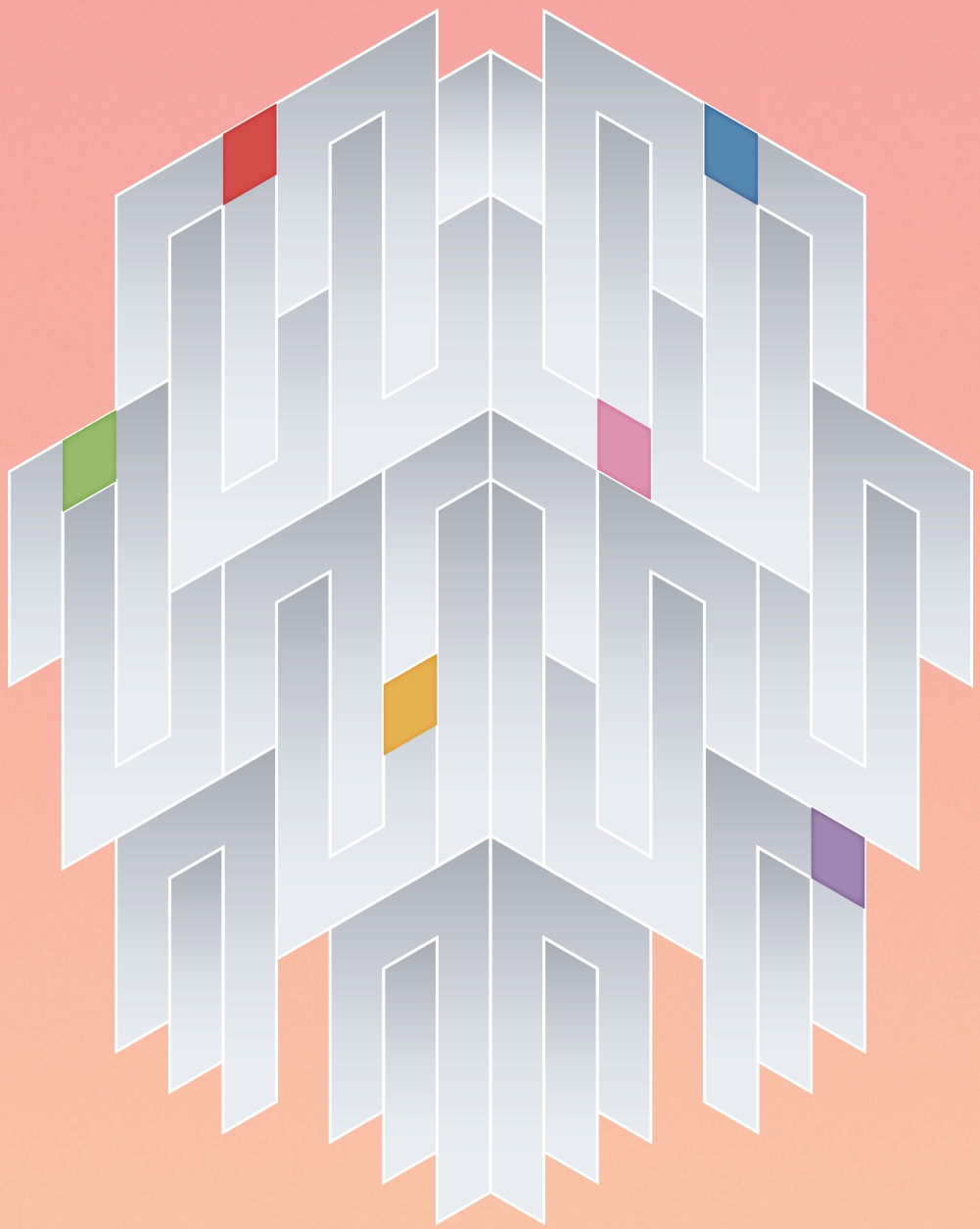


Brain Research Institute

NIIGATA UNIVERSITY

2024

新潟大學腦研究所

In the Age of Generative AI

A Perspective from the
Director of Brain Research Institute

Osamu Onodera

We've entered the age of generative AI, where the accumulation and summarization of knowledge is no longer an exclusive academic prowess or a special skill. Just as Google has revolutionarily democratized access to past knowledge, generative AI will democratize much of what was previously deemed academic. This democratization will likely lead to a significant transformation in the structure of academia, which has been built with the primary purpose of acquiring past knowledge, and in the mechanisms of professions that rely on it. Reconstructing knowledge will no longer be an exclusive task and will be open to all.

I believe this will bring about substantial changes in research as well. The significance of tasks such as literature reviews and comparisons of previous studies will likely diminish. The future is likely to see AI taking over in silico analysis using large-scale data. In such a scenario, our role will be simply to collect data. Collecting accurate data is fundamental to science, but this is not what we have aspired to be as scientists since childhood. Many of us, apart from a few scientists, may become mere data gatherers. This will demand a new employment and education system in the scientific community. However, there seems to be little sense of urgency about this in the research community. We need to urgently reassess science and research.

Scientific research is essentially the process of finding new things from nothing. The process involves struggles. Dr. Martin A. Schwartz, a professor at the University of Virginia at the time, remarked in a 2008 essay that "Science involves confronting our 'absolute stupidity'." He pointed out that research is immersion in the unknown, commenting, "We can't be sure whether we're asking the right question or doing the right experiment until we get the answer or the result." The path can be frustrating and full of errors, forcing us to face our own stupidity. He stated, however, "That kind of stupidity is an existential fact, inherent in our efforts to push our way into the unknown." He added that "One of the beautiful things about science is that it allows us to bumble along, getting it wrong time after time, and feel perfectly fine as long as we learn something each time." This statement connotes a sense of pride as a scientist.

Much of our work involves reconstructing knowledge. But in the age of generative AI, we must leave that to AI and continue to selflessly challenge ourselves to do something truly new, unknown to anyone, and yet seemingly foolish. This kind of work doesn't come with a roadmap or an exit strategy. We challenge because we don't have them. I believe that a research institute is a place where people with a spirit to keep challenging gather.

Schwartz emphasized in his essay that what a scientist should do is to make a transition "from learning what other people once discovered to making your own discoveries." This essentially aligns with the old saying "standing on the shoulders of giants."

I believe that only a limited number of people who can truly practice this kind of science as a profession. And yet, we need to do science education at a research institute as well. Regarding education, Schwartz stated that "the faculty committee pushes until the student starts getting the answers wrong or gives up and says, 'I don't know'." In his view, "The point of the exam isn't to see if the student gets all the answers right. If they do, it's the faculty who failed the exam." He continued, "The point is to identify the student's weaknesses, partly to see where they need to invest some effort and partly to see whether the student's knowledge fails at a sufficiently high level that they are ready to take on a research project."

Brilliance and the spirit of challenge are traits that are difficult to coexist with. Our institute aims to nurture brilliant scientists who will continue to take on this challenge. We will continue to provide an environment in which we put generative AI to full use in order to make associations with past knowledge to reach new understandings.

In this new environment, the inquisitive mind combined with the potential of generative AI will allow us to continue to explore the unknown and constantly build new knowledge. In that process, we experience failure, learn from it, and deepen our understanding. This is what a genuine scientist is, and this is the genuine power of learning.

This new challenge brings us redefine the role of scientists and build new knowledge that will be passed on to the next generation of scientists. The new knowledge will provide the basis for them to take on another challenges.

Our mission as scientists is grounded in such approach and commitment, which will be a beacon for prospective researchers. The process allows us pursue the essence of science, search for truth, deepen our knowledge, and develop our understanding of the world. This is the role that BRI is assigned to in the age of generative AI.
*Proofread by ChatGPT4.

Schwartz, M. A. "The importance of stupidity in scientific research." *J Cell Sci* 121, 1771–1771 (2008).

History

Since 1957

Research Facility of Neurosurgery at School of Medicine, the origin of Brain Research Institute is founded.

1967

Research Facility of Neurosurgery, School of Medicine is transformed into Brain Research Institute. Faculty of Morphology is renamed Faculty of Neuropathology.

1971

Brain Disorder Specimen Center is set up.

1977

New Brain Disorder Specimen Center opens. (531m^2)

1995

Reorganization results in BRI's new structure of 3 big branches: Basic Neuroscience Branch (Depts. of Molecular Neurobiology, Cellular Neurobiology, Neurophysiology, and Developmental Neurobiology), Pathological Neuroscience Branch (Depts. of Pathology and Molecular Neuropathology), and Clinical Neuroscience Branch (Depts. of Neurosurgery and Neurology). Brain Disorder Specimen Center is renamed Brain Disorder Analysis Center.

1996

Ultra-high Magnetic Field MRI Research Building opens. (251m^2)

1997

Monbusho's Center of Excellence (COE) program starts.

2002

Brain Disorder Analysis Center is transformed into 2 Centers: Center of Integrated Human Brain Science and Center for Bioresource-based Researches. The latter merges with Genetic Research Facility of Niigata University and Animal Testing Facility, School of Medicine.

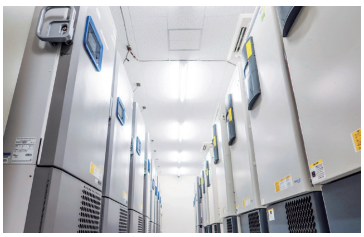
2003

Center for Integrated Human Brain Science (CIHBS) Building opens. (3,969m^2)
21st century COE program "Virtual University of Neuropathology" starts.

2006

CIHBS PET Building opens. (416m^2)

2008



Center for Bioresource-based Researches extension is completed. (200m^2)

2009

BRI is certified as a Joint Usage/Research Center by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). ("the Advanced Collaborative Research Center for Brain Diseases Utilizing Neuropathological Specimens", start date: April 1, 2010)

2016

BRI renews MEXT's certification on the Joint Usage/Research Center, which is renamed "Collaborative Research Center for Brain Diseases Utilizing Neuropathological Resources".

2022

BRI renews MEXT's certification on the Joint Usage/Research Center, which is renamed "The Collaborative Research Center for Neuropathological and Psychiatric Disorders".

Organization

As of July 1 2024

Basic Neuroscience Branch

Dept. of Brain Tumor Biology

Assoc. Prof.	Nobuyuki Takei
Assist. Prof.	Yuriko Iwakura
Assist. Prof.	Masayasu Okada

Dept. of Cellular Neuropathology

Prof.	Takayasu Mikuni
Assoc. Prof.	Motokazu Uchigashima
Assist. Prof.	Daisuke Satoh

Dept. of System Pathology for Neurological Disorders

Prof.	Kazuki Tainaka
Prof.	Masaki Ueno
Specially Appointed Prof.	Kohta Yoshida
Assoc. Prof.	Naoko Fujito
Assist. Prof.	Hitoshi Uchida
Assist. Prof.	Tokiharu Sato
Assist. Prof.	Takahiro Inoue
Assist. Prof.	Xinyi Liu
Assist. Prof.	Yuuki Ishita

Pathological Neuroscience Branch

Dept. of Pathology

Prof.	Akiyoshi Kakita
Assoc. Prof.	Hiroshi Shimizu
Assist. Prof.	Asa Nakahara

Dept. of Molecular Pathology

Visiting Professor	Koichi Wakabayashi
Visiting Assoc. Prof.	Fumiaki Mori

Clinical Neuroscience Branch

Dept. of Neurosurgery

Prof.	Makoto Oishi
Assoc. Prof.	Hitoshi Hasegawa
Assist. Prof.	Ryosuke Ogura

Dept. of Neurology

Prof.	Osamu Onodera
Assoc. Prof.	Masato Kanazawa
Assist. Prof.	Shintaro Tsuboguchi

Center for Integrated Human Brain Science

Dept. of Integrated Neuroscience

Assist. Prof.	Yukimi Nakamura

Dept. of Biological Magnetic Resonance

Prof.	Hironaka Igarashi
Assoc. Prof.	Kosuke Itoh
Assist. Prof.	Masaki Watanabe

Dept. of Functional Neurology & Neurosurgery

Prof.	Hitoshi Shimada
Assoc. Prof.	Yoshihiro Murakami
Assist. Prof.	Masahiro Hatakeyama

Center for Bioresource-based Researches

Bioresource Science Branch

Dept. of Molecular Genetics

Prof.	Takeshi Ikeuchi
Assoc. Prof.	Akinori Miyashita
Assist. Prof.	Kensaku Kasuga

Dept. of Comparative & Experimental Medicine

Prof.	Toshikuni Sasaoka
Assoc. Prof.	Nanaho Fukuda
Assist. Prof.	Kanako Oda

Dept. of Animal Model Development

Prof.	Toshikuni Sasaoka
Assoc. Prof.	Manabu Abe

Brain Science Branch

Dept. of Pathology Neuroscience

Prof.	Mari Tada
Assist. Prof.	Rie Saito

Dept. of Molecular Neuroscience

Prof.	Osamu Onodera
Assoc. Prof.	Taisuke Kato
Assist. Prof.	Yuka Mitsuhashi

Dept. of Neuroscience of Disease

Prof.	Hideaki Matsui
Assoc. Prof.	Ryuichi Hishida
Assoc. Prof.	Tomoyuki Yamanaka
Assoc. Prof.	Atsushi Sugie
Assist. Prof.	Godfried Dougnon
Assist. Prof.	Takayoshi Otsuka

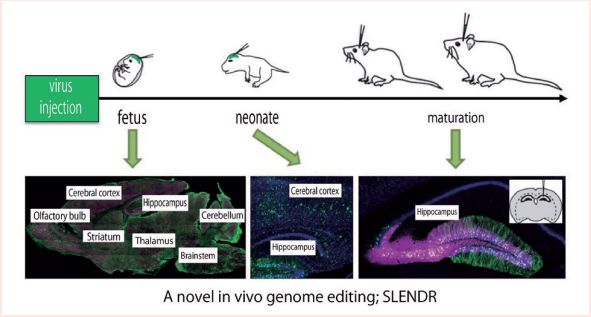
Endowed Research Branch

Advanced Tratment of Neurological Disease Branch

Specially Appointed Assoc. Prof.	Tomohiko Ishihara
Specially Appointed Assoc. Prof.	Manabu Natsumeda

Dept. of Cellular Neuropathology

Our goal is to understand the physiology and pathophysiology of the brain at the cellular and molecular levels. We established "SLENDR", a technique based on in vivo genome editing, to image endogenous proteins with high specificity, resolution and contrast in single cells in mammalian brain tissue (Cell, 2016). In addition, we recently developed "vSLENDR", a genome editing method to target virtually any cell-types, areas and ages across the brain, widely expanding the applicability of genome engineering technologies in the broad field of neuroscience (Neuron, 2017). Using "SLENDR" and "vSLENDR", we will explore the cellular and molecular mechanism underlying long-lasting memory, and further investigate how the mechanism is impaired in memory disorders to provide new therapeutic strategies.

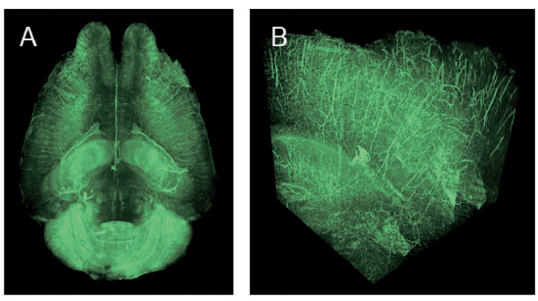


A novel in vivo genome editing; SLENDR

Prof.
Takayasu Mikuni

Dept. of System Pathology for Neurological Disorders -Tainaka Lab

Current biopsy and histology have long relied on thin-sectioned 2D images with several chemical staining methods and specific immunohistochemistry. Facile 3D visualization of human brain tissue with single-cell resolution would provide a novel concept of the neuropathological diagnosis and contribute our understanding of pathological mechanisms based on comprehensive and quantitative analysis of individual biomarker. In this laboratory, we aim at establishing a novel 3D neuropathology by developing a highly efficient clearing protocol for human brain tissue and combining with a rapid 3D imaging using light-sheet fluorescence microscopy.

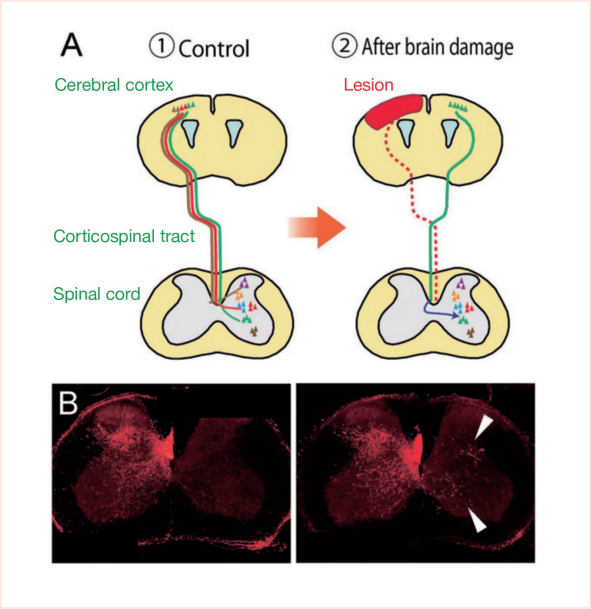


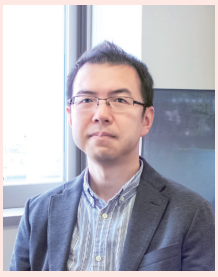
Whole 3D brain imaging by light-sheet microscopy

Prof.
Kazuki Tainaka

Dept. of System Pathology for Neurological Disorders -Ueno Lab

Central nervous system injuries due to stroke or trauma disrupt neural circuits and result in severe deficits of functions. The brain and spinal cord have very limited capacity to reconstruct the circuit once it is damaged, and therefore none of effective therapeutic methods have been developed so far. We previously demonstrated that spared motor and autonomic circuits are dynamically reorganized after injuries and influence the recovery process of functions. These results suggest that controlling the rewiring of the circuit would lead to make proper neuronal connections that achieve functional recovery. The goal of our study is to understand the process of rewiring and its underlying molecular mechanisms and neural functions. To this end, we are analyzing neural systems of both normal and injured brain and spinal cord, using cutting-edge techniques including, mouse genetics, viral tracers, optogenetics, chemogenetics, and 3D behavior analysis. We believe that this study paves the way to develop novel strategies to regenerate the circuits and restore neural functions.

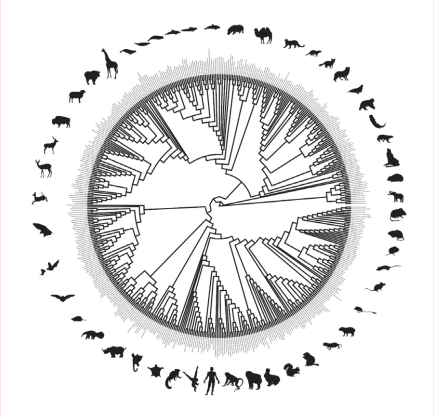




Prof.
Masaki Ueno

Dept. of System Pathology for Neurological Disorders -Laboratory for Evolutionary Brain Pathology

The genetic causes and susceptibility to brain disorders are encoded in the genome sequence. Recent advancements in sequencing technology give easy access to an individual's genome sequence. However, understanding the "meaning" of this genome sequence is extremely challenging. One reason for this is that the genome sequence is not like a book written all at once but formed over long periods of evolutionary time through events such as mutations, recombination, selection, introgression, and genetic drift. Furthermore, the diversification of the genome through these changes contributes to differences in susceptibility to diseases among individuals. Evolutionary genomic biology aims to elucidate how these evolutionary events occur and to reveal the principles of genome diversification using model organisms such as nematodes. Applying this knowledge to the analysis of the genetic background from which disease-causing mutations arise, we analyze publicly available human and mammalian genome and aim to uncover the origins of brain diseases.



Specially Appointed Prof.
Kohta Yoshida

Dept. of Pathology

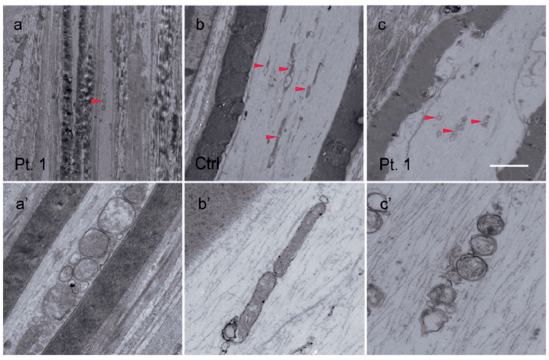
Mission

To provide the highest quality pathology services and scientific evidence focused on the advancement of developments in the field of neuropathology.

Vision

As an academic pathology department, we aim to deliver a high degree of professionalism in clinicopathological diagnostic services and neuropathology research, utilizing comprehensive and innovative approaches and building departmental competence to meet the needs of patients, institutions, and society.

Our approach will involve taking full advantage of opportunities to advance both the science and practice of neuropathology through individual and collaborative research, which hopefully will produce leading practitioners and researchers.

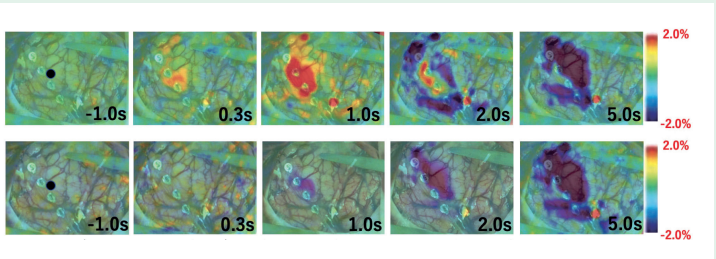


Charcot-Marie-Tooth disease type 2A2 (CMT2A2) is the second most common type of CMT, characterized by axonal neuropathy and optic atrophy. It is caused by mutations in the mitofusin2 (MFN2), which encodes a component of the outer mitochondrial membrane. Although a number of clinical studies have been reported, the neuropathologic features remain unknown. We have reported clinicopathologic features and mitochondrial ultrastructural abnormalities of two autopsied patients with CMT2A2.

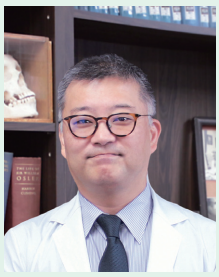
Prof.
Akiyoshi Kakita

Dept. of Neurosurgery

We are a clinical department specializing in neurosurgery, uniquely affiliated with the Brain Research Institute of Niigata University. We aim to precisely answer clinical questions through basic and translational research and using the results to improve clinical medicine, which has been continued ever since the Brain Research Institute was founded. Currently, our clinical focus includes skullbase surgery, endovascular treatment, malignant brain tumors, epilepsy and functional surgery in collaboration with the National Nishiniigata Chuo Hospital. The main research areas we are currently investigating include: elucidating treatment methods for brain tumors using cultured cells and xenograft models, investigating nerve axon regeneration and growth mechanisms, developing assistive surgical technology to enable accurate simulation for complex neurosurgical cases, and education of young neurosurgeons. Additionally, we are exploring non-invasive fluorescence methods and ways to visualize intraoperative neural activity, aiming to significantly advance future neurosurgical treatments. Our clinical environment offers a unique opportunity to consult with top researchers at the Brain Research Institute on experimental methods and related matters.



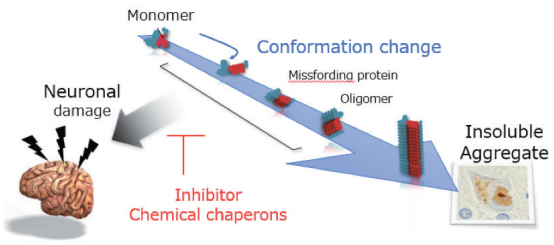
Prof.
Makoto Oishi



Dept. of Neurology / Dept. of Molecular Neuroscience

The Niigata University Brain Research Institute possesses not only a basic neuroscience branch but also a clinical neuroscience branch: Departments of Neurology and Neurosurgery. Thus, the aim of our Institute is to overcome brain diseases. We study a wide variety of brain diseases by using genetic, biochemical, cell biological, histological, and imaging approaches, in collaboration with other departments in the Institute.

In the past 50 years, we have produced favorable results of clinical and basic research. In the beginning, we revealed Niigata Minamata and SMON diseases, which are caused by toxic reagents, making us to have profound connections with society.



We conducted a multicenter, investigator-initiated clinical trial from 2020 to 2022 to evaluate a treatment for spinocerebellar degeneration type 6 (SCA6), an inherited disorder that commonly occurs in Japan and for which the development of an effective treatment is anticipated. The clinical trial has been successfully completed according to the planned timeline, and the results will be published in due course.

Up to now, we established entities of novel brain diseases and elucidated their etiologies and disease mechanisms by genetic, biochemical, and histological approaches.

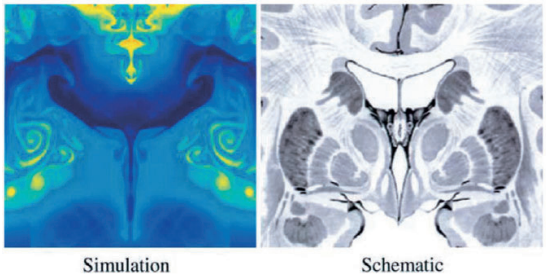
We have also educated a large number of neurologists. Careful observation of patients by the excellent neurologists brought us fruitful success in a new discovery. Our research is attributable to the support of patients and clinicians, and we will keep tight connection with them.

Neurologists need comprehensive knowledge of medicine and a wide range of social skills including communication, leadership, and problemsolving skills. We actively train young doctors to acquire the knowledge and skills to become a specialist in various fields from a cutting-edge basic neuroscience to practical neurology. We are professional for brain diseases and will ensure the best possible support for our patients.

Prof.
Osamu Onodera

Dept. of Biological Magnetic Resonance

Continuous technological development represents an indispensable component of the recent remarkable advancements in the state of our knowledge of human brain function. Magnetic resonance is a field which provides a number of versatile non-invasive methodologies applicable to the analysis of human specific brain function. The Department of Biological Magnetic Resonance focuses on the research, development and education of magnetic resonance technologies as well as the research and education of human brain function based on integrated knowledge of advanced engineering and non-linear computational analysis.

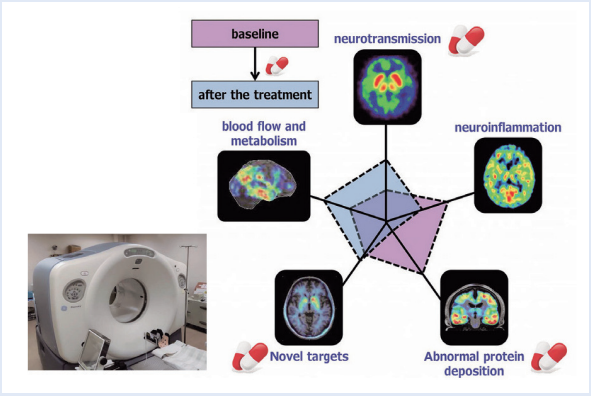


Simulation of brain morphology
The results of numerical simulation with thermal convection as a dominant equation.

Prof.
Hironaka Igarashi

Dept. of Functional Neurology & Neurosurgery

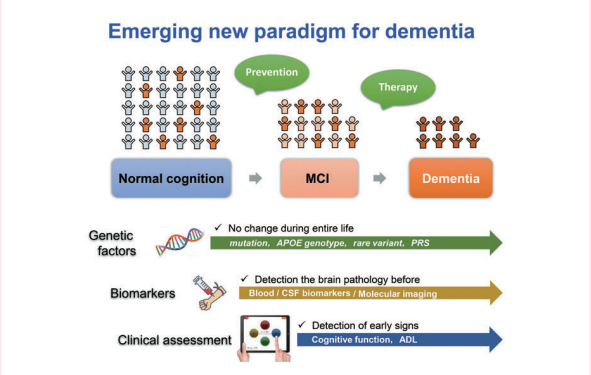
Recent development of in vivo imaging enable us to track disruption of brain environment, such as abnormal protein deposition and neuroinflammation in addition to neuronal function. The aims of our department are to investigate the watershed between healthy brain aging and brain diseases, and to reveal pathological bases of diverse brain disorders using multimodal imaging technique including PET (positron emission tomography) and MRI (magnetic resonance imaging). We will execute the clinical imaging study contributing to finding out pathological bases of neuropsychiatric disorders, leading to the establishing novel techniques of early diagnosis, treatment and prevention, by collaborating with government, industry, and academic researchers inside and outside Brain Research Institute. As a leading laboratory in this field, we have ambitious plans to cultivate human resources capable of conducting translational study.



Prof.
Hitoshi Shimada

Dept. of Molecular Genetics

New anti-amyloid-β antibody drug, Lecanemab was introduced into clinical practice in 2023, and the therapeutics of dementia in Japan has entered a new stage. Although clinical diagnosis of dementia was used to be based on clinical symptoms and morphological imaging, biomarkers that reflect brain pathology have become more important in the diagnostic process of dementia. Disease-modifying therapy that act directly on the pathological proteins has become the focus of therapeutic development for dementia. To lead this paradigm shift, our laboratory has been engaged in research and development for better clinical practice in dementia. The two pillars of our laboratory are biomarker development and genomic research. Using blood and CSF samples collected by various dementia cohort studies, we have developed biomarkers to reveal the progression of brain pathology from preclinical to symptomatic stages. We showed that the measurement of amyloid-β and phosphorylated tau, which biologically define Alzheimer's disease (AD), significantly improved the accuracy of clinical diagnosis. In addition, neurofilament light chains, GFAP, and α-synuclein are measured to better understand pathophysiology occurring in brain of dementia patients. In the near future, blood-based biomarkers will play a major role in the diagnosis of dementia. We have conducted joint research to develop efficient blood-based biomarkers by collaborations with industries that possess cutting-edge technology. We believe that it is important to understand dementia based on genomic information. We have established one of the largest dementia genome cohort in Japan. We are conducting whole genome/exome analysis using next-generation sequencer to find genetic risks unique to the Japanese population. We showed that the polygenic risk score has been successfully adapted to Japanese AD patients to predict the inborn risk. We also making an effort to promote the implementation of clinical sequencing and APOE testing to realize genomic medicine for dementia. Although the environment surrounding dementia research may changes with the times, we will make progress of our research keeping our mission in mind to contribute to better society for patients of dementia and their family.



Prof.
Takeshi Ikeuchi

Dept. of Comparative & Experimental Medicine / Dept. of Animal Model Development

Dopamine is thought to play an important role in motor control, memory, learning and motivation. We focus on Parkinson's disease (PD), which is one of the most common neurological disorders associated with dopamine dysfunction. As PD animal models, we have developed genetically modified mice targeting dopamine receptors and related molecules. Through analyzing the behavior and neural circuits of these model animals, we aim to elucidate the role of dopamine signaling on motor control, learning and memory, and to develop a new therapeutic approach for PD. Additionally, we are studying RNA-binding proteins involved in neural circuit formation and function, as well as the effects of in vitro culture of early-stage mouse embryo on individual development.

We are responsible for managing the university-wide animal experimental facility, providing ethical and appropriate environments for experiments involving a variety of animals, such as mice, rats, rabbits, guinea pigs, dogs, pigs, Japanese macaques, marmosets, and medaka fish. Moreover, we provide research support using reproductive biotechnologies such as in vitro fertilization, embryo transfer, cryopreservation of embryo and sperm. This support is crucial for maintaining Specific Pathogen-Free (SPF) environment for experimental animals and facilitating efficient research through planned animal production. Furthermore, we are advancing the creation of genetically modified animals using genome editing technologies, aiming to promote animal experiments in the university.

Our research efforts are focused on understanding of molecular mechanisms of higher brain functions such as learning and memory. Making good use of current methods in molecular biology and developmental engineering, we are now engaged in the following projects: 1) functional assay of neurotransmitter receptors and related molecules with gene-targeting techniques, 2) generation and analysis of animal models for human nervous diseases, 3) stablishment of germ line-competent embryonic stem cells derived from rat embryos, and 4) development of basic methods for generation of gene-modified animals using gene-editing technology.

Gene manipulation of rats using rat ES cells

Prof.
Toshikuni Sasaoka

Dept. of Pathology Neuroscience

The neurosurgeons, neurologists, and neuropathologists of Brain Research Institute, Niigata University, have performed high-quality clinicopathological practice for over 50 years. Through the experience, as an academic pathology department, we have built a comprehensive collection of human brain tissue resource obtained from consecutive autopsies and surgical resections. We take advantage of opportunities to advance the medical science through individual and collaborative research by using the tissue resource, for understanding pathomechanisms underlying brain disorders.

Prof.
Mari Tada

Dept. of Neuroscience of Disease

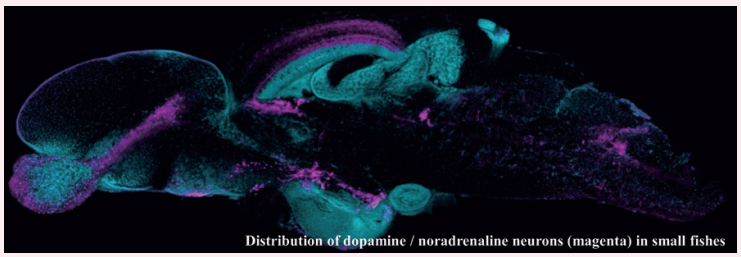
Neurodegeneration such as Alzheimer's disease, Parkinson's disease, amyotrophic lateral sclerosis, and Cerebrovascular diseases including stroke and cerebral hemorrhage, as well as Developmental disorders and Mental illnesses, present significant challenges in terms of treatment and management. Many of these disorders and disabilities have a high incidence rate and are of utmost importance both in medicine and in society.

Brain disorders may be perceived as highly complex and unique to humans. However, various organisms naturally develop brain disorders through aging or other processes similar to humans. For instance, our laboratory has revealed that African killifish exhibit a disease state reminiscent of Parkinson's disease during aging, leading to numerous insights that contribute to the understanding of novel pathological mechanisms in this disorder. Cognitive impairment in various animals is also occasionally reported in news and scientific articles. Furthermore, α-synuclein, a molecular factor implicated in Parkinson's disease, is found in fish, and the amyloid precursor protein, a molecular factor in Alzheimer's disease, exists in fish and insects as well.

In our laboratory, we integrate the study of various research subjects, primarily focusing on small fish species. We combine the cutting-edge neuroscience and evolutionary approaches, leveraging the esteemed Brain Bank of our institute, and employing research methodologies that cannot be replicated by AI for the next 20 to 50 years. We strive to unravel the evolutionary origins of brain disorders and establish a fundamental understanding of the pathophysiology rooted in the comprehension of the physiological functions of molecular factors that underlie these disorders.

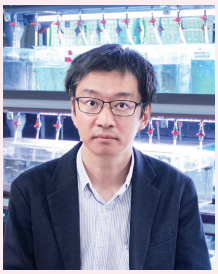
1. Conquering difficult diseases.
2. Supporting individuals with disabilities.
3. Leaving a significant mark on the history of science.

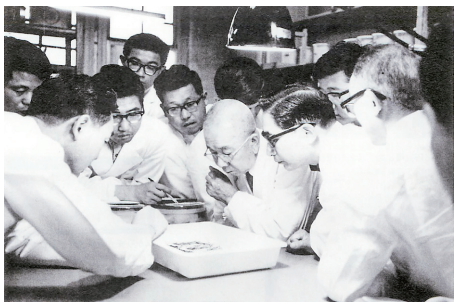
By shedding light on the essence of brain disorders, we aim to expand our research achievements to areas such as industry-academia collaboration, drug development research, and preventive medicine, making substantial contributions to the treatment of brain disorders and the promotion of healthy longevity. Furthermore, we actively propose approaches to foster coexistence with disabilities and aging.

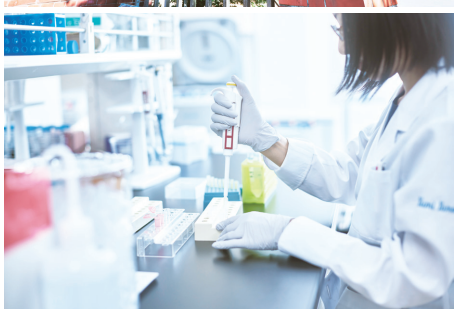


Distribution of dopamine / noradrenaline neurons (magenta) in small fishes

Prof.
Hideaki Matsui



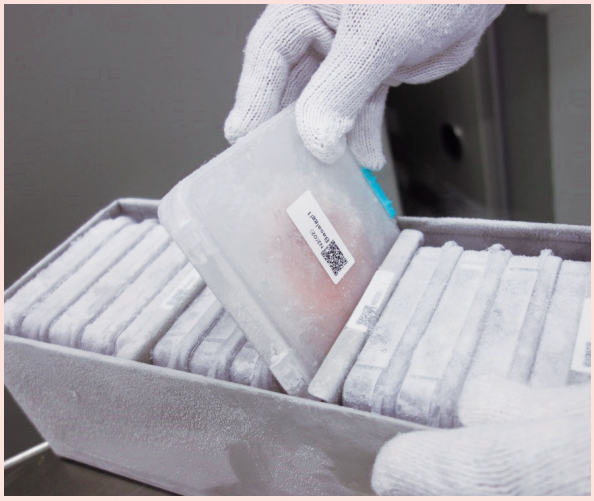




MEXT Joint Usage / Research Center

The Collaborative Research Center for Neurological and Psychiatric Disorders

BRI has been certified as a joint usage/research center by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) since 2010. Its extensive collection of brain disease resources and expertise have been open to the neuroscientists' community. BRI's diverse research collaborations in neuropathology and related fields have brought out a great deal of achievement in relation to unravelling the pathological mechanism of brain disease. The institute has renewed its MEXT certification of a joint usage/research center in 2022 as "the Collaborative Research Center for Neurological and Psychiatric Disorders." BRI has the world-class collections of neuropathological specimens and advanced imaging analysis techniques. The institute is committed to tackling tasks such as neuropathological analysis on brain disorders like Alzheimer's disease, development of early diagnostic technique, and translational research on the treatment for reducing disease progression. By utilizing the specimens of human brain disease and the animal model resources along with the underpinning of translational research for clinical application, BRI's collaboration with researchers across the world offers a prospect of reducing the burden of intractable neurological disease.



MEXT Education and Research Organization Reform Project

21st Century Brodmann Areas Mapping

Integrating Molecular and Functional Information

The center for industry-academia-government collaboration and human resource development to complete a "brain map" integrating molecular and functional information in the brain that will serve as a guidepost for a dementia inclusive society

Overcoming age-related diseases of the brain, such as Alzheimer's and other types of dementia, is an urgent issue. In order to develop treatments for these diseases, it is important to establish diagnostic methods that can accurately estimate prognosis at an early stage. To do so, we need a map that can serve as a guidepost to predict the progression of the disease in the brain. This project aims to develop social implementation and human resource development in collaboration with industry, government, and academia, starting with the creation of a new human brain map that will serve as a guide to understanding the progression of brain diseases, and to give back to society through a dementia inclusive society. To achieve this aim, we are working on the establishment of cell dispersion technology from human brain tissue, clearing technology and cell labeling technology for human brain tissue, and the creation of function-related maps of brain regions using functional MRI.

Medical Practice and Education

BRI's mission is to advance scientific research on the nervous system of the brain. BRI has a historical background that has developed through the clinical care of neurosurgical cases in the School of Medicine. BRI offering an integrated approach to its research, along with clinical and educational activities, is therefore a great strength. The research at BRI covers a wide spectrum from Basic Neuroscience to Clinical Neuroscience related research to human brain disease. Pathological Neuroscience that bridges these two areas and the integrated research of these three areas brings greater progress, making BRI one of the most desirable institutes for research on brain disease in Japan. In order to continue to engage in cutting-edge research, BRI is dedicated to training competent researchers. BRI is also dedicated to research in the clinical area to advance medicine.




Niigata Junior Doctor Training School

BRI gave science talks in November 2023 as part of the master's program of "the Niigata Junior Doctor Training School", a STEM education program aiming at fostering the budding scientists. 36 pupils, from the 5th grade elementary school to junior high, participated in a lecture session by two BRI researchers.


BRI Endowed Research Branch Activity Report Meeting

The 2023 activity report meeting of the Advanced Treatment of Neurological Diseases Branch (BRI Endowed Research Branch), established through a collaboration between Niigata University and the NSG Group, convened on March 18, 2024. The meeting showcased research accomplishments from April 1, 2023, and outlined activity and project plans for the forthcoming year.

Global Partnerships

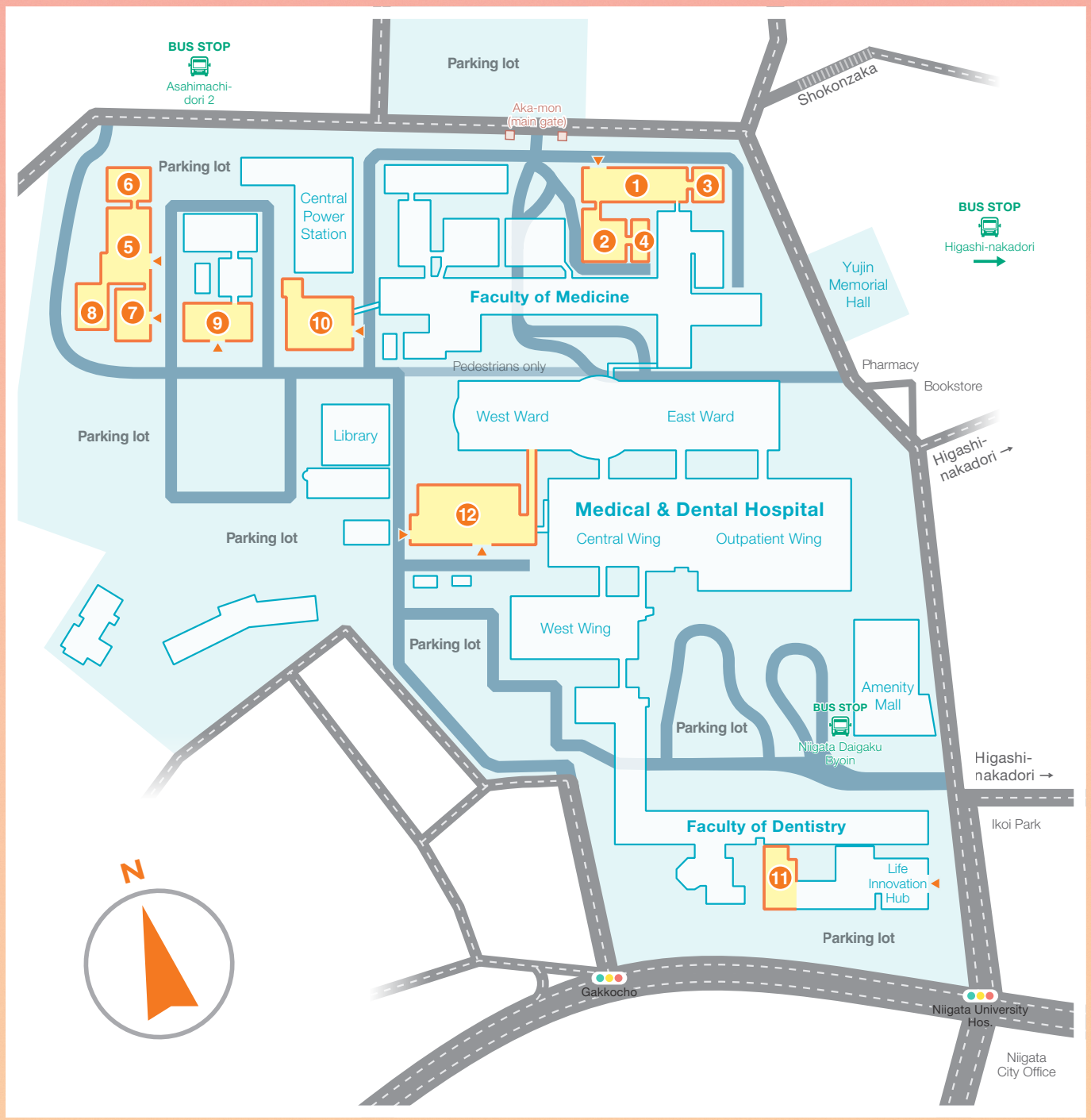
Global partnerships can bring together complementary strengths and deepen the impact of joint research. BRI is committed to forming such partnerships and will further develop existing partnerships. The institute regularly welcomes scientific visitors from around the world and signs MOUs and agreements with overseas research institutions. BRI also annually hosts international symposia, which feature fascinating lectures by distinguished scientists from across the world.


Science Education

Partnering with the local Super Science High Schools specified by MEXT, BRI scientists visit local highschools to give lectures on neuro science. BRI is working to nurture the next generation of global researchers by introducing the attractive world of neuroscience.

BRI Map

1. BRI A Block
2. BRI B Block
3. BRI C Block
4. BRI D Block
5. Asahimachi Research Laboratory Bldg. (Center for Integrated Human Brain Science)
6. PET
7. 3 Tesla MRI
8. 7 Tesla MRI
9. Genome Science Bldg.
10. Animal Research Bldg.
11. Dept. of Animal Model Development
12. Administration Office (General Administration and Research Bldg. 1F)



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Published July 2024