VAN ANDEL INSTITUTE®

HIGHLIGHTS OF HOPE | March '19 ISSUE

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UNCOVERING HOW THE BODY'S FUELING SYSTEM AFFECTS HUMAN HEALTH

It takes a lot of energy to keep the human body up and running. But where does this energy come from? And how does it affect every aspect of our lives?

The answer is metabolism — a set of constantly occurring chemical reactions that provides the fuel for day-to-day life, from keeping the heart beating to aiding in digestion. Although metabolism is a central part of human health and well-being, there's still much that we don't know about how it works and how it contributes to a host of health problems.

That's why, last fall, Van Andel Research Institute (VARI) established the most comprehensive metabolism research program of its kind, aimed at developing scientifically driven strategies for improving health and for treating diseases like cancer, Parkinson's and diabetes.

This collaborative effort comprises six laboratories, four of which are new, to investigate the full spectrum of metabolism, from dietary influences to how cancer cells hijack metabolic processes.

"Metabolism is involved in each and every process in the body, from big, system-level things like our immune defenses down to smaller-scale things like the life cycles of individual cells," said Dr. Russell Jones, the program's leader, who joined the Institute from McGill University in 2018. "We have so much to learn. It is our hope that we can leverage what we find to prevent disease and to better treat it when it does occur."

To start, the program will focus on several areas, including:

Understanding the role of nutrition in one generation and beyond

When most people hear the word "metabolism," food is the first thing that comes to mind. While it is a major player in metabolism, it's important to remember that food consumption is part of a bigger story. During digestion, the body breaks food down into its most basic components — sugars, amino acids, vitamins and minerals. Some of these nutrients will be used right away to fuel everyday function, while others will be stored for later use. VARI scientists are investigating how nutrition impacts health and risk for disease and is exploring if these effects can be passed down through the generations.

Better targeting and treating cancer

Cancer cells have a voracious appetite for energy, which propels their invasive spread throughout the body. But this strength may also be a weakness — the by-products produced by their out-of-control metabolisms may help locate and identify cancers early on, allowing for treatment of some cancers much sooner than currently possible with existing detection methods.

For example, certain cancers, such as those in the pancreas, produce special carbohydrates called glycans that one day could be used for earlier and more definitive diagnoses. Think of them like molecular fingerprints that scientists can use to differentiate a sick cell from a healthy cell.

But that's not all. VARI scientists also are searching for ways to starve cancer cells of energy and, in doing so, could uncover new, more effective ways to treat the disease.

Drilling down on the causes of Parkinson's disease

There's still much we don't know about the root causes of Parkinson's, a neurodegenerative disorder that affects 7 to 10 million people worldwide. Today, new discoveries are pulling back the curtain on some of the metabolic mechanisms that cause cells in the brain to die off, leading to the disease's hallmark movement-related symptoms.

Growing evidence shows that problems with cellular powerplants, known as mitochondria, may cause cells to dysfunction, allowing toxic proteins and other debris to build up, eventually clogging and killing the cells. By figuring out how and why this happens, VARI scientists hope to develop new ways to interfere with this devastating process and stop Parkinson's in its tracks.

Bringing it all together

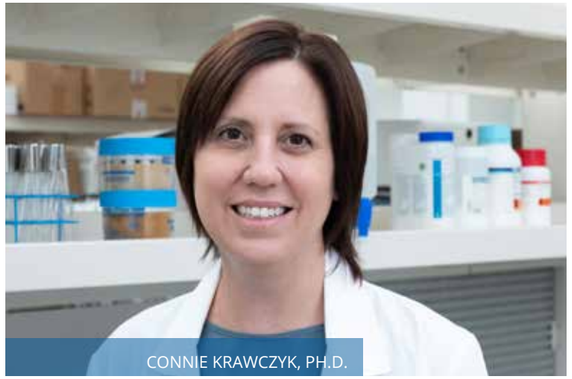
Metabolism isn't just one thing — it's a constellation of systems and processes working in elaborate concert to power life. The Institute's new program reflects this connectivity and collaborative spirit, and aims to translate the promise of discovery into everyday practice — changing the way diseases like cancer and Parkinson's are treated and improving the lives of people around the world.

Learn more about the Institute's metabolism research at vari.vai.org.

Metabolic and Nutritional Programming Team


RUSSELL JONES, PH.D., PROGRAM LEAD


BRIAN HAAB, PH.D.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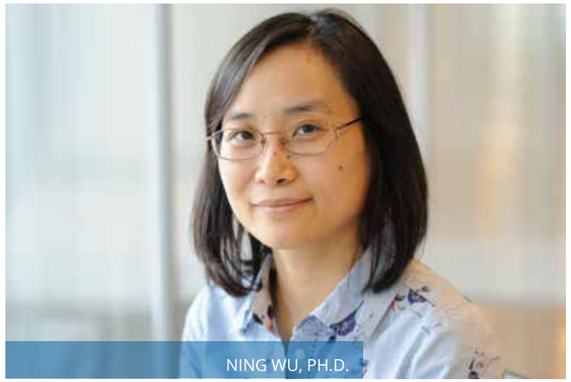

NING WU, PH.D.

A SURPRISING DISCOVERY

How the appendix is transforming our understanding of Parkinson's

When it comes to Parkinson's disease, the appendix is usually not the first thing that comes to mind — but perhaps it should be, according to Van Andel Research Institute's Dr. Viviane Labrie.

In October, Labrie and her colleagues published revolutionary new findings that peg the appendix as a starting point for Parkinson's, a discovery that provides a path forward for devising powerful new ways to predict and possibly prevent the disease. The findings were hailed as a major — and surprising — breakthrough by scientists around the world.

"We're in the midst of a watershed moment in Parkinson's research," Labrie said. "Right now, there are no ways to prevent, slow or stop Parkinson's, or even to objectively diagnose it prior to the onset of motor symptoms. We are extremely hopeful that our work will help change that."

The findings come at a time when experts are warning of a looming Parkinson's epidemic, largely the result of an aging global population. Between 1990 and 2015, the prevalence of Parkinson's doubled to an estimated 7 million people worldwide. By 2040, the number is expected to double again. These statistics are sobbering, but thanks to a dedicated Parkinson's research and patient community, we now know more about Parkinson's than any other time in human history, and we are closer than ever before to making a lasting impact on how we diagnose and treat this devastating disease.

The team's research shows that removing the appendix — a surgery called an appendectomy — significantly reduces the risk of developing Parkinson's disease by eliminating a major reservoir for abnormal proteins linked to its onset. Called alpha-synuclein, these proteins travel from cell to cell, clumping together and clogging up the cellular machinery required for normal, healthy function. Their results also indicate that people who have had their appendix removed early in their lives are 19 percent less likely to develop Parkinson's. In people who live in rural areas, that number is even higher, with appendectomies reducing the risk of developing the disease by 25 percent. Parkinson's often is more prevalent in rural populations, which studies suggest may be related to pesticide exposure.

The findings also show that appendectomy may slow the disease's progress, pushing back diagnosis by an average of 3.6 years. Because diagnosing Parkinson's is closely tied to onset of movement-related symptoms, this means people have more time before these symptoms become pronounced enough to be noticed.

That is an important caveat, however. Removal of the appendix — and the Parkinson's-associated alpha-synuclein proteins contained within it — must occur before the disease process begins to impact risk. This window of time can vary from person to person, with evidence suggesting the disease process starts as early as 20 years before diagnosis.

Removal of the appendix also doesn't appear to prevent or delay Parkinson's in people whose disease has a purely genetic cause — a group that comprises less than 10 percent of those with Parkinson's disease.

> "Right now, there are no ways to prevent, slow or stop Parkinson's – or even to objectively diagnose it prior to the onset of motor symptoms. We are extremely hopeful that our findings will help change that."
>
> - DR. VIVIANE LABRIE

Labrie and her colleagues stress that people shouldn't opt for an appendectomy as a way to mitigate risk for two major reasons. First, despite its undeserved reputation as useless, the appendix actually acts as an important storehouse for bacteria that play a role in the immune system. Second, appendectomy only demonstrated benefit decades before the onset of Parkinson's and would not be protective in people who have already developed the disease. It's also worth noting that all surgeries carry risk and that, while an appendectomy reduced the chances of developing Parkinson's, it did not eliminate the disease.

Instead, Labrie said, this discovery could lead to new ways to more effectively reduce the levels of alpha-synuclein proteins before they cause trouble.

"There are many new medications designed to break up these problematic protein clumps undergoing rigorous testing in clinical trials," she said. "If successful, we could have a new way to interfere with disease progression, an urgent unmet need and something current treatments can't do."

DR. VIVIANE LABRIE

In an unexpected turn, Labrie and her team also found alpha-synuclein pathology in the appendixes of healthy people of all ages, as well as people with Parkinson's, raising new questions about the mechanisms that cause the disease and propel its progression. Prior to this study, alpha-synuclein pathology was thought to only be present in people with Parkinson's.

"We found alpha-synuclein pathology in people of all ages, and with and without the disease, which suggests that it is not unique to Parkinson's," Labrie said. "Parkinson's is relatively rare — less than 1 percent of the population — so there has to be some other mechanism or confluence of events at play that allows the appendix to affect Parkinson's risk. That's what we plan to look at next — which factor or factors tip the scale in favor of Parkinson's?"

Data for the study was gleaned from an in-depth characterization and visualization of alpha-synuclein forms in the appendix, which bore a remarkable resemblance to those found in the Parkinson's disease brain, as well as analyses of two large health-record databases. The first dataset was garnered from the Swedish National Patient Registry, a one-of-a-kind database that contains de-identified medical diagnoses and surgical histories for the Swedish population beginning in 1964, and Statistics Sweden, a Swedish governmental agency responsible for official national statistics. The VARI team collaborated with researchers at Lund University, Sweden, to comb through records for 1,698,000 people followed up to 52 years, a total of nearly 92 million person-years. The second dataset was from the Parkinson's Progression Marker Initiative (PPMI), which includes details about patient diagnosis, age of onset, demographics and genetic information.

"The expansion of Parkinson's disease research into areas outside of the brain and affecting the GI tract and immune system has really opened the door for understanding this illness," Labrie said. "We know more about disease initiation than ever before and are committed to leveraging our findings to improve patients' lives."

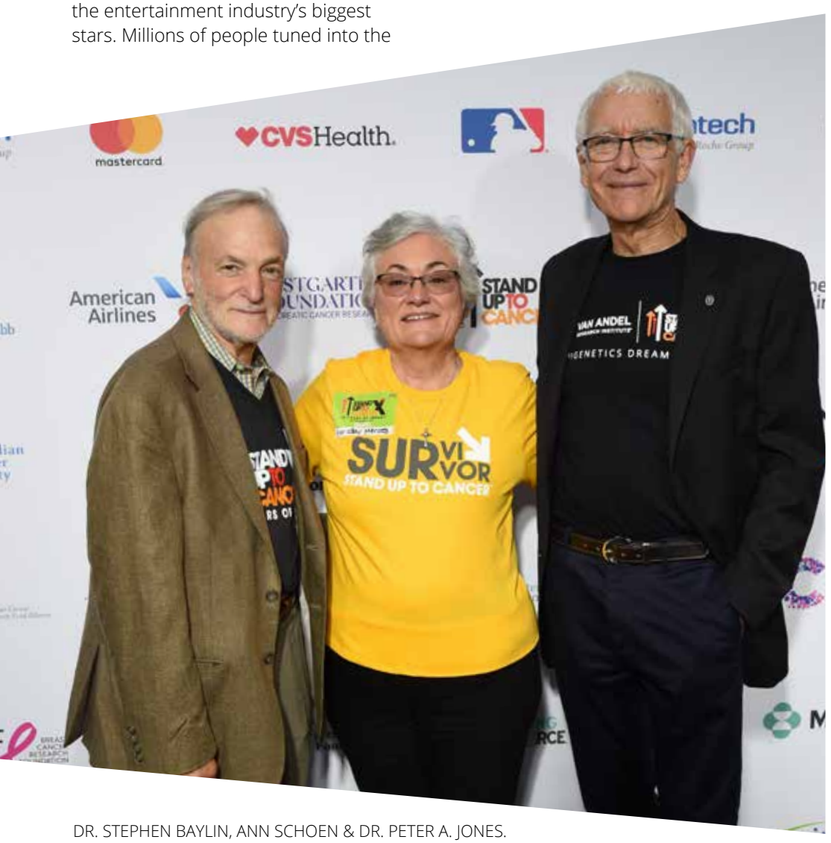
In addition to Labrie, authors include Dr. Bryan A. Killinger, Zachary Madaj, Dr. Lena Brundin, Dr. Patrik Brundin, Alec J. Haas and Yamini Vepa of Van Andel Research Institute; Dr. Jacek W. Sikora and Dr. Paul M. Thomas of Northwestern University; Dr. Nolwen Rey of Paris-Saclay Institute of Neuroscience; Dr. Daniel Lindqvist of Lund University; and Dr. Honglei Chen of Michigan State University.

STAND UP TO CANCER 2018 GLOBAL TELECAST

HONORS VAN ANDEL INSTITUTE'S ANN SCHOEN AS AN "EVERYDAY HERO"

On Sept. 7, Van Andel Institute (VAI) participated in Stand Up To Cancer's (SU2C) 2018 telecast, helping to raise a record-breaking $123 million for cancer research programs. During the live event, VAI employee and 16-year breast cancer surivivor Ann Schoen shared her story in a video segment called Everyday Heroes.

The telecast aired on more than 70 network and broadcast platforms around the world and brought together some of the entertainment industry's biggest stars. Millions of people tuned into the broadcast, which was executive produced by award-winning actor and director Bradley Cooper and included appearences by celebrities including Jason Bateman, Kathy Bates, James Corden, Katie Couric, Matt Damon, Julia Louis-Dreyfus, Jennifer Garner, Matthew McConaughey and Sofia Vergara. Schoen appeared in a video featuring cancer survivors and was recognized with them onstage during the event.



DR. STEPHEN BAYLIN, ANN SCHOEN & DR. PETER A. JONES.

"Stand Up To Cancer has established a wonderful community of support, bringing researchers and advocates together to fight cancer," Schoen said. "I was thrilled to represent the Institute and be a part of this inspiring event."

Stand Up To Cancer encourages scientists to collaborate with each other rather than compete to accelerate the pace of research and deliver promising new treatments to patients. The Institute began working closely with SU2C in 2014 when it became home to the Van Andel Research Institute–Stand Up To Cancer (VARI–SU2C) Epigenetics Dream Team, which is led by Dr. Peter A. Jones, VARI's Chief Scientific Officer, and Dr. Stephen Baylin, a VARI Director's Scholar and Virginia and D.K. Ludwig Professor for Cancer Research at the Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins.

Jones and Baylin are the leaders of the original SU2C Epigenetics Dream Team, which was founded in 2009. Today, more than 500 people in the U.S. and abroad are enrolled in clinical trials run through this powerful collaborative partnership between VARI and SU2C.

Schoen had worked at the Institute for six years when she was diagnosed with breast cancer in 2002. In an instant, she became one of thousands of Americans who are diagnosed with cancer every day. Schoen said it was one of the most difficult chapters of her life, but she found solace in the sense of hope she received from her coworkers at VAI.

"I was diagnosed with cancer while working at a cancer research institute," Schoen said, "The people here understood what I was up against, and they gave me the encouragement I needed."

For many people like Schoen, the fight against cancer is long and arduous, and the love, compassion and support of family, friends and colleagues offers a much appreciated comfort. She also found strength in the fact that she was working for an organization dedicated to stopping cancer and making life better for those affected by this devastating disesase. Today, Schoen's battle is behind her, but she is deeply grateful for the role biomedical research played in the development of the treatments that saved her life.

"These scientists are such rock stars," Schoen said. "I'm so honored to work with them and support their efforts to find new and better treatments for cancer patients. As far as we've come, we still have progress to make. The VARI–SU2C Epigenetics Dream Team is bringing us one step closer to ending this disease, and I know we won't quit until we reach our goal of a world that is cancer free."

Learn more about the VARI–SU2C Epigenetics Dream Team at vai.org.

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CANCER SURVIVORS BEING HONORED DURING THE 2018 STAND UP TO CANCER GLOBAL TELECAST (ANN SCHOEN PICTURED ON THE FAR RIGHT).

MEETING THE GRAND CHALLENGE
OF NON-MOTOR SYMPTOMS IN PARKINSON'S DISEASE

In September, the Institute hosted its annual *Grand Challenges in Parkinson's Disease* symposium and *Rallying to the Challenge* meeting. Nearly 300 scientists, physicians and people with Parkinson's spent two days intensely focused on the non-motor symptoms of Parkinson's, a diverse group of problems that play a major role in quality of life and provide important clues for better understanding a condition that affects 7 to 10 million people worldwide. Here are some major takeaways:

Non-motor symptoms provide a unique window into the underpinnings of a complicated and often mystifying disease. Take, for example, two common non-motor symptoms of Parkinson's — gastrointestinal issues and loss (or reduction in) sense of smell.

Evidence suggests that the gut and the nose may be starting points for the disease thanks in part to their exposure to factors in the outside environment, and that persistent digestive issues such as constipation and loss of sense of smell may be early symptomatic warning signs.

Scientists believe a perfect storm of circumstances, such as a combination of genetic risk and long-term exposure to these inflammatory environmental factors, could trigger the processes that eventually lead to the disease's hallmark movement-related symptoms.

Non-motor symptoms have a substantial effect on quality of life — sometimes even more so than motor symptoms such as tremor.
This was the major takeaway from *Rallying to the Challenge*, our annual meeting for people with Parkinson's, advocates and care partners hosted in collaboration with The Cure Parkinson's Trust. In all, participants underscored the great need for urgency in addressing these symptoms.

Specifically, they have suggested the creation of a scale that prioritizes potential therapies for translation into the doctor's office based on the needs of the patient community, which would help ensure scientists' priorities are in alignment with people with Parkinson's. In a fitting tribute, Ralliers have suggested that it be called the "Isaacs Scale" in honor of Trust co-founder Tom Isaacs, a passionate and beloved Parkinson's advocate who passed away in 2017.

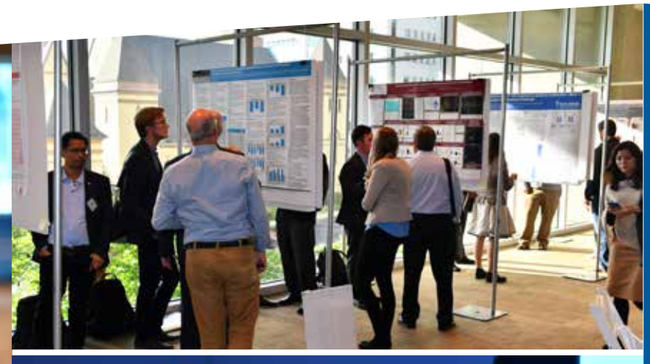
> . . . In the coming decades, the number of Parkinson's cases is expected to double to more than 14 million worldwide.

Ralliers also:
- Emphasized the importance of clear communication around sensitive issues, such as thinking and memory in Parkinson's.
- Explored reframing how fatigue is discussed to ensure that it is clearly differentiated from tiredness.
- Discussed the benefits of exercise on non-motor symptoms.
- Highlighted the challenges and importance of objectively measuring non-motor symptoms.

Working together is the way forward.
Parkinson's isn't pulling any punches and neither should we. It's a complicated, tough disease that can vary greatly from person to person, and we have to tackle it from all sides. It's also an increasingly pressing problem — in the coming decades, the number of Parkinson's cases is expected to double to more than 14 million worldwide.

That's why events like *Grand Challenges in Parkinson's Disease* and *Rallying to the Challenge* are so valuable — they bring together scientists with different expertise, physicians and people with Parkinson's, creating a catalyst for new ideas, sparking new conversations and, importantly, ensuring everyone is working together.

To stay up to date on next year's Grand Challenges in Parkinson's Disease symposium and Rallying to the Challenge meeting, please visit grandchallengesinpd.org or follow us on Facebook at facebook.com/grandchallengesinpd.



Common Parkinson's disease non-motor symptoms:

- Loss of sense of smell
- Constipation
- Insomnia
- Fatigue
- Cognitive decline

THE 2018 *GRAND CHALLENGES IN PARKINSON'S DISEASE* SYMPOSIUM & *RALLYING TO THE CHALLENGE* MEETING.

TRAINING THE NEXT GENERATION OF SCIENTISTS

AN INTERVIEW WITH DR. STEVEN J. TRIEZENBERG, DEAN OF VAN ANDEL INSTITUTE GRADUATE SCHOOL

Van Andel Institute Graduate School Dean Dr. Steven J. Triezenberg has spent most of his life working as a scientist and educator — leading labs and helping to mentor and train young scientists who are just beginning their professional journeys. Recruited in 2006 as VAIGS's founding dean, Triezenberg helped design the school's strategic plan and developed the school into a competitive Ph.D. program. Triezenberg is a passionate believer in the power of innovative education and its ability to have a life-long impact on all students, but especially those who have decided to pursue careers in science.

What is the basis for VAIGS's educational philosophy?
The school's philosophy begins with the idea that students enrolled in VAIGS aren't here to train to be students — they are here to become scientists, which means they should think, act, talk, write and learn like scientists. We believe our students should become immersed in science and take on the persona of a scientist while they are here.

The second part of our philosophy is that graduate school is not a destination, but rather a path to a future as a scientific leader.

How does the school's philosophy affect how students interact with peers and faculty?
We want students to see themselves as partners in science with faculty members and other students. They might be junior partners, but they are integral parts of the Institute's research teams, and we want them to feel a part of the research enterprise here.

> We believe our students should become immersed in science and take on the persona of a scientist while they are here.
> - DR. STEVEN J. TRIEZENBERG

At VAIGS, we don't view the faculty and the student relationship as one of guru and student — we see it more as a relationship between colleagues at different levels. There is a real partnership in the process of learning here between faculty and students.

Good mentor relationships are absolutely essential for students in the program. In some respects, a Ph.D. education is an apprenticeship — because as a beginning scientist, you're learning constantly from your faculty members and discovering new ways to grow with their guidance.

What kind of support does VAIGS offer students in its program?
Financial support is one important way we support students in the program. Students' tuition is covered, and they also receive a very competitive stipend for living expenses, as well as health insurance.

Because the school is fairly small, we can build a real sense of connection with the students. Each new graduate student has a peer mentor, someone who is a year or two ahead and can help them develop connections and build relationships.

Is there a specific kind of student who will thrive in the VAIGS program?
Students who thrive here are eager, willing and capable of being independent learners. Our problem-based learning approach puts a lot of responsibility for doing the learning on the student.

We are also keenly looking for students who are interested in biomedical research that directly impacts human health and well-being.

What are some of the goals for the future?
In 2019, we are developing our strategic plan for the next five or six years. We'd like to expand our number of students and begin to reach out to more international students.

We'd also like to increase the experiences our students have available to them. For instance, we may consider an internship program where students can spend three months at a pharmaceutical or biotech company or a consulting firm, so they have meaningful professional experiences and develop necessary professional connections.

What inspires you about working with young scientists?
I get a lot of inspiration from seeing our students succeed — because the success of the school is defined by the success of our students. It's a good feeling to know that the first students who graduated in 2012 are now finishing their postdoctoral positions and moving into faculty or industry leadership positions. It's always inspiring to help students launch their careers.

To learn more, please visit vaigs.vai.org.

DR. STEVEN J. TRIEZENBERG

TRAINING SCIENTISTS ONE DISCOVERY AT A TIME

Van Andel Institute Graduate School (VAIGS) student Erin Williams is about to embark on a new stage in her career as a scientist. In February, Williams successfully defended her dissertation — the culmination of years of hard work. After completing VAI's graduate school program, Williams knows firsthand what makes the Institute such a unique and special place to learn.

VAIGS's culture of collaboration was one of the most compelling reasons Williams decided to enroll. The Institute's size and structure provides students with the opportunity to interact with peers and work in the labs of expert faculty mentors.

"It's truly a close-knit community," Williams said. "Because it's relatively small, most of the graduate students, postdoctoral fellows and principal investigators know each other, and it's really quite easy to form friendships among your peers and mentors. When you're just starting out, that level of support is meaningful."

VAIGS students aren't just students — they're valued members of the lab who are regarded as working scientists with real responsibilities. Williams works closely with her mentor, Dr. Darren Moore, in his lab where she studies the molecular pathophysiology of Parkinson's disease. The experience has helped her gain important insights into what it means to conduct top-tier biomedical research, run a lab and be a scientific leader.

"Dr. Moore has been very influential in my development as a scientist," Williams said. "He always has new ideas and is engaged in my professional growth. His commitment to his work has been really inspirational to me."

VAIGS's curriculum is designed around problem-based learning, a philosophy that views faculty as mentors, and focuses on process design and problem solving to empower students to be proactive learners and take ownership over their professional development.

"The Institute's problem-based curriculum has really been beneficial for me because it teaches you how to think like a scientist," Williams said. "The first year of the graduate program consists of eight four-week courses, all based on a different disease. The first disease we study is cervical cancer, and we have four weeks to learn everything there is to know about cervical cancer — the molecular biology, biochemistry, current treatments, etc. At the end of the four weeks, we have to write a grant proposal that addresses an important question related to the disease. If you think about it, within weeks of starting the program, we're working in the same way scientists work — it's an incredible way to learn."

> "Because it's relatively small, most of the graduate students, postdoctoral fellows and principal investigators know each other, and it's really quite easy to form friendships among your peers and mentors. When you're just starting out, that level of support is meaningful.
>
> - Erin Williams.

VAIGS GRADUATE SCHOOL STUDENT
ERIN WILLIAMS

When the Institute was founded in 1996, it began an ambitious mission to help develop and train the next generation of scientists. Today, VAIGS students like Erin Williams are receiving an education of a lifetime, learning from world-renowned faculty members, and training to become tomorrow's scientific leaders — one discovery at a time.

To learn more, please visit vaigs.vai.org.

VAN ANDEL EDUCATION INSTITUTE'S BLUE APPLE –

A FRESH APPROACH TO SCIENCE EDUCATION

The landscape of education is always changing. As humanity progresses, our pace is measured by the uncomfortable truth that what we know today could change dramatically tomorrow. For K–12 teachers, this presents a significant challenge as they navigate between traditional knowledge and new discoveries. How do educators keep up in a field that is now shifting faster than ever? And how do they maintain relevance in a culture over-saturated with information?

The answer? They can't. At least, not by repeating the same methods as their predecessors. Today's schools are largely relying on Industrial Age teaching models for students who are entering a society built on information. Complicating matters even further is the existence of smartphones, tablets and laptops that teach children to lean on devices rather than solving complex problems on their own. If educators hope to remain central to the learning process, they need to do more than simply develop a few stopgap measures to address these new challenges. To embrace the future of learning in the modern age, educators will need to take a new, fresh approach to how they work with students.

Creating classrooms where curiosity, creativity and critical thinking thrive

There is no denying that technology has radically altered the way we grow and develop, particularly within the halls of education.

"Teachers are no longer the ones who should be disseminating information. Google can do that far better," explained Terra Tarango, director of Van Andel Education Institute (VAEI). "Instead, teachers need to facilitate authentic learning experiences where children have a chance to discover learning for themselves and make a difference in their world."

How does an educator shift from traditional standards and practices to an entirely new method of teaching? For VAEI, it begins by designing instructional experiences and learning environments where curiosity, creativity and critical thinking thrive.

And according to Tarango, VAEI's Blue Apple program is a great place to start.

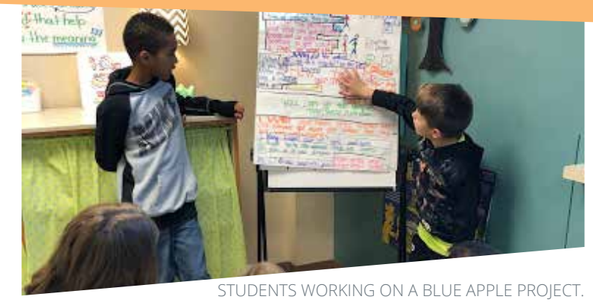
Synthesizing the most powerful ideas in education

Blue Apple, VAEI's most recent initiative, is a collection of comprehensive, project-based learning experiences that inspire children to solve real-world problems through critical thinking. Built on the philosophy that content instruction is best linked to an authentic experience, each Blue Apple project highlights a different subject matter while incorporating science, language arts, math, social studies and social–emotional growth into each project. For example, using the *Food for Thought* project, students learn the value of healthy eating while graphing nutrients and writing recipes; *50 Years of Interest* introduces children to the concept of investing, helps them understand the impact of compound interest by making a 50-year investment in a charity; and *State of Sustainability* has classrooms discuss the United Nation's Sustainable Development Goals and apply them to local communities.

The goal is to get students to aim high and achieve even higher. In the words of Ben Talsma, one of VAEI's learning solution specialists, "Blue Apple is a beautiful synthesis of some of the most powerful ideas in education. It's cross-curricular. It's hands-on. It's inquiry-based. And best of all, it gets students, teachers and communities working together to make the world a better place."

For the teacher who wants to transform the classroom

Blue Apple wasn't just created to provide students with exciting, inquiry-based learning opportunities; it was also designed to empower teachers as well. VAEI searched for inspirational teachers doing engaging projects and selected 10 of them to partner with, turning their ideas into published Blue Apple projects. The originating teacher-authors provide tips and tricks, videos and pictures that help other teachers implement the projects in their classrooms. Blue Apple projects include a variety of online resources and physical supplies that come packaged and shipped to the teacher directly, including games, links to online sources, and even real-world connections that classrooms can call upon for additional authentic expert encounters.



STUDENTS WORKING ON A BLUE APPLE PROJECT.

By giving classrooms the necessary tools for discovery, educators can guide their students toward the knowledge they need, rather than simply handing them the answer, and they can do so while engaging students in making the world a better place. This doesn't just transform the way students think about learning — it also changes the way our society thinks about teaching.

You can get involved!

The Institute will bring Blue Apple to classrooms across the U.S. in 2019, igniting curiosity in students and teachers alike — taking the first step toward meaningful change in how we approach education. Blue Apple will launch a pilot program beginning in April and May, with the final product being available for purchase for the 2019–2020 school year. *To learn more or share this information with a teacher, please visit us at vaei.org.*

Van Andel Education Institute Honors Teachers During Science on the Grand 2019

Teaching is one of the most rewarding, yet demanding jobs in the world — it is also one of the most important. On July 15–16, 2019, Van Andel Education Institute (VAEI) will celebrate the art of teaching at the second annual *Science on the Grand* conference in Grand Rapids, Michigan.

This unique, teacher-focused conference was designed by education experts and teachers to provide research-based and classroom-tested content that supports the needs of teachers, whether that be classroom expectations, content standards, or personal and professional development.

During the conference teachers will:

- Learn how to establish a classroom culture to support STEAM instruction (science, technology, engineering, art and math).
- Explore standards-aligned lessons by grade level with STEAM integration.
- Network with like-minded educators teaching the same grade and interest area.
- Nurture your own curiosity and personal growth.
- Have a chance to win up to $5,000 to supercharge your classroom!

Registration includes:

- Two days of inspiration, exploration and practical takeaways.
- Opportunities to network with like-minded teachers.
- Breakfast, lunch and dinner!

Bring a friend and share the experience! Plus, principals can attend FREE!*

Register at vaei.org!

** With the paid registration of a staff member, a principal from the same school may attend for FREE.*

Register Your Second Through 12th-grade Student for Van Andel Education Institute's Summer Camps!

Summer is a time for fun with friends, exploring interests and discovering new worlds! Van Andel Education Institute (VAEI) is offering a unique summer camp experience for second through 12th-graders. Students will learn to think and act like scientists in hands-on and interactive investigations while building their curiosity, creativity and critical thinking skills!

All summer camp programs take place June–July 2019.

Cost for each camp is $55 per-student for one week of camp. All camps take place during weekdays from 9 a.m. to 12 p.m.

To learn more about VAEI's summer camps or to register, visit vaei.vai.org/student-programs/summer-camp.

VAEI's summer camps are made possible because of support from the Bea Aldrink Idema Foundation. Their generosity has enabled VAEI to provide an inspiring, high-quality educational experience for students from a variety of backgrounds from communities across West Michigan.

Register at vaei.org!

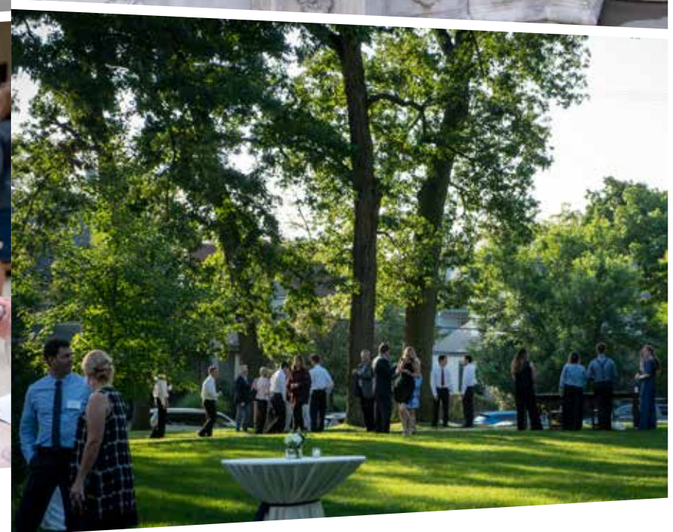
CURIOSITY HOUR

Van Andel Institute (VAI) donors, advocates and JBoard members visited Van Andel Education Institute (VAEI) for *Curiosity Hour* — an event that gave guests the rare opportunity to explore VAEI and experience the vast world of scientific discovery. Guests participated in hands-on experiments and mixed and mingled with Institute JBoard Ambassadors. All proceeds from *Curiosity Hour* went directly to benefit the Institute's innovative science education programs.

(STARTING AT THE TOP, LEFT TO RIGHT) TERRA TARANGO, VAN ANDEL EDUCATION INSTITUTE'S (VAEI) DIRECTOR & EDUCATION OFFICER & GUESTS FEED TOBY THE TORTOISE; GUESTS BUILD & RACE THEIR OWN ROBOTS; ONE OF VAEI'S LIZARDS; GUESTS PERFORM A SCIENCE EXPERIMENT.

BUILDING HOPE

Held in the historic Fisher House in Grand Rapids, *Building Hope* brought hundreds of people together for an evening of history, architecture, interior design and philanthropy. The signature event was hosted by Van Andel Institute's JBoard and Jeffery Roberts, a West Michigan-based interior designer and furniture designer. During the event, Roberts gave guests a guided tour of the landmark property that serves as his studio and home and provided attendees with a sneak peek of his newly unveiled furniture collection.



(STARTING AT THE TOP, LEFT TO RIGHT) THE FISHER HOUSE & CUSTOM FOUNTAIN; EXTERIOR OF THE FISHER HOUSE; JEFFERY ROBERTS SPEAKS TO GUESTS; EVENT GUESTS MINGLE IN THE THE GARDEN; AB, MICHAEL ERICKSON & MICHELLE MCKORMICK.

VAI GOLF OUTING

Golfers of all skill levels gathered at the Wuskowhan Players Club in West Olive, Michigan, for the 11th annual *VAI Golf Outing*. Following an exciting day on one of Michigan's most beautiful courses, guests enjoyed a dinner and reception with guest of honor, famed placekicker Jason Hanson of the Detroit Lions. For more than a decade, the *VAI Golf Outing* has rallied the West Michigan golfing community together for a day of generosity, awareness and advocacy.

Thank you to the Title Sponsor: The Veldheer, Long, Mackay & Bernecker Group of Merrill Lynch.

(STARTING AT THE TOP, LEFT TO RIGHT) DAVID VAN ANDEL & JASON HANSON; CAROL VAN ANDEL; DOYLE A. HAYES, BRUCE COURTADE & TIM WILLIAMS; LYNN TENHARMSEL, MOLLY HUNTING, TINA EMERMINE & KASIE SMITH; HELMET SIGNED BY JASON HANSON.

COUTURE FOR A CURE

Fashionistas from across West Michigan turned out in style for the Institute's 13th annual *Couture for a Cure*. The event featured a New York-style runway show highlighting designer Lourdes Chavez's Spring 2019 collection, as well as fanciful hat creations by milliner Christine A. Moore. Guests also enjoyed specialty cocktails, strolling appetizers, a packed dance floor and beauty bar makeovers from the Amway Artistry team.

Thank you to the Presenting Sponsor: Leigh's, and the Title Sponsor: Amway.

(STARTING AT THE TOP, LEFT TO RIGHT) SCOTT & REBECCA WIERDA, CAROL & DAVID VAN ANDEL; JORDAN CARSON FROM WOOD TV8 & WOTV 4 WOMEN; MISSY SHARPE, ALLISON BURR, DAVID BRACIAK & CHRISTINE HUGHES; GUESTS MINGLE AT THE AMWAY ARTISTRY BEAUTY BAR.

HOPE ON THE HILL

The splendor and elegance of the Kentucky Derby was in full effect during the Institute's 18th annual *Hope on the Hill Gala — Run for the Roses*. More than 800 guests gathered for a night of fundraising, networking and entertainment. World-renowned, London-based artists Light Balance also performed a stunning live stage show that featured dazzling neon lights, dynamic choreography and acrobatic dance moves.

For nearly two decades, *Hope on the Hill* has united the Grand Rapids' philanthropic community and VAI's most passionate donors for a night that celebrates the Institute's mission and raises funds that support groundbreaking biomedical research and impactful science education.

Thank you to the Title Sponsor: Fifth Third Private Bank.

(STARTING AT THE BOTTOM LEFT, GOING CLOCKWISE) EVENT GUESTS MINGLING; TERESA HENDRICKS-PITSCH, JIM NICHOLS & JAMIE MILLS; DANA STENSTROM, GINNY BAYSHORE & PATTI BOYD; DAVID VAN ANDEL, VICKY LUDEMA & TIM LONG; LIGHT BALANCE PERFORMING.

A CONVERSATION ABOUT PEDIATRIC CANCER RESEARCH AND TREATMENT

Van Andel Institute (VAI) special events have the power to educate our community and provide VAI supporters with a platform to learn about and discuss important health-related issues. During *A Conversation about Pediatric Cancer hosted by Carol Van Andel*, the Institute highlighted the work of scientists and clinicians who have dedicated their lives to taking on childhood cancers, and gave guests a unique opportunity to ask questions. Event speakers included Dr. Matt Steensma (VAI, Spectrum Health), Dr. Jenna Gedminas (VAI, Spectrum Health), and keynote speaker, Dr. James Fahner (division chief of pediatric hematology/oncology at Spectrum Health Helen DeVos Children's Hospital).

Thank you to the Title Sponsor: Howard Miller.

(STARTING AT THE BOTTOM LEFT, GOING CLOCKWISE) CAROL VAN ANDEL ADDRESSES THE AUDIENCE; DR. MATT STEENSMA ANSWERS A QUESTION DURING THE EVENT Q&A; EVENT GUESTS MIX & MINGLE; DR. JAMES FAHNER GIVING HIS KEYNOTE PRESENTATION.

VAN ANDEL INSTITUTE PUBLIC LECTURE SERIES: A FOCUS ON PARKINSON'S DISEASE

Van Andel Institute's *Public Lecture Series: A Focus on Parkinson's Disease* took place in December, and highlighted the Institute's groundbreaking Parkinson's research. The event featured presentations by Van Andel Research Institute (VARI) scientists, Dr. Vivane Labrie, assistant professor in the Center for Neurodegenerative Science (CNS); and Dr. Wouter Peelaerts, a postdoctoral fellow working in the CNS; as well as a Q&A session with the speakers and Dr. Patrik Brundin, the Institute's associate director of research and director of the CNS. Guests learned about the Institute's groundbreaking study that links the appendix to Parkinson's, as well as insights into how drug repurposing might improve Parkinson's treatments in the future.

Additional VAI Lecture Series events are planned for 2019. If you're interested in participating, please visit vai.org for more information.

(TOP TO BOTTOM) DR. WOUTER PEELEARTS; AN AUDIENCE MEMBER ASKS A QUESTION DURING THE Q&A SESSION; DR. VIVIANE LABRIE.

THANK YOU TO OUR GENEROUS EVENT SPONSORS

To learn more about sponsoring an event, contact Sarah Rollman at sarah.rollman@vai.org.

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A Conversation About Pediatric Cancer Hosted by Carol Van Andel
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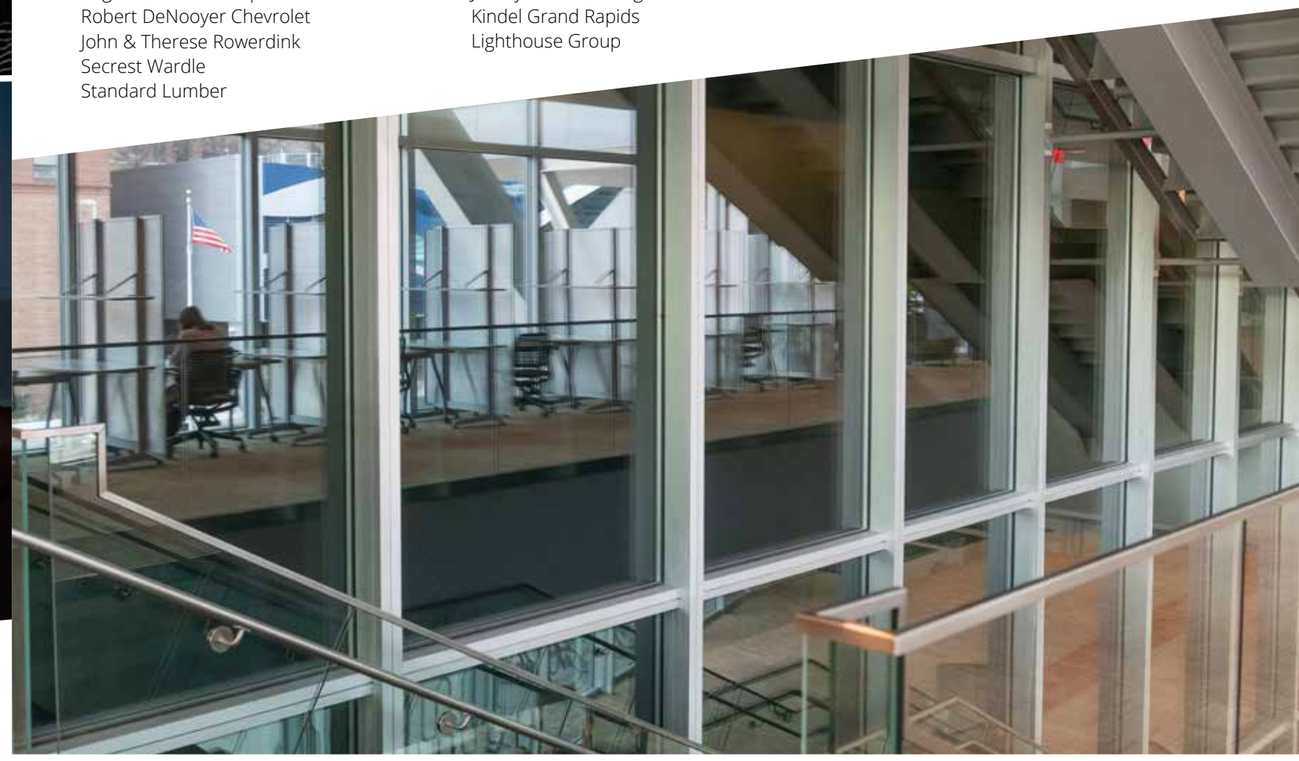

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If you're interested in sponsoring one of our special events, please contact Sarah Rollman at sarah.rollman@vai.org.

OTSEGO SCHOOLS RALLY TOGETHER TO RAISE $100,000 FOR CANCER RESEARCH

Otsego isn't a big city — it's a quiet, rural community tucked away in a corner of West Michigan, far from the bright lights of Kalamazoo and Grand Rapids. Its population is just over 5,000 people, but in this tight-knit community live thousands of hardworking, generous people who teamed up to raise $100,000 to benefit cancer research at Van Andel Institute (VAI).

"There is really no separation between our schools and our community," said Holly McCaw, director of communications for the Otsego school district. "Everyone really gets involved in our *Purple Week*, and our community supports everything we do."

Purple Week started with a single football game at Otsego High School in 2010, and has since grown to a week-long series of purple-themed sports events that have become a powerful source of support for the Institute's cancer research.

"Our *Purple Week* started with the actions of athletic directors, members of the high school marketing class, student leaders in the honors society and student council, but now after eight years, all the students are involved in everything we do," McCaw said. "Every year, we ask the kids if they want to do *Purple Week* again, and the answer we get is always an emphatic 'yes!'"

Students lead all the fundraising initiatives and work directly with members of Van Andel Institute's Purple Community to plan, promote and host the events. Enthusiasm for *Purple Week* has increased with each passing year, and the energy from the students has rallied the city's small business community around this shared cause.

"Otsego is such a unique and proud town, and there is such a spirit of community here," McCaw said. "This year, we had businesses asking us if they could sponsor our events and people in our business community were telling me how important they thought this effort was and asking how they could support the students."

(STARTING AT THE TOP, LEFT TO RIGHT) *PURPLE WEEK* KIDS; A SIGN HONORING CANCER SURVIVORS & THOSE WHO LOST THEIR FIGHT WITH THE DISEASE; THE OTSEGO HIGH SCHOOL FOOTBALL TEAM.

McCaw credits Purple Community with helping build on the first event Otsego hosted eight years ago and believes that this partnership has not only raised an impressive amount of funds to support great research, but also has created a way for students to develop a deeper understanding of the importance of science and biomedical research in West Michigan.

"Cancer research is a wonderful cause to get behind, and Purple Community is such a great organization to work with," McCaw said. "When the kids had the opportunity to come to the Institute and meet scientists and see a research lab, they instantly understood how their work benefits the Institute's scientists. And just knowing that is really a big deal for them."

In 2018, Otsego Schools were inducted into the Institute's Legacy Society in honor of their tremendous fundraising achievement. For McCaw and the students, *Purple Week* isn't just about how much money they raise — it's about working hand in hand to make their community more united, healthier and stronger.

"One of our teachers said, 'It's important to be involved in this, because without research we aren't going to have better treatments for cancer … or hopefully one day a cure,'" McCaw said. "At the end of the day, we're going to keep up what we're doing because we believe in the Institute's scientists, and we have no doubt that what we are doing matters, and every year we do this, we're reminded that we are all in this together."

If you are interested in hosting a Purple Community game at your school, please contact Ashley Owen at ashley.owen@vai.org.

26.2 MILES OF LOVE AND DETERMINATION – PURPLE COMMUNITY'S TEAM HOPE MARATHON RUNNERS

Aaron DeVos was surrounded by runners from every corner of the world as he bounded across the Verrazzano-Narrows Bridge, connecting Staten Island and Brooklyn hundreds of feet above New York Harbor. Rising up from the morning mist, New York City's towering landscape provided a backdrop for a day he would never forget — the day he completed the *2018 TCS New York City Marathon* as a member of Purple Community's Team Hope. DeVos trained rigorously for months leading up to the event, but nothing prepared him for the mental and physical demands that this world-class marathon required of him.

"The *New York Marathon* was extremely demanding in every way," DeVos said. "As tough as it was, it was still a really great experience. You're just soaking it all in as you run — the city, the energy, the cultural diversity of each of the neighborhoods, and the millions of people cheering you on. It's really incredible."

DeVos became a member of Team Hope through his membership on the Institute's young professionals board, the JBoard Ambassadors. A runner for more than 14 years, DeVos was approached to join the team and knew he couldn't pass up the opportunity to run in support of something he felt very strongly about — cancer research.

AARON DEVOS (LEFT) RUNNING IN THE 2018 TCS NEW YORK CITY MARATHON.

TODD & BRENDA GARDNER

"Our family has been affected in a number of different ways when it comes to cancer," DeVos said. "Knowing that you're running for something bigger than yourself really motivates you to take on the challenge."

In 2018, members of Team Hope ran in both the *Bank of America Chicago Marathon* and the *TCS New York City Marathon* and raised more than $90,000. Most of the team's members traveled to the events from West Michigan, often motivated by a personal connection to cancer or Parkinson's disease.

During the last stretch of the *Chicago Marathon*, Team Hope member Brenda Gardner's knee gave out, and for a few fleeting seconds, she thought she'd be unable to finish the race. Then, as if by fate, she looked out into the cheering sea of people that lined the route and spotted a group of young Chicago police officers — and one of them looked right at Gardner and said without missing a beat, "You don't give up …" "I needed to hear that," Gardner said.

Those few words of encouragement gave her the inspiration she needed to finish the race — a race she was running for her husband who was diagnosed with Parkinson's when he was 41-years-old and in the prime of his life.

"It was a very scary time in our lives," she said. "Parkinson's was considered to be an older person's disease, so to be diagnosed when you're a young man and the father of a young child is really devastating. We thought we had a perfect little life, and then, Parkinson's changed everything."

Following the diagnosis, Gardner's husband, Todd, created a small nonprofit organization that hosts a golf outing to raise funds for Parkinson's-related causes.

"We decided that instead of being angry, we would take the high road and do something positive," Gardner said. "As long as you have hope, you can do anything — and as long as you're alive, there is always hope."

Like Gardner, DeVos also runs motivated by his connection to a devastating disease that affected the love of his life. When his wife, Afton, was finishing high school she was diagnosed with Hodgkin's lymphoma, and spent the last part of her teenage years fighting for her life.

"My wife, Afton, is an 18-year cancer survivor," DeVos said. "She won her battle, but had to fight it when she was just a teenager. I met her when she celebrated her five-year cancer-free mark, so all of this really hits home for me."

Both DeVos and Gardner believe passionately in the Institute's mission and its research that might one day put an end to cancer and Parkinson's. They run because of the love they feel for those closest to their hearts, but they also understand that their efforts have a wider impact on a future they might never know.

"I know that we might not see a cure for Parkinson's in our lifetime, but in my heart, I know that my husband and I can do something to help the generations to come," Gardner said.

With every step, through every marathon mile, bonded by shared experiences, the members of Team Hope give their all to benefit research that might one day change the course of human health.

Being a member of Team Hope means the world to Gardner because as she often reminds her family, friends and teammates, "There is no better feeling in the world than giving of yourself for a cause you believe in and knowing that along the way you might have helped someone, somewhere … It's a feeling you can't explain … and it's truly the best feeling in the world."

If you are interested in getting involved with Purple Community, please contact Ashley Owen at ashley.owen@vai.org.

AARON & AFTON DEVOS

CELEBRATING A LEGACY OF RESEARCH

EVENT HONORS THE LEGACY OF A WOMAN WHO DEDICATED HER LIFE TO RESEARCH

Kathleen Drennan rode her bike 13 miles along her favorite path around Chicago's Lake Michigan shoreline on the day before she passed away in 2013.

STARTING AT THE TOP, LEFT TO RIGHT) PATRICK BRADY & DR. BART WILLIAMS; KATHLEEN DRENNAN; CYCLISTS AFTER THE RIDE IN HONOR OF KATHLEEN DRENNAN.

Cycling was her passion, and she refused to let cancer get in the way of one of her greatest joys. The disease entered her life in the late 1970s when she was raising a young son and building a career in medical research. Drennan beat back cancer five times throughout her life, but never once did she let it determine how she lived.

In October, 50 of Kathleen's closest friends and family participated in the *Kathleen and Van Andel Institute — Celebrating a Legacy of Research* event in Chicago, and 24 cyclists rode along the same path Drennan loved so dearly. Her son, Patrick Brady, and Kathleen's niece, Caroline Redeker, helped organize the event that raised more than $25,000 to benefit cancer research at Van Andel Institute (VAI). Dr. Bart Williams, director of the Institute's Center for Cancer and Cell Biology, gave a presentation for those in attendance, and discussed his work and the different ways VAI is fighting back against cancer. Brady views the day as a fitting way to honor his mother's memory and bring attention to the Institute's research.

"My mother raised me in West Michigan and spent most of her life working in clinical research — beginning her career at Upjohn in Kalamazoo and then making her way to Chicago, where she founded the Chicago Center for Clinical Research," Brady said. "She was very passionate about the importance of biomedical research, and she had a particular focus on helping women and minority communities."

Drennan's life-long passion for research led her to be an active supporter of the Institute's mission as a donor and frequent guest at the annual *Hope on the Hill Gala*. A Michigan native, she was proud that such great work was taking place in the region she called home for so many years.

"Our family was excited to hear about the Institute from the moment it was founded," Brady said. "So when my mom died, I wanted to continue to support her love for clinical research. There was no doubt in my mind that the Institute was the perfect place to do it."

Brady regards the Institute as a shining light of hope in Grand Rapids and feels connected to its mission. As the son of a parent who fought bravely against the ravages of cancer, Brady is focused on the event's ultimate impact on the future, and how the event's funds might help people who are fighting for their lives.

"My mom was a wonderful mother and grandmother, and she lived her life helping others," Brady said. "My passion is her passion, and I know that we can continue to honor my mom's legacy and work together to eradicate this devastating disease that in one way or another affects us all."

MY CAUSE, MY CLEATS

DENVER BRONCO'S JARED VELDHEER REPS THE INSTITUTE'S PARKINSON'S RESEARCH ON AND OFF THE FIELD

While the crowd of thousands roared, and players crashed into one another during a game against the Cleveland Browns, Bronco's offensive tackle Jared Veldheer wore a special pair of cleats with Van Andel Institute's logo and the words "Parkinson's" and "100% to research, discovery and hope" emblazoned on the sides. He played that night in front of a national television audience, knowing that his cleats were designed for a very specific and special purpose — to pay tribute to his great-grandfather and grandfather, who both died of complications from Parkinson's disease.

Two days earlier, Jared's father, Jim Veldheer, held the cleats closely in his arms during *Van Andel Institute's (VAI) Public Lecture Series: A Focus on Parkinson's Disease*. After the event, Jim met with Dr. Patrik Brundin, the Institute's associate director of research and director of the Center for Neurodegenerative Science. It was an opportunity for Veldheer to showcase the efforts of his son and meet with one of the world's most highly regarded Parkinson's experts.

"It's really amazing that we have a world-class Parkinson's research center right here in my hometown in West Michigan," Veldheer said. "Having educational forums where people can come and get information is really great for our community. As the son of a father who died from Parkinson's, I especially appreciated seeing scientists speaking directly to people who were personally affected by this disease."

Jared wore the VAI-themed cleats when he took the field during two regular season games, and the NFL auctioned them off and donated 100% of the proceeds to the Institute's Center for Neurodegenerative Science. Jim is proud of his son's career in the NFL and willingness to support causes he cares about.

"Jared has always been a very philanthropic person, and for years, he hosted a football camp and donated the proceeds to benefit heart screenings for high school athletes," Veldheer said. "Now that Jared's season is over, I would love for him to visit the Institute and meet with Dr. Brundin and hear from scientists who are doing this incredible research."

> "It's really amazing that we have a world-class Parkinson's research center right here in my hometown in West Michigan ..."
> - Jim Veldheer

Initiatives like the NFL's *My Cause, My Cleats* and generous athletes like Jared Veldheer help create a powerful network of awareness that supports great science and gives hope to those who continue to battle Parkinson's long after the last field goal has been scored and the bright lights dim on the gridiron.

DR. PATRIK BRUNDIN & JIM VELDHEER

MEMORIALS

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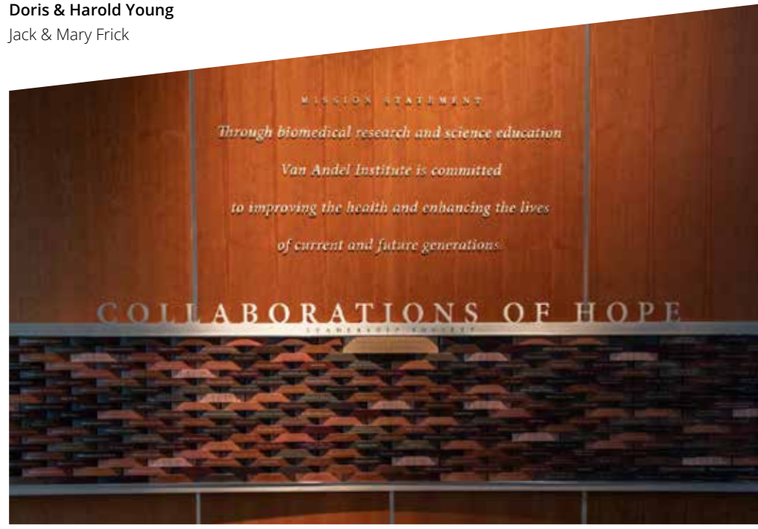

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