ALUMNI

MAYO CLINIC ISSUE 2 2018

MAYO CLINIC

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DEEP SPACE MEDICINE RESEARCH PROGRAM

PET PROJECT

NEURO THEN AND NOW

LETTER FROM THE SECRETARY-TREASURER

I remember when I was a young surgeon navigating the research waters. It helps to have strong mentors who serve as role models, provide encouragement and support, and help you identify and manage your strengths and weaknesses. It also is critically important to work at an institution that supports research endeavors. Having one and not the other is a formula for frustration, as I discovered at some other institutions when I was starting out. I was very fortunate to land at Mayo early in my career and be blessed with kind, generous and wise mentors in a rich research environment. Mayo excels at fostering young investigators because the Mayo environment nurtures mentoring and allows us the time to talk, teach and share. Mayo Clinic's Young Investigators Research Symposium (page 40) is a wonderful forum for young researchers across our schools to share their work with the Mayo community and get experience and feedback presenting it to senior investigators, some of whom may become future mentors. I served on the Advisory Committee for the event so I may be biased, but I feel strongly that this biennial event is invaluable in reinforcing the culture of scholarly investigation, sharing and teamwork that are the hallmarks of the Mayo research community.

Diversity also is a hallmark of a rich research community; I strongly believe that a diverse staff is more creative, open and inquisitive. Yet there are challenges in creating a diverse faculty. The story about two people I admire greatly, Drs. Nilufer Ertekin-Taner and Rosa Rademakers at Mayo Clinic in Florida (page 24), discusses some of the unique challenges women investigators face. I know we can do better to support our women colleagues. Please take note of the query on page 31 asking for your feedback about our forming a subgroup of the Alumni Association for women physicians and scientists.

PETER AMADIO, M.D. (OR '83)

- Secretary-Treasurer, Mayo Clinic Alumni Association
- Lloyd A. and Barbara A. Amundson Professor of Orthopedics

Be sure to read the story on page 42 about one of our recent medical student graduates and his young faculty member mentor. It's a reminder that you don't have to be gray-haired and nearing retirement to be a life-changing mentor to a student or trainee. Having the opportunity to mentor others has been a wonderful part of my career at Mayo. Be sure to sign up for Alumni Connect, the Alumni Association's mentorship program, to share your experience and insights with a Mayo medical student.

Alumni Connect is one tiny portion of what the Alumni Association does for students, trainees and 30,000 alumni around the world. I'd like to thank those of you who donated more than $39,000 above and beyond annual dues payments in 2017. Your generosity helps us do more to strengthen our alumni community and nurture Mayo's many trainees, who will become our future Alumni Association leaders.

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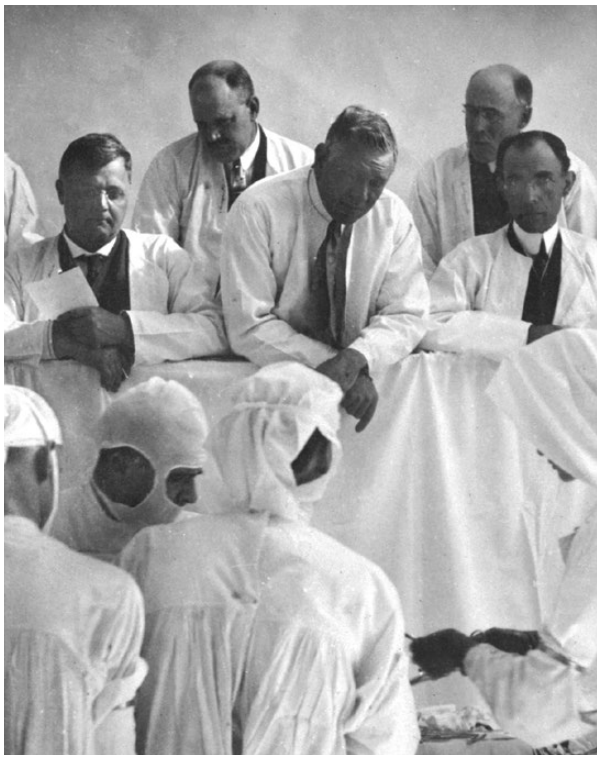
NEURO THEN AND NOW

Mayo Clinic's departments of Neurology and Neurosurgery represent one of the largest and most comprehensive neurological practices in the world. *Mayo Clinic Alumni* looks at the origins of these departments and the physicians who blazed trails to advance them.



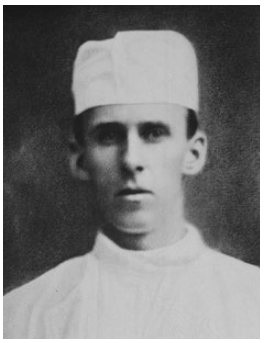
Emil Beckman, M.D. (back to camera), performs surgery before visiting neurosurgeons around 1915.

Throwback neurologic surgery

Neurologic surgery at Mayo Clinic began with early efforts by Charles H. Mayo, M.D., and Emil Beckman, M.D. (S '07), including procedures for trauma, infection, tumor, epilepsy and hemorrhage.

In 1891 Dr. Mayo published an article in which he described two neurosurgical cases: drainage of an intracranial epidural abscess and ligation of the common carotid artery for a traumatic carotid cavernous fistula. In 1906 he published an article on surgery for tic douloureux. He continued to expand beyond a busy general surgical practice to include procedures for epilepsy and "spasmodic wry-neck."

Dr. Beckman joined the practice in 1907, becoming the fourth surgeon at Mayo Clinic. Neurosurgery was not held in high esteem at the time. Dr. Beckman was the first member of the surgical staff to develop a major interest in neurologic surgery. He wrote 29 papers on facial paralysis, trigeminal neuralgia, removal of spinal cord tumors, decompression of the spinal cord and repair of spina bifida. He died unexpectedly in 1916 at age 44.




Early Mayo Clinic surgeons Emil Beckman, M.D. (left), and Alfred Adson, M.D.

Alfred Adson, M.D. (S '17), came to Mayo Clinic as a surgical fellow in 1914 and worked as an assistant to the Mayo brothers, E. Starr Judd, M.D. (S '04), and Dr. Beckman. He'd assisted for only five months when Dr. Beckman died:

"I suddenly found myself without a chief and without a surgical service, with eight months of my three-year fellowship to complete …"

On Nov. 9, 1916, after the memorial service for Dr. Beckman, Dr. Adson was summoned to the waiting room of Drs. William (Dr. Will) and Charles Mayo. They asked him to join the Mayo Clinic staff as a junior surgeon. Dr. Will told him, "You will, of course, be expected to look after the few neurological cases that will come to the Clinic. Feel free to refer cases to Doctors (Harvey) Cushing (of Baltimore and Boston), (Charles) Frazier (of Philadelphia) and (Charles) Elsberg (New York City) unless you feel qualified to handle them yourself."

In the next few years, Dr. Adson told his colleagues:

"Dr. Will wants me to cut out all general surgery and do nothing but brain surgery. I don't want to do that. The future of brain surgery is so uncertain, everybody is doing it. There are so few patients you can really help. The mortality is terrible. If I limit myself to this field and it continues the way it has, I'll be out of general surgery and may not be able to get back in. I told Dr. Will I wanted to keep my fingers in general surgery for at least three years. If the prospects in brain surgery become brighter I'll be willing to drop general surgery and limit myself to brain surgery."

Eventually Dr. Adson agreed to devote his surgical efforts to neurologic surgery and to developing the specialty at Mayo Clinic as long as Dr. Will would meet his demands: that neurosurgery encompass all facets of surgery related to the nervous system, that neurosurgery be an independent division and not a section of the Department of Surgery, and that neurosurgeons have the same financial benefits as general surgeons.

Dr. Will agreed, and the Department of Neurosurgery was established as a separate entity in 1921 with Dr. Adson as chair.

He became a leading neurosurgeon and pioneer in the surgery of the autonomic nervous system, development of the upright position for certain procedures, vertical incision for the temporal extradural approach to the gasserian ganglion, and diagnosis and alleviation of some of the "outlet syndromes" of the upper extremities. He described the transcranial approach for repair of cerebrospinal fluid rhinorrhea and the straight lateral incision for unilateral suboccipital craniectomy. He also designed many instruments for neurosurgical procedures.

In 1949 Dr. Adson was selected as one of Minnesota's 100 living distinguished citizens. He was president of the Minnesota Medical Society and a founding member of the American Board of Surgery, Society of Neurological Surgeons, and American Board of Psychiatry and Neurology. He co-sponsored the formation of the American Board of Neurological Surgeons and became its chair.

Throwback neurology

Dr. Will also was a force behind the development of Mayo's neurology practice. In 1913 he asked Walter Shelden, M.D. (N '13), an internist-neurologist, to start a neurology section. From the start, the

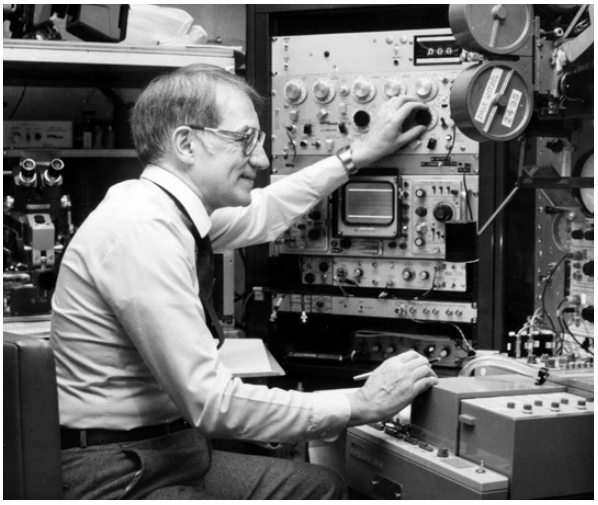

Mayo Clinic's first neurology section head Walter Shelden, M.D. (left), and subsequent chair Henry Woltman, M.D.

From its humble beginnings, the Department of Neurologic Surgery has grown to become one of the largest in North America, with more than 10,000 procedures performed by a staff of about 45 neurosurgeons across all three Mayo Clinic campuses.

section was aligned with internal medicine, given Dr. Shelden's background, with neurology offices located near internists and ophthalmologists and close relationships fostered with pathology and neurosurgery. Dr. Shelden wanted separation from psychiatry, unlike some contemporary neuropsychiatrists.

Dr. Shelden was head of the neurology section until 1930. He was nicknamed Pop because of his fatherly attitude toward trainees and associates. He taught approximately 45 neurology residents between 1919 and 1943.

One of his students, Henry Woltman, M.D. (N '17), joined the section in 1917 and chaired neurology from 1930 to 1954. Dr. Woltman brought neurology at Mayo Clinic to national prominence. He conducted research on the neurologic manifestations of pernicious anemia, peripheral neuropathy and diseases of the spinal cord. In 1929 he and pathologist James Kernohan, M.D. (PATH '26), described notching of the cerebral peduncle due to contralateral brain tumor, which was subsequently named the Kernohan-Woltman notch.



Edward Lambert, M.D., in the EMG lab he founded in 1947.

Other Dr. Woltman eponyms include Woltman's sign of myxedema and Moersch-Woltman syndrome.

Clinical neurophysiology played an important role in the early history of neurology at Mayo Clinic. The first electroencephalogram (EEG) at Mayo Clinic was performed by Edward (E.J.) Baldes, M.D. (BPHY '34), in 1936. Edward Lambert, M.D. (PHYS '43), founded the electromyography (EMG) lab in 1947, the same year he was awarded the U.S. President's Certificate of Merit for his work on the effects of acceleration in man. Dr. Lambert was a pioneer in nerve conduction and EMG approaches to neurology. With colleagues Lealdes Eaton, M.D. (I '34, N-PSY '36), and E. Douglas Rooke, M.D. (I '41, N '49), Dr. Lambert described myasthenic syndrome — later named Lambert-Eaton myasthenic syndrome — in 1956.

Neuro now

From its humble beginnings, the Department of Neurologic Surgery has grown to become one of the largest in North America, with more than 10,000 procedures performed by a staff of about 45 neurosurgeons across all three Mayo Clinic campuses. Similarly, neurology thrives at Mayo Clinic because of an intense focus on the needs of the patient, collaboration with other specialties, dedication to research, faculty member commitment to education, and outstanding residency and fellowship training programs.

At campuses in Arizona, Florida and Minnesota, Mayo Clinic's top-ranked neurologists and neurosurgeons diagnose and treat more than 500 conditions, including many rare or complex disorders. Neurologic services are provided to children at Mayo Clinic in Rochester. The departments' scholarly productivity rate averages five publications per faculty member per year. The departments have 37 active basic science labs, and their researchers have 80 NIH grants as well as other sources of funding.

(Clockwise from upper left) Fredric Meyer, M.D., Robert Spinner, M.D., Bernard Bendok, M.D., and Alfredo Quinones-Hinojosa, M.D.

Dean Wingerchuk, M.D., Claudia Lucchinetti, M.D., and James Meschia, M.D.

NEURO LEADERS

Department of Neurologic Surgery enterprise chair: **Fredric Meyer, M.D.** (NS '88), the Alfred Uihlein Family Professor of Neurologic Surgery

- Rochester chair: **Robert Spinner, M.D.** (MDPH '89, NS '00), the Burton M. Onofrio, M.D. Professor of Neurosurgery
- Arizona chair: **Bernard Bendok, M.D.** (NS '15), a William J. and Charles H. Mayo Professor
- Florida chair: **Alfredo Quinones-Hinojosa, M.D.** (NS '16), a William J. and Charles H. Mayo Professor

Department of Neurology enterprise and Rochester chair: **Claudia Lucchinetti, M.D.** (N '94, NIMM '95), a Eugene and Marcia Applebaum Professor of Neurosciences

- Arizona chair: **Dean Wingerchuk, M.D.** (I-1 '94, N '97, NIMM '98)
- Florida chair: **James Meschia, M.D.** (N '97)

Department of Neuroscience Florida chair: **Leonard Petrucelli, Ph.D.** (NSCI '03), the Ralph B. and Ruth K. Abrams Professor

Leonard Petrucelli, Ph.D.
See page 24 for neurosciences story.

Mayo Clinic's neuro programs

Spine

- 50,000 spine patients per year
- Informatics and electrophysiologic diagnostic tools to select patients who will benefit from surgical interventions
- Advanced preoperative imaging combined with minimally invasive approaches enhance planning, surgical safety and outcomes

Brain and central nervous system tumors

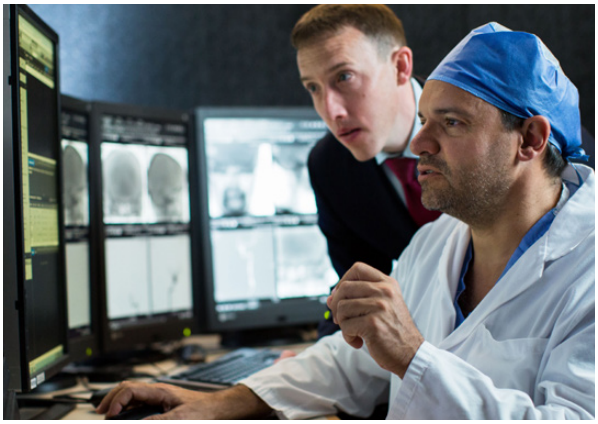
- One of highest patient caseloads in U.S.; 3,000+ adult cases per year in highly integrated brain tumor clinics
- Research leader in advanced imaging (FDOPA-PET and 7-Tesla MRI), molecular diagnostics, and biologic therapies including pioneering experimental trials for vaccines that engage the immune system
- Surgery significantly less likely to result in mortality than anywhere else in U.S.; enterprise survival rate for brain tumors 200 percent above national average

Cerebrovascular diseases

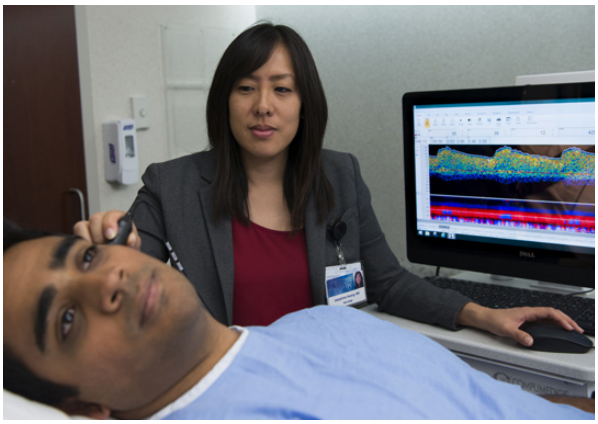
- Leader in diagnostic and therapeutic management of cerebrovascular disease including CT perfusion, advanced brain MRI, diffusion- and perfusion-weighted MRI, MRA, carotid plaque imaging, transcranial Doppler, intracranial vessel wall imaging and genetics
- Leader in advanced endovascular interventions, radiation therapy and surgery for cerebrovascular disease with 1,000+ procedures annually
- Certified comprehensive stroke centers in Minnesota and Florida; primary stroke center in Arizona
- Telestroke network of 30 hospitals in six states served by 17 physicians who respond to emergencies in minutes via robotic technology

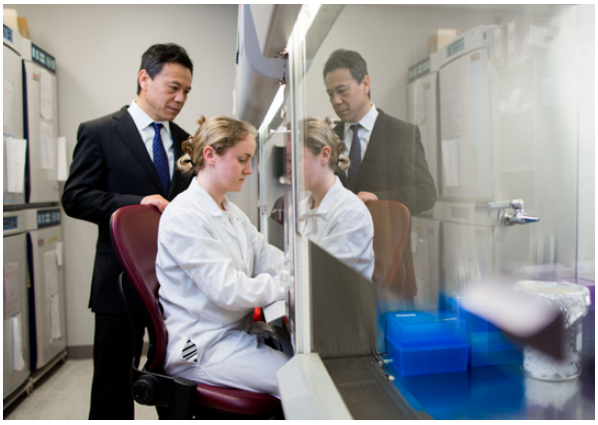
Epilepsy (page 16)

- 700+ procedures per year including vagus nerve stimulation, responsive neurostimulation, deep brain stimulation, resection, laser ablation and chronic sub-threshold stimulation (not available elsewhere)
- All three campuses rated as Level 4 epilepsy centers



- World-leading neuroimmunology lab for diagnosis and treatment of autoimmune epilepsy syndromes, with multiple clinical trials including cannabidiol studies and fenfluramine study for Dravet syndrome
- World-class imaging including first clinically available 7-Tesla MRI in North America to detect previously unidentified structural brain abnormalities as source of epilepsy





Headache/migraine

- Cutting-edge integrated translational research including basic science, imaging science and drug/device/biologics development, and largest registry and biobank for migraine research
- Discovery of genetic, brain imaging, blood and clinical biomarkers to facilitate accurate diagnosis and identify predictors of response to treatment, risk factors for progression and remission, and factors that predict risk of adverse outcomes and side effects to medications
- Identification of markers to distinguish post-traumatic headache from other headache disorders, novel treatment options for post-traumatic headache, and one of country's only multidisciplinary pain rehabilitation clinics

Multiple sclerosis and autoimmune neurology (page 20)

- Highly experienced clinicians for accurate diagnosis; cutting-edge, individualized treatment and differentiating from mimickers of MS; highest quality MRI, neuroradiologic interpretation and expert neuro-ophthalmology
- Clinicians highly regarded in diagnosis and treatment of autoimmune neurologic diseases including optic neuritis, encephalitis, dementia, epilepsy, movement disorders, transverse myelitis and dysautonomia
- Mayo Clinic Neuroimmunology Laboratory to evaluate patients suspected to have neuromyelitis optica or other autoimmune neurologic diseases

Peripheral neuropathy and nerve pain

- Electromyography, autonomic reflex testing, thermoregulatory sweat testing, quantitative sensory testing; peripheral nerve, root and fascicular biopsies; peripheral nerve pathology lab; skin biopsy for epidermal nerve fiber testing; and genetic testing
- One of largest peripheral nerve pathology labs in the world; advanced techniques including teased fiber analysis
- Electromyography and autonomic labs with advanced methods to evaluate large and small fiber peripheral neuropathies ▲

ALEJANDRO RABINSTEIN, M.D.

DEEP SPACE MEDICINE RESEARCH PROGRAM

SHOOTS TO FACILITATE MISSIONS TO MARS AND IMPROVE HEALTH ON EARTH

A full year before Alejandro Rabinstein, M.D. (CCMN '02), was born in Cordoba, Argentina, Apollo 11 made the first successful landing on the moon and U.S. astronaut Neil Armstrong became the first person to set foot on another planet. That was the summer of 1969. Forty-eight years later, Dr. Rabinstein has become Mayo Clinic's expert on deep space travel medicine — a role he never anticipated.

"I wasn't interested in space as a kid, and I'm not a sci-fi buff," says Dr. Rabinstein, a consultant in the Department of Neurology at Mayo Clinic in Rochester. "I am, however, intellectually curious. I have the mindset of a clinician. I believe deep space medicine can be transformative and transcendent and can only enrich our knowledge about Earthbound human health. While I understand the allure of space travel, my fascination isn't with the stars. Rather, my hope is that this work will spill over into patient care."

Dr. Rabinstein is the energy behind Mayo Clinic's nascent deep space medicine research program. Mayo hopes to lend its widespread multidisciplinary expertise to the medical challenges astronauts face.

On long space flights, astronauts experience health-related problems including visual and sleep disturbances, a vertical brain shift, a narrowing of the central sulcus, behavioral problems and radiation exposure. So when NASA sends humans hurtling on a yearlong mission into deep space in the 2020s to test readiness for Mars and, ultimately, on a three-year round trip to Mars in the 2030s, what can space travelers expect? Based on experience with astronauts, experts expect Mars travelers will undergo physiologic changes due to microgravity and ionizing radiation during prolonged space travel.

> **"I believe deep space medicine can be transformative and transcendent and can only enrich our knowledge about Earthbound human health."**
>
> – Alejandro Rabinstein, M.D.

Specifically, these changes may include:

- Intracranial hypertension and visual impairment
- Sleep disturbances
- Vestibular dysfunction
- Orthostatic intolerance
- Decompressive sickness
- Behavioral changes
- Burnout
- Reduced aerobic capacity
- Reduced muscle mass
- Inadequate nutrition
- Bone loss and fractures
- Intervertebral disc damage
- Cardiac rhythm problems
- Renal stone formation
- Radiation exposure — acute radiation sickness, carcinogenesis, cataracts, cardiac damage, delayed degeneration of other organs/tissues, impaired wound healing, infertility, DNA damage and inheritable disorders, deleterious effects on nutrients and medications
- Altered immune response
- Host-microorganism interactions
- Pharmacokinetic changes

What can medical science do to prevent, ameliorate and treat these myriad anticipated problems?

Mayo Clinic hopes to collaborate with federal entities, industry, space travel and flight operation safety experts, and physicists to solve the medical challenges of space missions and, equally important, make discoveries that are useful for clinical applications in patient care. To aid in this effort, Mayo is bringing together team members from neurology, neurosurgery, neuro-ophthalmology, neuroradiology, neuro-otology, sleep medicine, psychology, psychiatry, cardiology, pulmonology, physiatry, radiology, oncology, genetics, nutrition, endocrinology, nephrology, pharmacy, physiology, biomedical engineering, telemedicine and research.

Mayo anticipates the major themes of its research will be:

- Discovery science aimed at understanding how microgravity, ionizing radiation and prolonged space travel adversely affect organ physiology
- On-Earth models to explore the complex physiologic and psychologic effects of space travel
- Technologic innovations for physiologic monitoring

Figuring out the unknowns

Dr. Rabinstein was thrust into the lead on Mayo Clinic's deep space medicine research efforts because of his involvement with NASA on another endeavor. SpaceWorks, an aerospace engineering firm and vendor to NASA, took note of his well-published research in therapeutic hypothermia (page 11) and enlisted his help. For several years Dr. Rabinstein has assisted SpaceWorks on a NASA grant to study hypothermia as a way to mediate the challenges of deep space travel, including protecting space travelers' health by inducing a state of hibernation for a portion of their trip.

"Hypothermia reduces metabolic demand and puts the brain in a state of rest, which could give astronauts a physical and psychological break," says Dr. Rabinstein. "It's likely this will become a part of the deep space travel protocols.

"There's great interest in and excitement about this kind of travel. But before people venture into deep space, they want to know that the unknowns related to their health have been figured out. We have a lot of work to do before that's the case. Mayo Clinic has an illustrious history in aerospace medicine during World War II, and we think we can create a new history to help make it possible for humans to safely travel into deep space. When we bring to bear the vast resources and minds at Mayo Clinic, we can accomplish great things. We're confident that includes solving the vexing physiological and psychological challenges of deep space travel and applying what we learn to help patients whose feet are firmly on the ground."▲

TORPOR TECHNOLOGY — INDUCING HYPOTHERMIA IN MARS-BOUND ASTRONAUTS

Much of Alejandro Rabinstein, M.D.'s, body of work has focused on clinical uses of hypothermia — a body temperature lower than 95 degrees. Mild therapeutic hypothermia protects the brain and improves short-term neurologic recovery and survival in cardiac arrest patients.

Inducing hypothermia in astronauts to minimize metabolic demands and make travel more tolerable — called torpor technology — is being explored as a way to simplify travel to Mars and is the focus of Dr. Rabinstein's research with SpaceWorks.

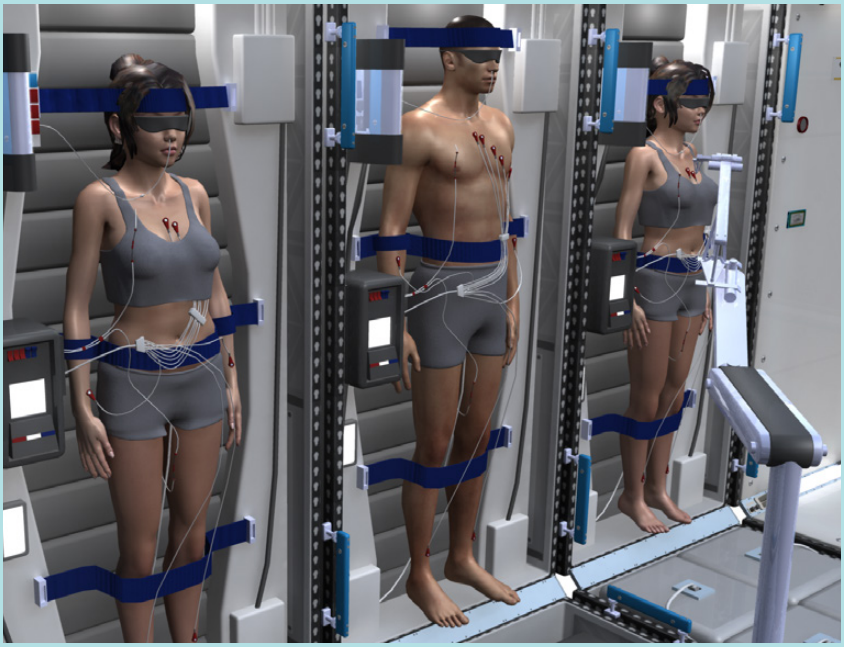
Maintaining a low body temperature can substantially reduce metabolic rate and facilitate rest. In addition to decreasing cerebral energy demands, hypothermia has been shown to have neuroprotective effects including preservation of the blood-brain barrier integrity, amelioration of toxicity from excitatory neurotransmitters and modulation of inflammatory responses. During long-term space missions, periods of hypothermia could prevent the occurrence of visual impairment that may result from vertical brain shifts and changes in the regulation of intracranial pressure, diminish the deleterious effects of radiation in the brain and other organs, lessen the problem of inadequate nutrition to meet metabolic needs, and reduce the chances of burnout and interpersonal conflicts by promoting sufficient rest.

A mission to Mars will take as long as three years: 180–250 days in transit each way and approximately 500 days on Mars.

Researchers are considering strategies to induce hypothermia. Astronauts probably would take mild sedatives to ease this transition and minimize discomfort. They would rotate between two-weeks-long periods of hypothermia and wakefulness, alternating with other astronauts on the same mission. Nutrition would be ensured through a gastric tube.

Inducing and maintaining hypothermia in deep space presents many challenges, including shivering. This natural reaction to cold expends significant energy and defeats the goal of reducing metabolic output. Also, even in a hospital setting, hypothermia presents risks when patients are returned to a normal body temperature. For instance, fluctuating potassium levels can trigger cardiac arrhythmia. Astronauts preparing to undergo this process would require careful preparation before the mission.

"We don't have every facet of torpor technology for deep space travel figured out yet," says Dr. Rabinstein. "But we are well on the road to paving the way to make this first step viable."



This artist's rendering shows how torpor technology could be used for the transit phases of human exploration missions to Mars.

CREST REDUX

ANSWERING QUESTIONS ABOUT OPTIMAL TREATMENT FOR CAROTID DISEASE

Almost two decades ago, Mayo Clinic began a landmark study, CREST (Carotid Revascularization Endarterectomy versus Stenting), that changed neurology practice. Now Mayo Clinic is halfway through recruitment for CREST-2, a trial that's expected to be just as significant. Physicians who treat carotid stenosis with surgery, minimally invasive stenting and medication are on tenterhooks waiting for the results and hoping to answer questions including:

- Is medication as safe and effective as surgery or stenting in preventing stroke caused by the buildup of plaque in the carotid artery?
- Are physicians doing more harm than good with interventions?
- Does surgery or stenting help cognitive performance in a subset of patients?

Whatever the results, patients around the world will benefit. The study's outcome will help determine the best treatment of asymptomatic carotid disease, which affects 80,000 to 100,000 people annually in the U.S.

According to co-principal investigator of CREST-2 James Meschia, M.D. (N '97), Department of Neurology at Mayo Clinic in Florida, Mayo is one of few centers with the infrastructure and resources to conduct these trials.

"The collegial and collaborative spirit of team care across disciplines for the betterment of the patient is fundamental to the Mayo Model of Care and is just as fundamental to a complex interventional trial like CREST-2," says Dr. Meschia. All three Mayo Clinic sites are involved, with specialists in neurology, neurosurgery, vascular surgery, brain and plaque imaging, and clinical trials management.

CREST

In the later years of the first millennium, smoking was more prevalent than it is today and statins hadn't been introduced. Carotid endarterectomy was the most widely used invasive treatment for significant carotid stenosis and was considered to be superior to medical therapy in stroke prevention of symptomatic carotid stenosis. Treatment of asymptomatic stenosis was controversial; several trials found higher rates of stroke and death associated with carotid artery stenting.

In successive years, stenting evolved.

THOMAS BROTT, M.D., AND JAMES MESCHIA, M.D.

The first CREST trial was designed in the late 1990s and commenced in 2000 at a time when no adequate randomized comparisons of carotid endarterectomy and carotid artery stenting existed.

Mayo Clinic succeeded Rutgers University as the leader of the CREST multicenter trial to determine the safer treatment: stenting or endarterectomy. With 2,522 patients, CREST was the largest randomized prospective study to compare carotid artery stenting and carotid endarterectomy in a patient population similar to that seen in everyday practice — both symptomatic and asymptomatic patients. The trial was supported by the National Institutes of Health-National Institute of Neurological Disorders and Stroke and involved 108 sites in the U.S. and Canada. Results of the trial, led by Thomas Brott, M.D. (N '98), and Dr. Meschia, were published in 2010 and concluded that, in general, carotid artery stenting is as good as carotid endarterectomy for patients with carotid artery stenosis. Both procedures were shown to be equivalent in major perioperative morbidity and mortality and long-term stroke prevention, and

were good options for patients — the choice of management should be individualized.

CREST was considered transformative because the results led directly to the FDA certifying carotid stenting as a safe and effective treatment for carotid artery stenosis, providing patients and their physicians with an alternative to surgery or to medical treatment alone.

"Trials such as this one form the basis for treatment guidelines, which helps to explain why their results are met with anticipation and anxiety by the medical community," says Dr. Meschia.

CREST-2

In recent decades, medications to treat stroke risk factors including hypertension and high cholesterol have improved, smoking rates have declined and the rate of stroke has been halved.

Dr. Meschia says it's high time for medical management of carotid artery stroke risk to be re-examined, given that the data on medical management is decades old.

"CREST showed that surgery and stenting are exceedingly safe and effective, but we didn't have a comparison group to the alternative," he says. "We've shepherded the field forward in recent decades, including improvements in surgery and stenting, and are now looking at the value of all treatment options. Are these procedures as effective as modern medical therapy, applied consistently and intensively? The quality medications we have today may mean it is not necessary to perform procedures on patients who do not have warning signs of stroke."

CREST-2 involves two parallel but separate studies conducted in patients with asymptomatic carotid disease who have at least 70 percent blockage in one of their carotid arteries but haven't had a stroke or warning signs of a stroke. The trials, which are led by Drs. Brott and Meschia, will test whether carotid endarterectomy or carotid stenting combined with intensive medical therapy is superior to intensive medical therapy alone in preventing stroke in patients with high-grade asymptomatic carotid stenosis. The results will provide the basis for treatment guidelines for a large group of patients, as did its predecessor.

"Regardless of the outcome of the study, which will determine the best treatment of carotid disease, patients win," says Dr. Brott. "Patients at all centers in the study will receive the highest-quality medical management possible along with best practices in surgery and stenting. CREST-2 should offer us the definitive answer to what works best in which patients to treat carotid disease. We hope vascular surgeons, neurosurgeons, interventionists and neurologists will embrace the results and focus efforts on providing the very best care for every patient."

CREST-2 Mayo Clinic team

Florida

- National principal investigator: **Thomas Brott, M.D.**, Department of Neurology; a Eugene and Marcia Applebaum Professor of Neurosciences
- Co-principal investigator: **James Meschia, M.D.**, Department of Neurology
- Co-investigator recruitment, co-chair CREST-2 Site Management Committee: **Kevin Barrett, M.D.** (TY '03, N '06), Department of Neurology
- CREST-2 site principal investigator: **Albert Hakaim, M.D.** (VASS '98), Division of Vascular Surgery; chair, Department of Surgery

Rochester

- CREST-2 site principal investigator: **Giuseppe Lanzino, M.D.** (NS '08), Department of Neurologic Surgery
- Chair, CREST-2 Publications Committee: **Robert Brown Jr., M.D.** (MED '87, N '92), chair, Division of Stroke and Cerebrovascular Diseases, Department of Neurology; John T. and Lillian Mathews Professor of Neuroscience
- Imaging and adjudication: **John Huston III, M.D.** (RD '88, RNEU '89), Division of Neuroradiology, Department of Radiology

Arizona

- Co-chair CREST-2 Site Management Committee and site principal investigator: **Bart Demaerschalk, M.D.** (N '01), Department of Neurology

About CREST-2

- Two parallel multicenter randomized, observer-blinded endpoint clinical trials
- National Institutes of Health-National Institute of Neurological Disorders and Stroke funded; $39.5 million grant — one of the largest grants ever awarded to Mayo Clinic Florida
- 122 actively enrolling centers; as many as 150 could be included (U.S., Canada and other international sites)
- Target enrollment 2,480 by fourth quarter 2020 with two-year follow-up of last person randomized
- First patient enrolled December 2014; results expected in 2022
- 980+ patients enrolled
- University of Maryland, Baltimore: Brajesh Lal, M.D., co-principal investigator
- University of Alabama, Birmingham: George Howard, DrPH, principal investigator for CREST-2 Statistical and Data Coordinating Center (managing patient data and statistical analyses)
- Three treatment methods:

1. Intensive medical management using aspirin to prevent blood clot formation, medications to reduce blood pressure and LDL cholesterol, and management of lifestyle risk factors such as physical activity, weight loss, and alcohol and tobacco use
2. Intensive medical management in combination with carotid endarterectomy
3. Intensive medical management in combination with carotid artery stenting

ALUMNA EAGER TO BE PART OF CREST-2

Neurologist and Mayo Clinic alumna Amelia Adcock, M.D. (TY '10, N '13, CBVD '16), is eager to be part of the process of determining the best treatment for carotid stenosis. She was in her intern year of residency at Mayo Clinic when the results of CREST were published. Today she's associate director of the West Virginia University (WVU) Stroke Center and director of the WVU Center for Teleneurology and Telestroke in Morgantown, West Virginia.

AMELIA ADCOCK, M.D.

"CREST is a classic study that all neurologists quote in discussing the management of stroke patients," she says. "CREST-2 is exciting because it takes patient management one step further to include medical management as a third treatment option. I'm glad to play a role in arriving at evidence-based clarification about how to treat asymptomatic patients."

When Dr. Adcock learned about CREST-2, she contacted Bart Demaerschalk, M.D., Department of Neurology at Mayo Clinic in Arizona, site principal investigator and co-chair of the CREST-2 Site Management Committee. "Dr. Demaerschalk is a mentor and friend, so I inquired if he was still looking for sites to participate," says Dr. Adcock. "An advantage of being a Mayo Clinic alumna is the collegiality. I can pick up the phone and call another alumnus or Mayo staff member."

CREST-2 is the first Mayo-led trial she's been involved with at WVU. "I was impressed when Dr. Brott called me himself to discuss how we'll recruit patients," says Dr. Adcock. "Having an opportunity to strategize with the lead investigator only serves to demonstrate the investigators' commitment to high-quality research and reinforces the spirit of teamwork among all participating partners." ▲

PET PROJECT

USING AI TO FORECAST AND PREVENT EPILEPTIC SEIZURES

If you're in California and see a dog outfitted in a snazzy vest with an electronic tablet, Spot, Fido or Lassie just might be participating in a Mayo Clinic epilepsy trial.

Mayo Clinic and Medtronic are developing a next-generation epilepsy therapeutics platform that integrates brain implants with local and distributing computing environments to continuously chronicle brain activity and deliver electrical brain stimulation guided by artificial intelligence (AI) algorithms.

This research is part of the National Institutes of Health's Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative, which aims to revolutionize understanding of the human brain. Mayo Clinic has partnered with Medtronic, the University of Minnesota, the University of Pennsylvania and the University of California, Davis, to create this epilepsy-management platform. The research is focused on drug-resistant epilepsy and has been studied in dogs with naturally occurring epilepsy in a laboratory kennel setting for several years. The four-legged Californians are the first to test the epilepsy-management system in real-world conditions.

The pets newly enrolled in the study through the University of California, Davis, have electrodes implanted in their brains to provide 16 channels of intracranial electroencephalography (iEEG) and a rechargeable telemetry device implanted in their furry chests. A "handheld" device, stored in the dog's vest, couples with cloud-computing resources and machine-learning algorithms to provide a seamless interface between the patient and physicians to automatically track disease activity and administer informed therapy.

GREGORY WORRELL, M.D., PH.D., AND JAMIE VAN GOMPEL, M.D.

Canine comparison

The prevalence, age of onset and clinical presentation of canine epilepsy is similar to human disease, and dogs' brain and body sizes are large enough to accommodate human-scale implants. Canine epilepsy is treated with many of the same medications and dosages as human epilepsy, and the refractory rate to medications is comparable in both groups. Approximately one-third of canines and people with epilepsy are resistant to drug therapy. The results of the trial could help the 1 million people who have uncontrolled epilepsy.

"Seeing your pet have a grand mal seizure is traumatizing," says Gregory Worrell, M.D., Ph.D. (I-1 '97, N '00, NPHY '01), an epileptologist in the Department of Neurology at Mayo Clinic in Rochester and principal investigator of the trial. "The dogs in this trial — and their owners — stand to benefit greatly from this epilepsy-management system. It goes without saying that people who participate in an upcoming parallel human trial could achieve life-changing results from this potentially transformative technology."

Collar all the parts

Previous trials at Mayo Clinic and elsewhere have demonstrated the efficacy of automated seizure detection, electronic seizure diaries, seizure forecasting and electronic brain stimulation to reduce seizures. Yet all of those pieces haven't been demonstrated together in a cohesive system, which is the goal of the Mayo Clinic trial. The pet study will last three years, and human trials with the same system are expected to commence later this summer.

Dogs enrolled in the study will have three seizures without electronic brain stimulation being administered. Those first few seizures will be recorded and the data analyzed to determine predictive biomarkers for each trial participant. Ideally, subsequent seizures will be reliably predicted, treated with neurostimulation and prevented. Participating dogs will retain the system upon completion of the trial.

Put a leash on seizures

This project requires a multidisciplinary team of Mayo Clinic engineers, scientists, physicians and surgeons working closely with industry and the FDA.

"This is a new paradigm in which we're using artificial intelligence to develop forecasts," says Benjamin Brinkmann, Ph.D. (BPHY '98), lead engineer, Mayo Clinic's Advanced Analytics Services. "We collect brainwave activity with the implanted device and run machine learning algorithms on the handheld device and cloud. Between these two architectures, we can forecast seizures and talk back to the device to administer patients' therapy — stimulating multiple brain regions in real time to prevent seizures."

Jamie Van Gompel, M.D. (CI '11, NS '12), Department of Neurologic Surgery, says the implantable portions of the epilepsy management system are placed in a surgery that lasts only a few hours. "There are no repeat procedures or seizure induction required. The results of the dog trial will help us strengthen the engineering of the system before the human trial commences. We're already working on the next generation of these devices."

Dr. Worrell points out that the Medtronic-designed device is being tested in human trials with other diseases in the BRAIN Initiative, including Parkinson's disease, cognitive disorders, depression, obsessive-compulsive disorder and dyskinesias.

"The potential for neuromodulation and neurorestoration is exciting," says Dr. Worrell. "This trial focuses on a therapy for a specific disease, but there's evidence that brain stimulation can improve, restore and even enhance function. For now, we're pleased to be on the cusp of transforming epilepsy care by using intelligent devices and technology that reliably forecast and deter seizure onset to improve the lives of patients." ▲

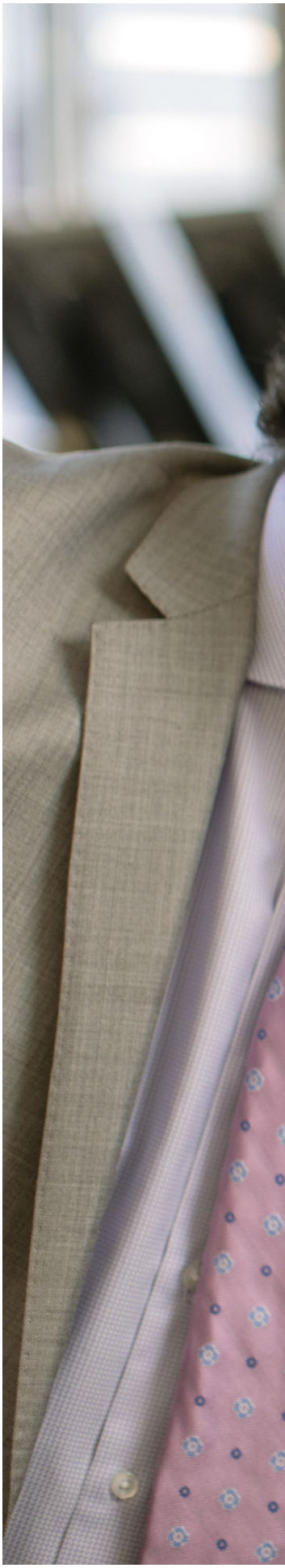
The four-legged Californians are the first to test the epilepsy-management system in real-world conditions.

MS OR NOT MS?

Mayo Clinic Neuroimmunology Lab answers the question

In 2017 Mayo Clinic launched a first-in-the-U.S. clinical test to help patients with some autoimmune disorders get the right diagnosis faster. The test defines a new form of inflammatory demyelinating disease, myelin oligodendrocyte glycoprotein (MOG) autoimmunity, which is distinct from multiple sclerosis (MS), with which it is commonly confused.

The test uses live cells to identify patients who are positive for an antibody to MOG. Mayo Clinic researchers have determined that patients who test positive for MOG antibodies usually don't have classic MS, which has no biomarker. This is significant because, unless their disease is differentiated from MS, some patients have been treated with medications appropriate for MS but not for inflammatory demyelinating diseases such as neuromyelitis optica, acute disseminated encephalomyelitis, optic neuritis and transverse myelitis. MS treatments have been reported to worsen the disease of patients with these other conditions. Correct and prompt diagnosis allows for early therapy with immunosuppressants rather than the disease-modifying agents used to treat MS.



SEAN PITTOCK, M.D., AND ANDREW MCKEON, M.D., M.B., B.CH.

From AQP4 to MOG-IgG

The new test allows serum detection of MOG-IgG (immunoglobulin), which targets a cell-surface protein present on oligodendrocytes in the brain. MOG-IgG is detected using a cell-based flow cytometry assay that measures a color signal transmitted by the IgG bound to MOG on living cells.

The AQP4 antibody, discovered at Mayo Clinic in 2004, was the first biomarker associated with inflammatory demyelinating diseases that could be used to distinguish MS from another neurodegenerative disease. Patients with AQP4 antibodies have an illness that resembles MS, but about 80 percent of them have been shown to have neuromyelitis optica.

The AQP4 antibody discovery led to redefining the diagnostic criteria — classifying neuromyelitis optica as a unique disease, not a variant of MS as previously thought. Having diagnostic-specific antibody tools allowed Mayo Clinic researchers to develop tests to help physicians rule out MS and for patients to get correct diagnoses in the early stages of disease.

Mayo Clinic now offers a comprehensive central nervous system demyelinating disease evaluation that includes both MOG antibody and AQP4 antibody tests. There is no overlap between the two antibodies in an individual patient. The combination of the two tests — AQP4 and MOG antibodies — allows for the most comprehensive evaluation for patients recently diagnosed with demyelinating diseases.

Both the MOG and AQP4 tests are available to Mayo Clinic patients and health care providers worldwide through Mayo Medical Laboratories, the global reference laboratory of Mayo Clinic.

"If a patient is positive for either, it tells the clinician something about the immunopathology of the disease and directs them toward a different type of treatment," says neurologist Sean Pittock, M.D. (N '02, I-1 '03, NMS '04), co-director of Mayo Clinic's Neuroimmunology Laboratory, and the Marilyn A. Park and Moon S. Park, M.D., Director of the Center for Multiple Sclerosis and Autoimmune Neurology. "We generally use immunosuppressant drugs to prevent attacks in both AQP4 and OG-IgG-positive

Sean Pittock, M.D., co-director of Mayo Clinic's Neuroimmunology Laboratory. Mayo Clinic coined the term autoimmune neurology.

Having diagnostic-specific antibody tools allowed Mayo Clinic researchers to develop tests to help physicians rule out MS and for patients to get correct diagnoses in the early stages of disease.

diseases. The traditional disease-modifying agents used to treat MS, such as interferon beta, may exacerbate these disorders, so correct and early diagnosis is important."

From antibody discovery to test development

This pioneering work emanates from Mayo Clinic's Neuroimmunology Laboratory, part of the Department of Laboratory Medicine and Pathology. The lab discovers antibodies and validates antibody tests to clarify differences among autoimmune diseases in a blossoming specialty led by Mayo Clinic. In fact, the specialty appellation was coined by Mayo Clinic.

The lab was founded in 1981 by Vanda Lennon, M.D., Ph.D. (N '78, CBCH '16), immunologist and the Dorothy A. Adair Professor. Dr. Lennon was instrumental in developing the field of autoimmune neurology and leading many of the laboratory's discoveries. Today the lab is co-directed by Dr. Pittock, and Andrew McKeon, M.D. , M.B., B.Ch., (MD '07, NAI '09, CBCH '16).

The Neuroimmunology Lab's work includes:

- Developing novel biomarkers and packaging them into disease-specific profiles and categories (e.g,. autoimmune epilepsy, encephalopathy and autoimmune dysautonomia evaluations).
- Establishing an Autoimmune Neurology Clinic in 2006 to evaluate patients. The clinic is staffed by five neurologists focused on autoimmune disease.
- Starting drug trials based on biomarkers discovered at Mayo Clinic (e.g., eculizumab in neuromyelitis optica [NMO] and intravenous immunoglobulin [IVIg] in autoimmune epilepsy).
- Training the next leaders in the field through the first autoimmune neurology fellowship program in the U.S. — a program that has produced 14 autoimmune neurologists since 2006. Some have stayed at Mayo Clinic; others now lead similar programs in the U.S. and internationally.
- Discovering GFAP and MAP1b antibodies — novel biomarkers of encephalitis — in 2017.
- Developing first-in-U.S. test to detect antibodies to the MOG protein. Studies from Mayo Clinic indicate this disease is twice as common as AQP4-IgG-associated diseases and affects about 1 million people.

"Over the past decade, there has been an explosion, driven by technological advances, in the number of neural antibody biomarkers," says Dr. Pittock. "These antibodies help physicians diagnose autoimmune neurological disorders, direct them toward specific cancer types and assist in therapeutic decision-making. As more antibodies become available to test, it is more challenging for general neurologists and physicians to keep up with this rapidly changing field.

"Our laboratory is committed to offering comprehensive, clinically relevant neural auto-antibody profiles to assist clinicians in providing optimal care to their patients, especially when an autoimmune etiology is in the differential diagnosis."▲

NEURO-SCIENCE POWERHOUSES

at Mayo Clinic in Florida

Rosa Rademakers, Ph.D. (NS ’07), and Nilufer Ertekin-Taner, M.D., Ph.D. (NSCI ’03, I-1 ’04, N ’07, N-BN ’08), collaborate on Alzheimer’s disease-related research in the Department of Neuroscience at Mayo Clinic in Florida. Dr. Ertekin-Taner’s lab, which focuses on late-onset Alzheimer’s disease, generates large datasets of gene expression and multilevel genomics data that are shared with Dr. Rademakers’ lab, which focuses in part on early-onset Alzheimer’s.

NILUFER ERTEKIN-TANER, M.D., PH.D. (LEFT), AND ROSA RADEMAKERS, PH.D.

At the center of Dr. Rademakers' research is the identification and functional analysis of novel genes and genetic risk factors for neurodegenerative diseases including frontotemporal lobar degeneration (FTLD), amyotrophic lateral sclerosis (ALS) and early-onset Alzheimer's. Dr. Ertekin-Taner's lab aims to discover and characterize genetic factors underlying the complex genetics of Alzheimer's and other neurodegenerative diseases, and to use genomics to identify novel therapeutics and biomarkers.

"Alzheimer's is the epidemic of the 21st century," says Dr. Ertekin-Taner. "The human brain is an unknown in many ways. Understanding the brain in health and disease is one of the biggest challenges in health care."

Early success

The two investigators are up to the challenge. Between them they've generated $43.8 million in grants and other accomplishments:

- Dr. Ertekin-Taner is principal investigator (P.I.) in one of six major projects in the Accelerating Medicines Partnership – Alzheimer's Disease initiative by the National Institute on Aging (NIA), aiming to identify drug targets for Alzheimer's disease.
- Dr. Ertekin-Taner is P.I. in the Molecular Mechanisms of the Vascular Etiology of Alzheimer's Disease consortium, aiming to identify novel genes and pathways that influence vascular risk in aging, Alzheimer's and other dementias.
- Dr. Rademakers is lead P.I. of the whole genome sequencing consortium on frontotemporal dementia with underlying TDP-43 pathology, a recent initiative funded by the National Institutes of Neurological Disorders and Stroke (NINDS) and a prestigious NINDS Research Program Award (R35) to provide long-term support and increased flexibility to P.I.s whose outstanding records of research achievement demonstrate their ability to make major contributions to neuroscience.
- Dr. Ertekin-Taner has made important discoveries including establishing some of the earliest endophenotype studies in Alzheimer's and other neurodegenerative diseases; generating one of the largest brain gene expression maps; identifying gene expression changes as the likely mechanism for many Alzheimer's disease variants; identifying changes in expression networks implicated in myelination in Alzheimer's disease; and launching an in-depth sequencing effort in African-Americans and discovering genetic risk variants in this group.
- Dr. Rademakers discovered the progranulin gene as a cause of FTLD and identified sortilin and prosaposin as major regulators of progranulin levels and potential targets for therapy development. She also identified hexanucleotide expansions in C90RF72 as the most common cause of FTLD and ALS, and provided insight into molecular mechanisms of this unique mutation. She leads an international effort to generate and analyze whole genome sequence data on patients with FTLD to identify novel genetic risk factors.

Crossed paths

The two researchers' paths crossed for the first time in 2007. Dr. Ertekin-Taner's Ph.D. co-adviser, Michael Hutton, Ph.D. (BIOC '97), was Dr. Rademakers' supervisor. The two women were given adjacent lab and office space to share.

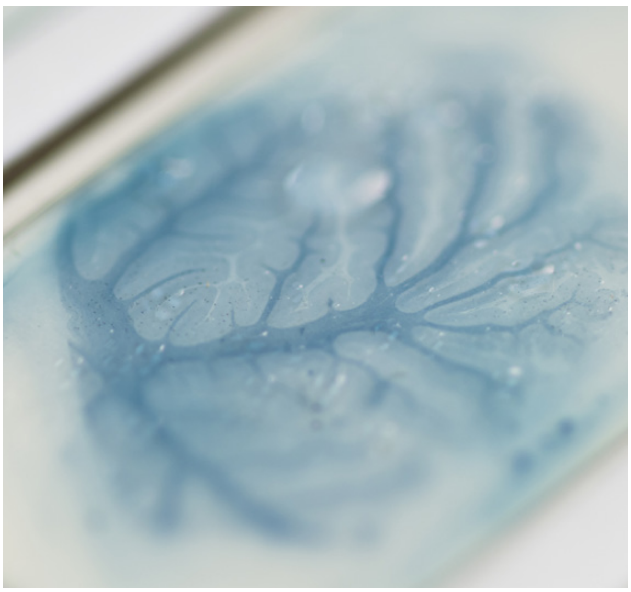
"We started as principal investigators at the same time — hiring and applying for grants and figuring out how to run our independent labs," says Dr. Ertekin-Taner, who at the time had four clinical years at Mayo Clinic under her belt. She received a medical degree in her native Turkey and came to the U.S. to pursue studies in neuroscience. She received her Ph.D. at Mayo Clinic, followed by a research fellowship in neuroscience and clinical residency in neurology in Rochester. She worked in the lab of Steve Younkin, M.D., Ph.D. (PHAR '95), a world-renowned researcher with a focus on Alzheimer's disease and the George M. Eisenberg Professor at Mayo Clinic. Dr. Ertekin-Taner moved from Rochester to Jacksonville in 2007 to pursue a clinical fellowship in behavioral neurology and continue her research as an independent investigator.

At the same time, Dr. Rademakers inherited Dr. Hutton's lab when he left for a job in industry. It had been only three years since she'd received her Ph.D. — an unusually fast pace to be put in charge of a lab.

Dr. Rademakers came to Mayo Clinic in 2005 as a postdoctoral research fellow from the Fund for Scientific Research – Flanders, Belgium, although she is originally from the Netherlands. "The focus of my work in Belgium was FTLD, and Dr. Hutton had found the first gene responsible for it at Mayo Clinic in Florida," she says. "I wanted to work for him for one year and learn as much as I could."

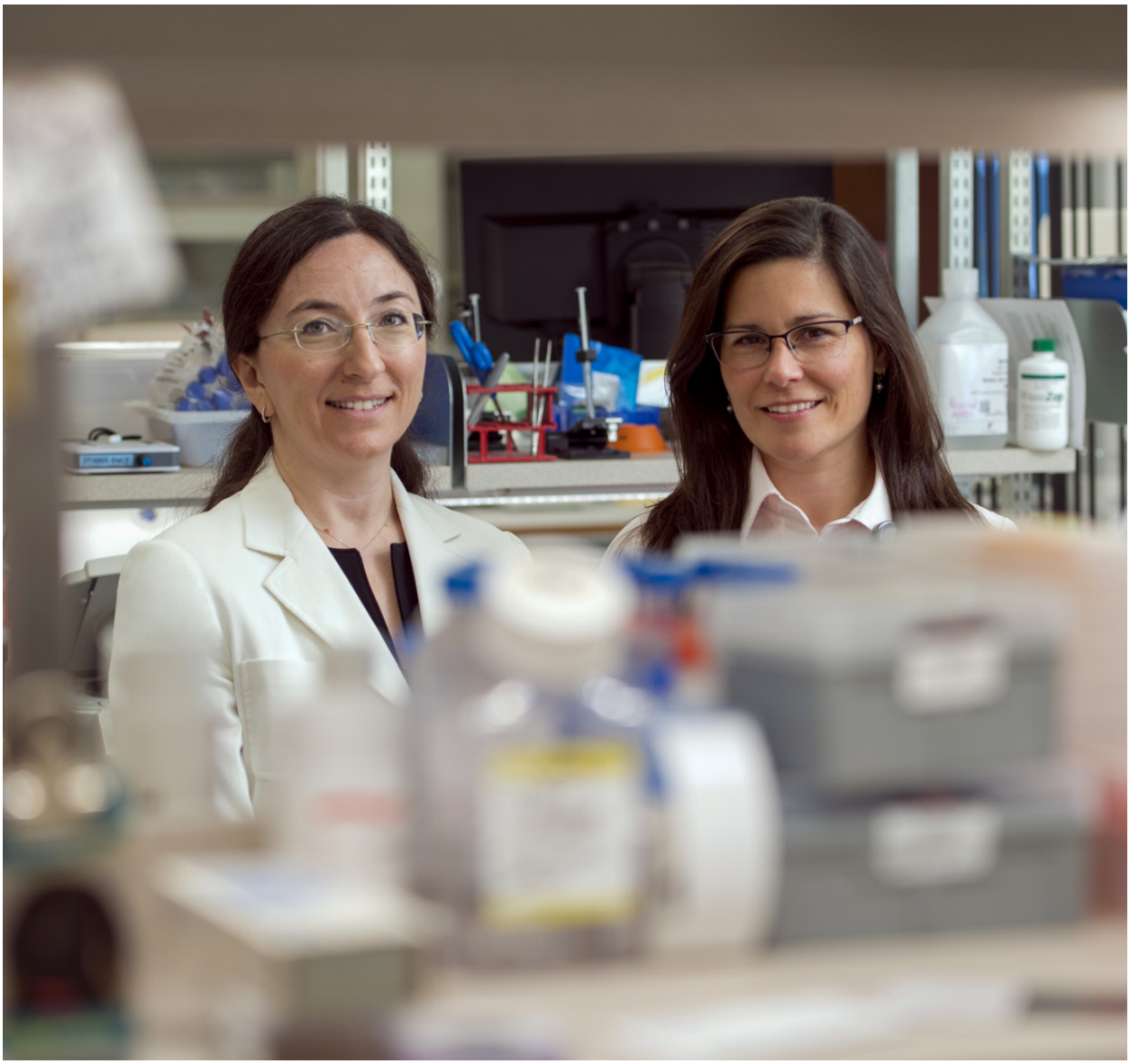
Dr. Rademakers brought with her DNA samples from dementia families who were studied in the Belgian laboratory and combined them with Mayo Clinic's samples. In 2006, the Hutton lab, in collaboration with Dr. Rademakers' Belgian group, found the second gene responsible for FTLD: progranulin.

"I was in the right place at the right time to take over Dr. Hutton's lab," says Dr. Rademakers, who then received several NIH grant awards including an R01 focused on progranulin mutations, followed by two more independent NIH R01 grants and, most recently, an NIH/NINDS R35 award. She also is part of the NIA-funded Mayo Alzheimer's Disease Research Center. In 2011 Dr. Rademakers led the study that identified the third FTLD gene — and long sought-after cause of the disease — receiving national and international attention, including the Potamkin Prize for Research in Pick's, Alzheimer's,



From Dr. Rademakers' lab: a slide section of a human cerebellum used for RNA fluorescent in situ hybridization (FISH) technique.

> **“We need to seek each other out and support each other to make sure that our numbers increase and that we continue to wow the research community with our accomplishments.”**
>
> – Nilufer Ertekin-Taner, M.D., Ph.D.



Nilufer Ertekin-Taner, M.D., Ph.D., and Minerva Carrasquillo, Ph.D., an investigator in Dr. Ertekin-Taner’s lab.

and Related Diseases from the American Academy of Neurology. "All of the major genes for FTLD have been identified at Mayo Clinic in this lab."

Parallel trajectories

Drs. Ertekin-Taner and Rademakers have had parallel research paths since meeting.

"In the early days we provided each other with a lot of emotional support as we applied for grants," says Dr. Ertekin-Taner. "We rejoiced together when we succeeded, and we supported and affirmed each other when we didn't get funding. It was nice to have a sounding board who was going through the same stages of research."

The two also shared similar personal journeys. "I got pregnant with my second daughter as I was writing my first major grant," says Dr. Ertekin-Taner. "I was constantly nauseated. We've shared the challenges and beauty of creating grants and projects while growing our respective families. When you're eight or nine months pregnant, physically uncomfortable and working 10 to 12 hours a day, you don't share that challenge with just anyone. You don't want to look weak or lose opportunities because people think you might not be up to them. I wrote the rebuttal of my first R01 late at night when I had a newborn. Some nights I nursed the baby and wrote parts of the grant with my left hand. I could share that with a fellow scientist who could see herself going through it someday. As working mothers, Rosa and I share anecdotes and camaraderie. It's a nice release to share those feelings in a safe space with someone who won't judge you. It's a level of comfort I cherish."

Dr. Ertekin-Taner's daughters are now 14 and 9; Dr. Rademakers' daughters are 5 and 4.

"We're able to empathize with the balancing act of responsibilities we each have as lab P.I.s, which includes having a sound direction to our labs, going after questions we're passionate about while getting funding, and providing a collegial and intellectually challenging environment for our lab staffs," says Dr. Ertekin-Taner. "The other aspect of our balancing act is as mothers of younger children and partners of working husbands."

Dr. Ertekin-Taner's husband, C. Burcin Taner, M.D. (S '04, TRANS '06), is chair of the Department of Transplantation at Mayo Clinic in Florida. Dr. Rademakers' husband, Christophe Verbeeck, is a senior research technologist at Mayo Clinic in Florida.

Both women remark on how competitive their fields are. "Genetics research is a race," says Dr. Rademakers. "We're all trying to find new genes, and only one in the world can be first. Running a lab is very demanding, and the times you work aren't well defined, so it can take over your life. We all want to be at the top of our field. If you take time off, others are still moving ahead, and you're getting behind."

Dr. Rademakers says she hasn't dropped in productivity or funding since having children. "From the outside, others in my field wouldn't know I'd had two children. But they may see less of me at meetings. I travel less than I used to.

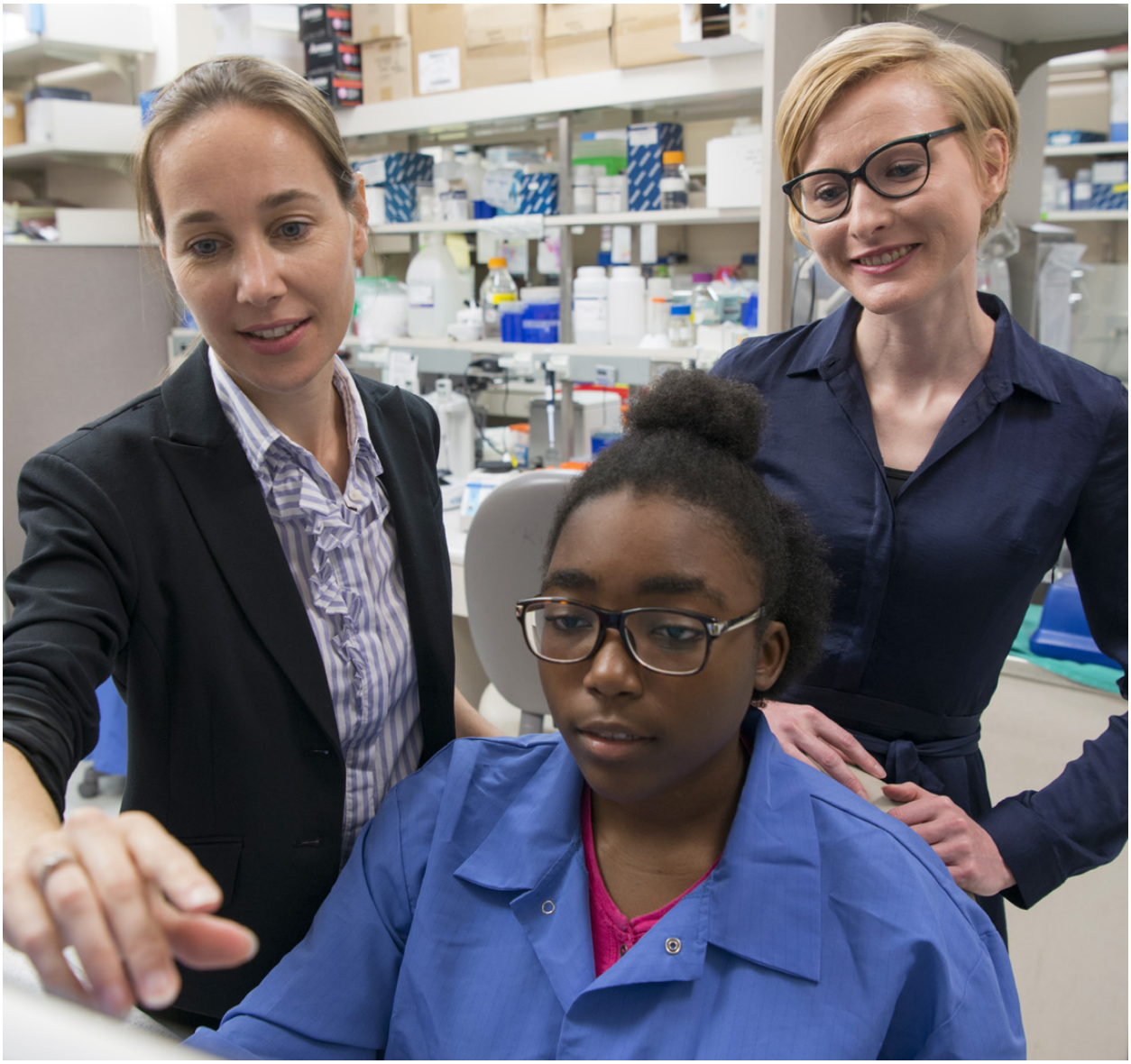
"Having worked in research for more than 10 years and being among the few women in a leading neuroscience department, we can compete with the best professionally — and be mothers and accomplish other things. Great research on Alzheimer's disease and FTLD is occurring on our campus. It just so happens that two women are prominent in it."

Dr. Ertekin-Taner cites the importance of support from successful women in similar career circumstances as key to her and Dr. Rademakers' accomplishments. "How much easier might it have been if we'd had that kind of support even earlier in our careers?" she says.

Nilufer Ertekin-Taner, M.D., Ph.D.

- Consultant, Department of Neurology; Department of Neuroscience
- Professor of neurology and neuroscience
- Mayo Clinic Florida

- Fellowship: Behavioral neurology, Mayo Clinic School of Graduate Medical Education, Jacksonville, Florida
- Residency: Neurology, Mayo Clinic School of Graduate Medical Education, Rochester, Minnesota
- Research fellowship: Molecular science, Mayo Clinic School of Graduate Medical Education, Rochester
- Ph.D.: Molecular neuroscience, Mayo Clinic Graduate School of Biomedical Sciences, Rochester
- Medical school: Hacettepe University Medical School, Ankara, Turkey
- Native of: Izmir, Turkey



Rosa Rademakers, Ph.D., and Marka van Blitterswijk, M.D., Ph.D., with research technician Jazmyne Jackson (seated).

> **“Great research on Alzheimer’s disease and FTLD is occurring on our campus. It just so happens that two women are prominent in it.”**
>
> – Rosa Rademakers, Ph.D.

Shared success

Drs. Ertekin-Taner and Rademakers are passing the baton by nurturing young investigators in their labs.

Minerva Carrasquillo, Ph.D. (NSCI '11), associate consultant in the Department of Neuroscience and assistant professor of neuroscience, is part of Dr. Ertekin-Taner's lab. Dr. Carrasquillo has three young children.

"When I had my first child, I went from having complete flexibility of when and how much I could work to working around her schedule," says Dr. Carrasquillo. "Having children has grounded me and helped me strike a better work-life balance.

"That said, women who pursue research careers and want to become principal investigators need better support systems. The majority of people in graduate school for biomedical research careers are women, but most P.I.s are men. We need a culture change that allows women to both advance and have children. Women can be successful scientists and mothers, but we're still figuring out how to do it. I'd like to be involved in developing an infrastructure to help women advance in research careers without compromising their families as much."

Dr. Ertekin-Taner says because she and Dr. Rademakers have lived through the challenges of having young children and active research careers, they can empathize and encourage. "Rosa and I are extremely passionate about our labs' missions, and our employees are equally passionate. Work doesn't occur in a vacuum — life happens. Empathy and support help make sure 'the show goes on' despite unplanned occurrences like sick kids or elderly parents with needs. In the supportive, safe, flexible environments we've created in our labs, if one person can't make a presentation due to a life event, another person will take it over. Truly embracing diversity involves enabling people to follow their passions, including working differently — not less — to accommodate life's conflicting needs."

Marka van Blitterswijk, M.D., Ph.D. (NSCI '14), associate consultant in the Department of Neuroscience and an assistant professor of neuroscience, has an independent lab but works under the umbrella of Dr. Rademakers' lab. Dr. van Blitterswijk received the prestigious 2017 Paulo Gontijo International Award in Medicine for scientists under age 40 who have made significant contributions to ALS research. Dr. Rademakers received the award in 2012 and nominated Dr. van Blitterswijk.

Dr. Ertekin-Taner also mentors Dr. van Blitterswijk and provides data for her research. "There are too few clinician-investigators in general and even fewer who are women," says Dr. Ertekin-Taner. "Marka has asked me for guidance because I'm the only clinician-investigator in neurology with a bench lab at Mayo Clinic in Florida. We need to seek each other out and support each other to make sure that our numbers increase and that we continue to wow the research community with our accomplishments. The more examples we have of colleagues going through different stages of life, the better." ▲

The Alumni Association is considering forming a subgroup for women physicians and scientists. To help us determine the interest level, please email mayoalumni@mayo.edu or call 507-284-2317 to tell us of your interest.

Rosa Rademakers, Ph.D.

- Consultant, Department of Neuroscience
- Mildred A. and Henry Uihlein II, Professor of Medical Research
- Professor of neuroscience
- Mayo Clinic Florida

- Postdoctoral fellowship: Neuroscience, Mayo Clinic College of Medicine and Science, Jacksonville, Florida
- Postdoctoral fellowship: Neuroscience, University of Antwerp, Belgium
- Ph.D.: Science, University of Antwerp
- Master of Biochemistry: University of Antwerp
- Bachelor of Biology: University of Antwerp
- Native of: Amsterdam, The Netherlands

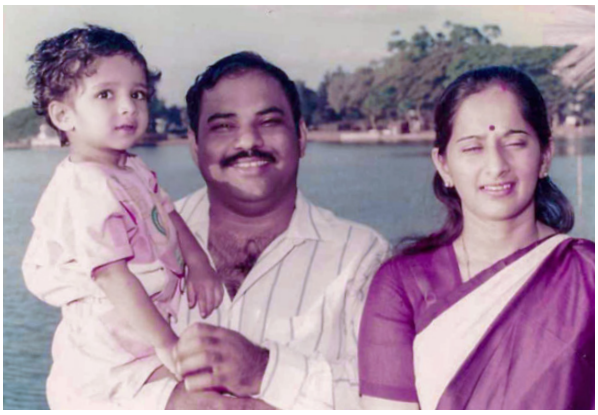
TRANSLATING IDEAS INTO CLINICAL PRACTICE 'IS WHAT RESEARCH IS ALL ABOUT'

2018 Mayo Clinic Alumni Association
Donald C. Balfour Award for Meritorious Research

YOGESH REDDY, M.B.B.S.

Yogesh Reddy, M.B.B.S.'s father is a Ph.D. in chemical engineering and was involved in pharmaceutical research with multiple patents. He told his son he could either pursue engineering like he had or medicine but, if he chose medicine, he would no longer tell him what to do. "So I went into medicine, but I am sure that was his master plan all along," says Dr. Reddy (CV '18, CTSA '19). "However, because of him, I've always been interested in human physiology and bio-engineering. Cardiology is pure engineering; if you understand hemodynamics, you can understand the mechanics of how the heart pumps."

Dr. Reddy credits his father with his curiosity. "He pushed me to try new things and think outside the box," he says. "I find discovery exciting. You publish about it, others read it, and you can potentially change how people think about disease and treatment. That opportunity to give back to science motivates me. Without discovery and innovation, we just keep doing things the same way."



Young Yogesh Reddy with his parents.

Drawn to Mayo Clinic for hemodynamic research

Dr. Reddy landed at Mayo Clinic for a fellowship in cardiovascular disease in 2014.

"Since medical school, I was always interested in hemodynamics," he says. "How the heart functions as a pump is so conceptually simple yet extraordinarily elegant in its complex interaction with the lungs and blood vessels. Much of what I read on those topics came from Mayo Clinic and Drs. (Barry) Borlaug (CV '06) and (Rick) Nishimura (I '80, CV '83). Their interests were a great fit with mine. I met Dr. Borlaug after my first couple of weeks at Mayo Clinic, and he became a tremendous mentor to me."

Dr. Reddy says Dr. Borlaug is the guiding force for his accomplishments at Mayo Clinic. "He taught me early on to identify what will make a difference in the field and what will not. He helps me focus on areas where there are gaps in knowledge that will help patients."

Focused on improving patient outcomes

Dr. Reddy completed his initial fellowship and is embarking on another one in heart failure as he wraps up a two-year master's degree in clinical and translational science through Mayo Clinic Graduate School of Biomedical Sciences.

"The master's program helped me learn how to do all my own statistics, which Dr. Borlaug emphasized was essential to maximize productivity," he says.

According to Dr. Borlaug, Dr. Reddy is being modest. He already has 80 peer-reviewed publications in high-impact journals and received a fellowship training grant from the Heart Failure Society of America and National Institutes of Health.

"What I really want to do is improve outcomes for patients with heart failure with a stiff heart, or heart failure with preserved ejection fraction (HFpEF)," says Dr. Reddy. "There's very little consensus on diagnosis for them and no treatment options."

During his fellowship, Dr. Reddy further defined the characteristics of HFpEF and investigated novel treatment. His accomplishments, which his mentors describe as seminal, include:

- Identifying obesity as the most common cause of high-output heart failure, and obesity-related HFpEF as possibly a unique disease
- Identifying dialysis fistulas as an important cause of heart failure
- Demonstrating that HFpEF is associated with abnormal pulsatile loading and reflected arterial waves with exercise beyond mere hypertension
- Assessing the utility of exercise echocardiography to diagnose HFpEF
- Discovering the near-universal presence of HFpEF among patients with symptomatic atrial fibrillation

- Developing and validating the HFpEF score for diagnosis using simple clinical criteria
- Demonstrating that inhaled albuterol improves all measures of pulmonary vascular load and cardiac output in HFpEF, paving the way for future clinical trials testing its clinical utility

Dr. Reddy's study about long-term cardiovascular changes after the creation of a dialysis arteriovenous fistula or graft in patients with end-stage renal disease is a landmark contribution to cardiology and nephrology, according to Karl Nath, M.B., Ch.B. (NEPH '96), Division of Nephrology and Hypertension at Mayo Clinic in Rochester. "Until Dr. Reddy's work, there was relatively little understanding of the long-term cardiac effects of the dialysis fistula or graft in these patients. This deficiency is especially notable because this patient population is prone to heart failure. His study points out, for the first time, the long-term adverse cardiac consequence of a dialysis fistula or dialysis graft and demonstrates that in patients with pre-existing right ventricular dysfunction, a fistula or graft may impose an increased mortality risk. The conventional teaching and practice of 'fistula first' and the clinical context must thus be carefully considered in patients with significant pre-existing right ventricular dysfunction."

The results of the albuterol finding are the basis for a planned larger clinical trial testing the benefit of this therapy in patients with HFpEF. According to Dr. Borlaug, these trials have the potential to have a dramatic effect on patient care.

Dr. Borlaug calls his protégé an almost-unparalleled rising star. "Our clinical fellows complete two years of difficult clinical rotations, and it is unusual for them to accomplish any research work during this time due to the demanding schedule," he says. "Despite this, Dr. Reddy burned the midnight oil after his clinical responsibilities were completed to perform the necessary data acquisition, analysis, interpretation and drafting of the manuscript that culminated in a first-author publication on the clinical syndrome on high-output heart failure that was published in *Journal of the American College of Cardiology*."

The publications are a means to an end for Dr. Reddy. "I feel like I've achieved some success when other physicians call and want to discuss cases based on something I've published or people discuss my data at national conferences," he says. "To translate an idea into clinical practice — well, that's what research is all about for me. I'll be even happier when patients with HFpEF tell me they feel better or they're living longer." ▲

Yogesh Reddy, M.B.B.S.

- Fellow, Department of Cardiovascular Medicine
- Mayo Clinic Rochester

- Fellowships: Advanced heart failure and transplantation, cardiology, Mayo Clinic School of Graduate Medical Education, Rochester, Minnesota
- Graduate: Masters in Science and Clinical Investigation, Mayo Clinic Graduate School of Biomedical Sciences
- Residency: Internal medicine, Case Western Reserve/ University Hospitals, Cleveland, Ohio
- Native of: Potsdam, New York

"I'll be even happier when patients with HFpEF tell me they feel better or they're living longer."

– Yogesh Reddy, M.B.B.S.

BUILDING BETTER EYES TO HELP RADIOLOGISTS SEE MORE CLEARLY

2018 Mayo Clinic Alumni Association
Edward C. Kendall Award for Meritorious Research

PENGFEI SONG, PH.D.

Pengfei Song, Ph.D. (BME '14, PHYS '16), grew up in China as an only child to parents who were both engineers. He was presented with two education tracks: art or science. He chose the science route. At college in China, he was told the 21st century is the century of biology, so he selected all bio-related courses and was ushered into a biomedical major. During his senior year he worked in a lab processing biomedical images, and he was hooked. He began looking for opportunities to learn more, which eventually led him to the University of Nebraska-Lincoln, where Professor Gregory Bashford, Ph.D., was looking for a student to analyze ultrasound images.

Drawn to Mayo Clinic by elastography

"His projects looked interesting, and it was a short-term commitment while getting my master's degree," says Dr. Song. While there, he became fascinated by elastography, a type of imaging that maps the elastic properties and stiffness of soft tissue. He inquired of his university professor about where to pursue his Ph.D. and education in elastography. The work of James Greenleaf, Ph.D. (PHYS '71), Department of Physiology and Biomedical Engineering at Mayo Clinic — a "big name" in elastography, according to Dr. Song — drew him to Rochester, Minnesota.

Dr. Greenleaf studies ways to measure tissue properties with high-speed ultrasound scanners, including vibro-acoustography and shear wave. This type of ultrasound is a vital tool for obtaining measurements of the elastic properties of tissue and organs — important biomarkers for assessing disease — and is fast, inexpensive and noninvasive.

In the eight years Dr. Song has been at Mayo Clinic, he's made a name for himself. He received a National Institutes of Health K99/R00 Pathway to Independence Award and American Heart Association postdoctoral fellowship. He has also published more than 40 peer-reviewed journal articles, 65 conference proceedings and abstracts, four book chapters on ultrasound imaging and has 13 patent applications (with four issued). Major ultrasound companies have licensed and commercialized several innovative ultrasound technologies he developed, which are being used by clinicians around the world. Licensing to one company alone brings in about $1 million annually to Mayo Clinic.

The focus of Dr. Song's pioneering work is developing cutting-edge, translational ultrasound imaging technologies that bridge the gap between patient health care needs and clinical practice. He conducted one of the first clinical studies to validate shear-wave elastography in liver fibrosis staging using magnetic resonance elastography (MRE) as a reference standard. His studies have produced important cutoff values of liver stiffness measurements for effective staging, and are essential for ultrasound practice transformation as Mayo rolls out elastography for routine liver fibrosis staging.

Dr. Song also has conducted innovative research in cardiac shear-wave elastography in which he achieved a key technical breakthrough of enabling in vivo human transthoracic measurement of myocardial stiffness. He developed several ultrafast ultrasound microvessel imaging techniques that increased the sensitivity of Doppler ultrasound by one order of magnitude without the use of contrast

> **"If we can measure response with ultrasound instead, we can image patients more often, less expensively and without radiation exposure."**
>
> – Pengfei Song, Ph.D.

microbubbles. These imaging techniques allow the imaging of microvessels in vivo that are otherwise invisible to ultrasound. His K99/R00 grant supports his work to develop and translate the microvessel imaging technologies to the clinic to realize early prediction of colorectal liver metastases treatment response to antiangiogenesis therapy.

"This tool could be a game-changer to revolutionize treatment-response monitoring of cancers to spare patients from the side effects and costs of ineffective medical therapies by expediting the transition to more effective treatment regimens," says Shigao Chen, Ph.D. (BPHY '02, PHYS '04), Department of Radiology at Mayo Clinic in Rochester. "It also has great potential of assessing emerging novel cancer treatment methods such as immunotherapy and providing an early and accurate predictive biomarker for the development of new therapy agents."

Dedicated to solving physicians' challenges

Dr. Song says he learned how to build things to solve problems from his engineer parents. "The short answer to questions about what I do is that I build better eyes to help radiologists see more clearly. For example, when a cancer patient has a therapy, we traditionally wait several months and then use MRI or CT to measure the results. Oncologists would like to know the response to therapy sooner because these drugs are toxic and expensive. If we can measure response with ultrasound instead, we can image patients more often, less expensively and without radiation exposure. And, more importantly, oncologists can switch drugs sooner toward a goal of effective therapy. I hope to reach a state where we can measure therapy response within days."

Dr. Song is grateful for the collaborative environment at Mayo Clinic. "It's important for researchers like me to talk to physicians and understand the challenges they face in practice," he says. "Just as important as being on the cutting-edge of technology is keeping a finger on the pulse of practice. That helps to ensure our research is translational. I get to work with physicians every day, and they tell me what they need and what works. That's valuable feedback for biomedical engineers so we can meet unmet clinical needs of patients." ▲

Pengfei Song, Ph.D.

- Associate consultant, Department of Radiology
- Assistant professor of biomedical engineering and radiology
- Mayo Clinic Rochester

- Fellowships: Research, radiology; postdoctoral research, physiology and biomedical engineering, Mayo Clinic School of Graduate Medical Education, Rochester, Minnesota
- Graduate: Ph.D., biomedical engineering, Mayo Clinic Graduate School of Biomedical Sciences, Rochester, Minnesota; master's degree, biological systems engineering, University of Nebraska-Lincoln
- Undergraduate: Huazhong University of Science and Technology, Wuhan, China
- Native of: Weihai, China

YOUNG INVESTIGATORS GET THEIR FEET WET

Mayo Clinic investigators produce more than 7,200 publications and present research at thousands of conferences around the world each year. The legacy of impactful research that has emanated from Mayo Clinic for more than 150 years can intimidate new researchers. Where to begin? How to get noticed? How to make your mark?

Enter the Mayo Clinic Young Investigators Research Symposium (YIRS). This biennial event on the Rochester campus showcases the research of Mayo Clinic's young investigators from all sites — research and clinical fellows, graduate and medical students, residents and junior faculty. Researchers from other institutions are invited, and several from the University of Minnesota participated this year. Both external and Mayo Clinic investigators spoke about research-related topics in a daylong formal program.

Adela Cope, M.D. (OBG '18), a resident in the Department of Obstetrics and Gynecology at Mayo Clinic in Rochester, presented a poster, "Postpartum Contraception Use in Somali Women: A Population-Based Study" — one of 264 posters in basic, clinical and translational science topics.

"I thought the event was an excellent representation of the variety of projects young investigators are conducting at Mayo and other institutions," says Dr. Cope. "There was a little something for everybody to get excited and learn more about.

"I appreciated the opportunity to share my work and gain experience presenting to those who may not be familiar with OB/GYN. In the process, I identified possible future collaborators in health care disparities, specifically in women's health and the Somali population. We exchanged information, and I also received contact information for a few people who are good connections for working with the

ADELA COPE, M.D.

Mayo Clinic Graduate School of Biomedical Sciences Ph.D. student Luz Cumba-Garcia (IMM '21) presented her research at the Young Investigators Research Symposium.

Somali community. I may not have made these connections had it not been for our discussion about similar interests at the YIRS."

Matthew D'Costa, M.D. (NEPH '19), a clinical fellow in the Division of Nephrology and Hypertension at Mayo Clinic in Rochester, also presented a poster, "Structural Heart Disease, Diabetes and Survival Among Elderly Patients Initiating Maintenance Hemodialysis." He says he received excellent feedback on his project to improve its chances of publication. "One of the judges gave me advice about how to improve the presentation of my data, to include more sophisticated statistical analyses and to extend patient follow-up."

Both Drs. Cope and D'Costa were poster presentation winners (alumniassociation.mayo.edu/news for a list of poster presentation winners).

Janet E. Olson, Ph.D. (HSR '99), Division of Epidemiology, Department of Health Sciences Research at Mayo Clinic in Rochester, was a first-time judge at the symposium. "For some, it was a first chance to present at a poster session," she says. "This is a fantastic opportunity to assist young investigators to gain experience in presenting and discussing their science. I left the session excited about the work being done by new investigators at our institution."

Bruce Horazdovsky, Ph.D. (MBIO '02), Department of Biochemistry and Molecular Biology, associate dean of Mayo Clinic Graduate School of Biomedical Sciences and director of the Office of Research Postdoctoral Affairs, has been involved as an Advisory Committee member and judge since the symposium's inception. "The YIRS was first proposed by our young investigators, who sought an opportunity to present their work and learn from experienced investigators in the Mayo community. This event allows the whole community of young investigators to gather and share what they've learned. New ideas are born, and new research teams are created. This benefits YIRS participants and enhances Mayo's education, research and clinical practice missions."

At the last two Young Investigators Research Symposiums, top winners from the Rochester Regional Science Fair — middle- and high-school students — also were invited to share their research. "These young investigators presented their award-winning science side by side with more than 260 Mayo Clinic researchers and held their own. The researchers of tomorrow were very well represented," says Dr. Horazdovsky. ▲

BENJAMIN SANDEFUR, M.D., AND VYTAS KARALIUS, M.D.

ON THE SHOULDERS OF GIANTS

Mentor helps medical student find his niche and realize his dreams

Vytas Karalius, M.D. (MED '18), didn't initially consider emergency medicine as a student at Mayo Clinic School of Medicine. "I wanted to have long-term relationships with patients," he says.

Then he heard Benjamin Sandefur, M.D. (MED '08, EM '12), Department of Emergency Medicine at Mayo Clinic in Rochester, speak about his passion for the specialty.

"Dr. Sandefur said he'd felt that way too but realized that in emergency medicine, you see patients for only a short time but on what may be one of the worst days of their lives. He said it takes special talent to form relationships in that environment that can be just as rewarding," says Dr. Karalius. "That resonated with me."

Dr. Sandefur also discussed the prominence of public health in emergency medicine — another factor that resonated with Dr. Karalius, who has a Master of Public Health degree.

"Dr. Sandefur talked about the patients emergency medicine physicians see, such as those with mental health and addiction problems, who frustrate some health care providers but are very much in need of medical attention," says Dr. Karalius. "I know how easily those patients can be stigmatized, and his perspective further attracted me to emergency medicine."

Besides sharing his philosophy about emergency medicine, Dr. Sandefur was a mentor. "He said his role was to give me the resources to make the best decisions for me rather than lead me in a particular direction," says Dr. Karalius. "He seemed to always have my best interests at heart and started every conversation with, 'Let's talk about how things are going for you.' It wasn't long ago that he was in my shoes, so he was able to relieve my anxiety. In his calming way, he showed me the big picture and reassured me that my concerns usually weren't make-or-break issues in my career.

"And he helped show me that emergency medicine physicians, who have high rates of burnout, can have a happy, engaged family life, which is my ultimate goal."

Dr. Karalius says every rotation in every specialty appealed to him during medical school, making emergency medicine a good fit. "You see problems with every organ system and a wide range of pathology, and use different tools to solve and fix problems. You get a little bit of everything, and you're intimately tied to the rest of the hospital and specialists. There's no specialty quite like emergency medicine, and I'm grateful to Dr. Sandefur for lighting the path on my journey through medicine so I could arrive at that decision."

Dr. Karalius matched at Northwestern University in Evanston, Illinois, and began his emergency medicine residency in June.

"If I can be like Dr. Sandefur in any way in my practice, I'll have made it," he says. "I'd love to be a mentor to someone the way he has for me. Dr. Sandefur told me he'd have succeeded as a mentor when I realize my dreams. I think he can call this one a success." ▲

Mayo Clinic Alumni Association Board of Directors

KNOW YOUR BOARD

Provides leadership • Makes policy decisions Decides strategic direction and vision

THOMAS SMITH, M.D. (MED '83)

Board member

- Pediatric hematologist/oncologist, Center for Cancer and Blood Disorders, Children's Hospital Colorado, Aurora, Colorado
- Associate professor of pediatrics, Section of Pediatric Hematology/Oncology/BMT, University of Colorado
- Research fellowship: National Jewish Center for Immunology and Respiratory Medicine, Denver, Colorado
- Fellowship: Pediatric hematology/oncology, Children's Hospital Colorado and University of Colorado Health Sciences Center, Denver
- Residency: Pediatrics, North Carolina Baptist Hospital, Bowman-Gray School of Medicine, Wake Forest University, Winston-Salem, North Carolina
- Medical degree: Mayo Clinic School of Medicine, Rochester, Minnesota
- Undergraduate degree: Michigan State University, Lansing
- Native of: Rochester, Minnesota

Why did you decide to pursue medicine?

I grew up in Rochester, surrounded by Mayo Clinic, its doctors and employees, their children, science, breakthroughs and patients from other countries. Everyone associated with Mayo was extremely proud of Mayo and its mission to take care of patients.

I was undecided on a career throughout college. At one point I decided to pursue ornithology because I was interested in birds. My ornithology professor told me, "Find a job where you make some money. Then, for birding, hire someone like me on the weekends."

In my junior year of college, I began to understand the great satisfaction of taking care of patients through good times and bad, and the excitement of the scientific research associated with a medical career.

Why did you train at Mayo Clinic?

Mayo exemplified the highest ideals of medicine — respect, compassion, teamwork, healing and innovation. While many organizations give lip service to these ideals, the employees at Mayo truly believed and lived these ideals — from Roy Baker, the elevator operator, to Dr. David Utz (U '58), the world-famous chair of urology. People in Rochester don't always realize the importance and uniqueness of every member of the Mayo team being proud of Mayo and their willingness to do whatever it takes to make things better.

What were your initial impressions of Mayo Clinic?

I think I first saw it out my front window when I was 4, and it looked big. I always remembered the statue of the man hanging off the wall of the Mayo Building. I went to reading hour at the public library when I

was a child before the building became a Mayo Clinic School of Medicine facility. I had important events like my Eagle Scout final interview at the historical offices in the Plummer Building.

Mayo surrounded me as a child, and its mission of providing the best care to every patient permeated my philosophy of life from an early age.

How does Mayo Clinic influence your practice?

The best word to describe the Mayo Clinic influence is profound. I had the privilege of training with the true giants of Mayo Clinic. Dr. John Mayne (I '53) taught me to listen closely to all patients because everyone has a story. Dr. Richard Reitemeier (I '54) taught me the art of taking care of dying cancer patients. Dr. Robert Kyle (I '59) helped me through the trials of research, and I published my first paper with him. Dr. Joseph Kiely (I '53) taught me to end every patient interaction with the question, "Is there anything else I can do to help you?" I think about my mentors and use these lessons in my practice every day.

At Mayo, I became more knowledgeable, trained in medicine and able to pursue my medical training very well prepared. But I also became more compassionate, healing and focused on patient care.

At my current institution, I'm on the Admissions Committee for medical students. I wear my Mayo Clinic tie in interviews with prospective students. I look for students who demonstrate respect, compassion, teamwork, excellence and innovation — all Mayo Clinic values.

What do you contribute to the Mayo Clinic Alumni Association?

I bring enthusiasm and a deep love and respect for Mayo Clinic. I hope to increase participation in the Alumni Association and work on programs where Mayo medical students interact with alumni during their training.

What do you do in your spare time?

I spend time with my wife and three children. My daughter is in her second year at the Royal College of Surgeons in Dublin, and my son is applying to medical school next year. My other son sells advertising for podcasts in Los Angeles. My wife is a psychologist.

What would people be surprised to know about you?

I'm an expert mountaineer. I have summited all of the 55 peaks in Colorado over 14,000 feet high and Mount Kilimanjaro. I'll be climbing the Grand Teton this summer. And I've walked up the Assisi Heights hill in Rochester on more than one occasion.

I also founded pediatric services at Samaritan House Homeless Shelter in Denver and served as a volunteer physician for 20 years. We had more than 200 nurses and doctors involved. It was deeply satisfying work. ▲

"I look for students who demonstrate respect, compassion, teamwork, excellence and innovation — all Mayo Clinic values."

– Thomas Smith, M.D.

MAYO CLINIC UPDATE

Mayo Clinic School of Medicine is ranked No. 6 in *U.S. News & World Report* rankings

Mayo Clinic School of Medicine was ranked as the No. 6 medical school in the recent *U.S. News & World Report* 2019 Best Graduate Schools report.

It's a jump from the school's 2018 ranking of No. 20. The rise is due, in part, to changes in *U.S. News* reporting methodology, which added four new ranking factors to fully capture the funding of research conducted in academic organizations and adjusting reputation factors that could possibly favor larger universities.

Fredric Meyer, M.D. (NS '87), the Juanita Kious Waugh Executive Dean for Education at Mayo Clinic, says the ranking reflects the tremendous research and education efforts underway at Mayo Clinic. "One of my goals in becoming executive dean for education and dean of the medical school in 2016 was to see our medical school become one of the top 10 in the country. Mayo Clinic College of Medicine and Science and administration, faculty, students and staff in the medical school have worked hard to enhance reporting processes and transform the educational experience at Mayo.

"While the *U.S. News & World Report* rankings are one benchmark used by academic medicine and prospective students, I hope the true measure of success for any medical school is knowing the students who graduate have the best knowledge and skills to be successful physicians and physician-scientists as well as compassionate hearts and inquisitive minds to change patient lives and innovate health care for generations to come."

Research training and scholarly activity are integrated into the school's curriculum, resulting in Mayo's medical students publishing their findings in peer-reviewed journals at more than twice the national average of their student counterparts.

In 2017 Mayo Clinic School of Medicine expanded to a national medical school and added a four-year campus in Arizona. The school also recently started a new program on Mayo Clinic's Florida campus that enables third- and fourth-year medical students from other Mayo campuses to complete their last years of training at Mayo Clinic Hospital in Jacksonville. Mayo medical students can perform clinical rotations and research with Mayo experts at campuses in Arizona, Florida and Minnesota.

Mayo Clinic experts on new NBC program

Mayo Clinic experts will be featured on "Health + Happiness with Mayo Clinic," a new weekly program on NBC. This 30-minute program airs after "Today" on Saturday mornings. The 22 episodes will be broadcast in more than 200 markets including Chicago, Jacksonville, Los Angeles, Minneapolis, New York City, Phoenix and Rochester.

The program is hosted by Mayo Clinic News Network's Vivien Williams and NBC's Joy Bauer. The program is aimed at young families and features practical tips about how to improve their lives. Topics include how to make healthy nutrition choices and sleep better.

"Health + Happiness with Mayo Clinic" is projected to reach 1.3 million viewers weekly. Episodes will be available on nbc.com the day after they air on the network.

22 EPISODES

200+ MARKETS

1.3 MILLION VIEWERS

Mayo Brothers and Barbara Bush Distinguished Fellowship awards

Mayo Clinic School of Graduate Medical Education announced fellowship awards for the 2018-2019 academic year. Recipients were selected based on clinical performance, scholarly activity and humanitarian work.

The Mayo Brothers Distinguished Fellowship award is the most prestigious recognition from Mayo Clinic School of Graduate Medical Education.

The Barbara Bush Distinguished Fellowship Award recognizes similar qualities with an emphasis on humanitarianism.

Mayo Brothers Distinguished Fellowship

Hayan Jouni, M.D. (CV '10, I '13, CI '14, CV '17, CVAD '19), Medicine & Pediatrics, Advanced Adult Cardiology, Mayo Clinic Rochester

Maria Linnaus, M.D. (S '18), General Surgery, Mayo Clinic Arizona

Meghan Murphy, M.D. (NSSE '17, NS '18), Surgery & Surgical Specialties, Neurosurgery, Mayo Clinic Rochester

Vijay Ramanan, M.D., Ph.D. (N '19), Medical & Laboratory Specialties, Adult Neurology, Mayo Clinic Rochester

Eugene Tan, M.D. (I '16, INFD '19), Medicine & Pediatrics, Infectious Diseases, Mayo Clinic Rochester

Cornelius Thiels, D.O. (S '18), Surgery & Surgical Specialties, General Surgery, Mayo Clinic Rochester

Barbara Bush Fellowship Award

Jay-Sheree Allen, M.D. (FM '18), Family Medicine, Mayo Clinic Rochester

Mayo Clinic coordinates new Lewy Body Dementia Association Research Centers of Excellence

Mayo Clinic will coordinate a new collaboration of the Lewy Body Dementia Association: the Lewy Body Dementia Association Research Centers of Excellence. The collaboration features 24 academic medical research centers across the U.S.

The program aims to establish a network of institutions that can host clinical trials and share the common vision of providing the highest level of clinical care over the course of Lewy body dementia treatment. The network also seeks to increase access to support for caregivers and people with Lewy body dementia, increase knowledge of the disease among the medical community, and construct administrative infrastructure and generate the resources necessary to advance research and care.

"Successful clinical trials are the holy grail for all stakeholders in the Lewy body dementia treatment community, so the goal of the Research Centers of Excellence program is to benefit patients with the disease," says Bradley Boeve, M.D. (I-1 '92, N '95, NACF '96), chair, Division of Behavioral Neurology, Department of Neurology at Mayo Clinic in Rochester, and The Little Family Foundation Professor of Lewy Body Dementia. "Lewy body dementia is chronically underdiagnosed, so we seek to address a decades-old challenge of finding and enrolling enough correctly diagnosed patients, working with clinicians and staff who understand the disease, and reaching the right patients and families to encourage participation in clinical trials. Now we can address all three."

Bradley Boeve, M.D.

Refer-a-friend

Did you know you can now refer friends and family who are not your patients to Mayo Clinic via the Alumni Association website?

alumniassociation.mayo.edu/refer

Obituaries

Jeffrey Bernstein, M.D. (S '86), died March 14, 2018.

Chris Christu, M.D. (PD '55), died Dec. 1, 2017.

George Chronis, M.D. (GYNS '92).

Willis Dickens, M.D. (I '59, N '62) died Feb. 16, 2018.

Peter Erbguth, M.D. (ANES '69), died Feb. 14, 2018.

Marshall Freedman, M.D. (S '53, I '54), died June 12, 2016.

E. Jerome Hanson Jr., M.D. (NS '75), died Jan. 28, 2018.

Vernon K.S. Jim, M.D. (PLS '55), died Sept. 12, 2017.

Harold Keenan, M.D. (I '69), died Aug. 28, 2017.

Evan Lindberg, M.D. (S '64, TS '66), died Feb. 22, 2018.

Gerald Needham, M.D. (M '47), died Feb. 17, 2018.

Brett Shepard, M.D., Ph.D. (I '06, CI '08, INFD '09), died Sept. 17, 2015.

Mary Templeton, M.D. (P '74), died Jan. 27, 2018.

George Walcott, M.D. (I '67), died March 24, 2018.

Complete obituaries and alumni news
alumniassociation.mayo.edu/people

Mayo Clinic Alumni magazine is published quarterly and mailed free of charge to physicians, scientists and medical educators who studied and/or trained at Mayo Clinic, and to Mayo consulting staff. The magazine reports on Mayo Clinic alumni, staff and students, and informs readers about newsworthy activities throughout Mayo Clinic.

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Mayo Clinic is committed to creating and sustaining an environment that respects and supports diversity in staff and patient populations.

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FIND MAYO CLINIC

TUNE IN TUESDAY: KEN BURNS' MAYO CLINIC DOCUMENTARY DEBUTS SEPT. 25

"The Mayo Clinic: Faith - Hope - Science," a new documentary executive produced and co-directed by Ken Burns, debuts on PBS Tuesday, Sept. 25, 9 p.m. EDT.

"The captivating stories of our patients come alive on film as they share intimate details about their search for hope and healing. This hope emanates from our staff members who work tirelessly every day to live our patient-centered values," says John Noseworthy, M.D. (N '90), president and CEO, Mayo Clinic. "Our hope is that Ken Burns' magical storytelling will give the world a small taste of Mayo Clinic and what is possible when committed professionals — grounded in common values — devote their lives to the vocation of serving others."