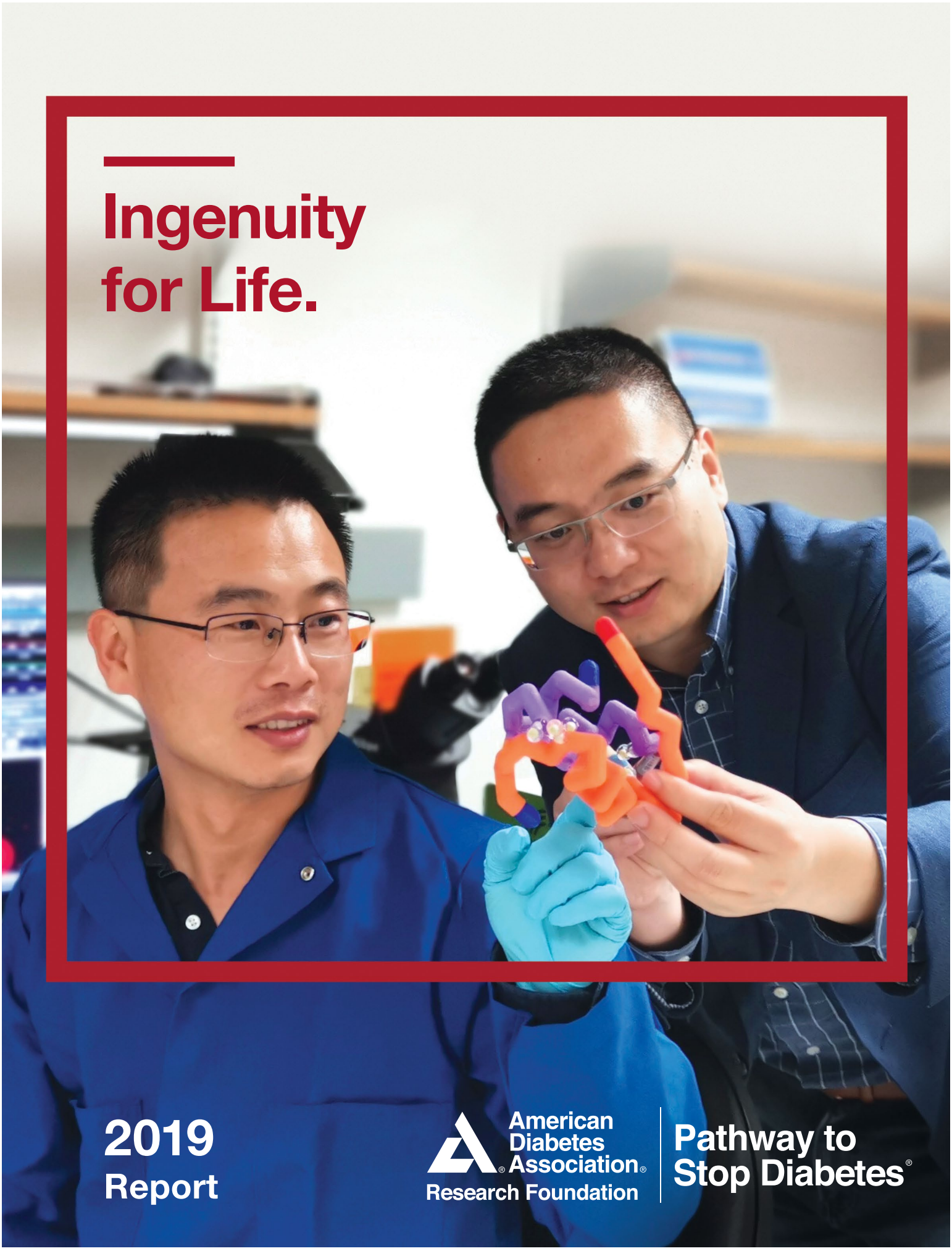
Ingenuity for Life.



2019 Report

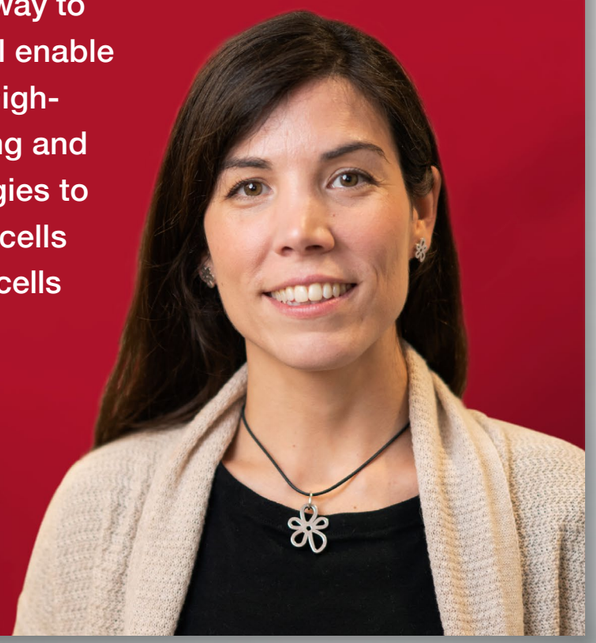
American Diabetes Association® Research Foundation

Pathway to Stop Diabetes®

2020 Pathway to Stop Diabetes® Accelerator Awardee

“Protecting beta-cells from immune attack still represents an unmet medical need for patients with diabetes. The Pathway to Stop Diabetes award will enable us to pursue high-risk, high-reward work investigating and developing novel strategies to successfully allow beta-cells to “cloak” from immune cells to achieve a real cure.”

—Judith Agudo, PhD



Dear Supporter,

Here at the American Diabetes Association® (ADA) research is in our DNA and it is our foundation. Pathway to Stop Diabetes is a truly groundbreaking program because it seeks out scientists at all career levels with the potential to further our understanding of diabetes and improve outcomes for the millions of Americans living with it, including myself. We provide each awardee the freedom, autonomy and financial and professional resources they need to deliver on their potential, both now and in the future.

We are living in a time when nearly half of American adults have diabetes or prediabetes. We need more passionate scientists dedicated to diabetes research to bend the curve on the diabetes epidemic once and for all. By supporting researchers at the peak of their creativity, we increase the chance that Pathway scientists will deliver on their potential and devote their careers to helping those living with diabetes. And we’re seeing real results! In just the first six years, our Pathway scientists have made tremendous advances including a new therapy to improve wound healing, identification of a new pathway regulating appetite and development of a novel molecule with the potential to improve continuous glucose monitoring.

As the first CEO of the American Diabetes Association to live with this disease, I can tell you that the incredible work our Pathway researchers are doing hits close to home. I have benefitted personally from how far we’ve come in the last decade—my own life has improved exponentially because I now use a continuous glucose monitor to measure and track my blood sugar levels. This technology has helped me conquer my diabetes management—to the point where I no longer need to take insulin to manage my blood sugar.

I couldn’t be more excited for the future. Our two new Pathway scientists bring to the table even more innovative ideas to keep pushing us forward. I’m confident that each of our 34 Pathway scientists will help lead us into a new decade filled with exciting breakthroughs as we march toward a cure.

Will you help us get to the next breakthrough?

Tracey D. Brown, Person with Diabetes
CHIEF EXECUTIVE OFFICER
American Diabetes Association

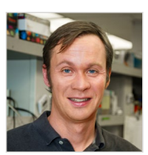
#AwakenTheWorld #ConnectedForLife

Cover: Pathway scientist Zhen Gu, PhD (right), conducting diabetes research at the University of California, Los Angeles.

The Pathway Scientists

To learn more about each individual Pathway project, visit **diabetes.org/pathway/recipients**

Type 1 Diabetes

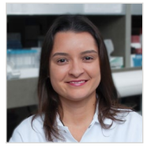


THOMAS DELONG, PHD*
University of Colorado, Denver
Accelerator ’15
Dr. Delong is researching the molecular mechanisms explaining why the immune system mistakenly attacks beta-cells.

SUMITA PENNATHUR, PHD
University of California, Santa Barbara
Visionary ’17
Dr. Pennathur is working to develop a simple, easy-to-use device capable of non-invasively monitoring blood glucose.

ZHEN GU, PHD*
University of California, Los Angeles
Accelerator ’15
Dr. Gu is working on a therapeutic system able to automatically regulate insulin delivery in proportion to blood glucose.

MAUREEN MONAGHAN, PHD
Children’s Research Institute
Accelerator ’18
Dr. Monaghan is conducting a clinical trial to improve communication between adolescents with T1D and providers.



STEPHANIE STANFORD, PHD
University of California, San Diego
Initiator ’15
Dr. Stanford’s project is attempting to determine how a genetic variant increases risk for developing T1D.

MATTHEW J. WEBBER, PHD
University of Notre Dame
Accelerator ’19
Dr. Webber is developing a new, innovative strategy to proactively prevent hypoglycemia in children with T1D.

ALEKSANDAR DAVID KOSTIC, PHD
Joslin Diabetes Center
Initiator ’17
Dr. Kostic is researching to understand the link between the microbiome and development of T1D.

JUDITH AGUDO, PHD
Dana-Farber Cancer Institute
Accelerator ’20
Dr. Agudo is developing a novel way to protect transplanted beta-cells from being attacked by the immune system.

*Indicates awardee who has graduated from the program.

Type 2 Diabetes

STEPHEN C.J. PARKER, PHD*
University of Michigan
Initiator ’14
Dr. Parker is using novel technologies to determine which genes play a role in the function of insulin-producing beta-cells.

MICHAEL L. STITZEL, PHD
The Jackson Laboratory
Accelerator ’18
Dr. Stitzel is studying the genetic signatures of the cells that make insulin, called beta-cells.

WOLFGANG PETI, PHD*
University of Arizona
Visionary ’14
Dr. Peti is working to gain fresh, essential insights into how to improve insulin sensitivity by targeting specific proteins.

JONATHAN V. SWEEDLER, PHD
University of Illinois at Urbana-Champaign | Visionary ’18
Dr. Sweedler is using novel technologies to examine the chemical composition of single insulin-producing beta-cells.

CELINE EMMANUELLE RIERA, PHD
Cedars-Sinai Medical Center
Initiator ’15
Dr. Riera seeks to understand the relationship between sense of smell and energy balance.

SARAH A. TISHKOFF, PHD
University of Pennsylvania
Visionary ’19
Dr. Tishkoff is investigating the genetic risk factors that influence T2D by studying indigenous African populations.

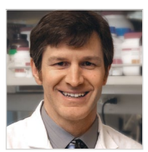
SAMIE R. JAFFREY, MD, PHD
Weill Medical College of Cornell University | Visionary ’18
Dr. Jaffrey is working to develop a new type of gene therapy that could improve outcomes in people with diabetes.

MAXENCE V. NACHURY, PHD
University of California, San Francisco
Visionary ’20
Dr. Nachury is studying how sensory antenna on cells influence regulation of body weight and blood glucose.

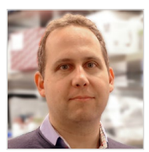
The Pathway Scientists

To learn more about each individual Pathway project, visit **diabetes.org/pathway/recipients**

Obesity, Prediabetes and Diabetes Risk



JOSHUA P. THALER, MD, PHD*
University of Washington
Accelerator ’14
Dr. Thaler is investigating specific cells in the brain, called glial cells, which could be targeted to treat obesity and diabetes.

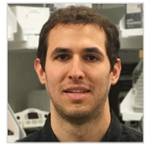


PAUL COHEN, MD, PHD
The Rockefeller University
Accelerator ’17
Dr. Cohen is researching a unique type of cell, called brown fat cells, which could be targeted to increase energy expenditure.

ZACHARY A. KNIGHT, PHD
University of California, San Francisco
Accelerator ’16
Dr. Knight seeks to understand how certain regions in the brain regulate appetite and how they change in obesity.

SARAH A. STANLEY, MD, PHD
Icahn School of Medicine at Mount Sinai | Accelerator ’17
Dr. Stanley is using novel techniques to investigate a specific population of glucose-sensing neurons in diabetes.

PRAVEEN SETHUPATHY, PHD
Cornell University
Accelerator ’16
Dr. Sethupathy is studying how the gut microbiome changes in obesity and how these changes impact glucose levels.



ALEXANDER R. NECTOW, PHD
Columbia University
Accelerator ’18
Dr. Nectow is researching how the brain regulates energy balance and what signals change when people gain or lose weight.

PHILLIP JAMES WHITE, PHD
Duke University
Initiator ’16
Dr. White is investigating the molecular pathways responsible for nonalcoholic fatty liver disease.

JOHN NELSON CAMPBELL, PHD
University of Virginia
Initiator ’18
Dr. Campbell is using novel techniques to better understand how certain regions of the brain control metabolism.

*Indicates awardee who has graduated from the program.

Complications of Diabetes

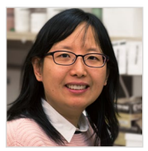
MICHAEL D. DENNIS, PHD
The Pennsylvania State University
Initiator ’14
Dr. Dennis is researching how high glucose levels can alter molecular pathways in the eye and lead to vision loss.

DAVID A. SPIEGEL, MD, PHD
Yale University School of Medicine
Visionary ’17
Dr. Spiegel is working on a potential therapy to prevent diabetes complications caused by elevated glucose.

MAYLAND CHANG, PHD*
University of Notre Dame
Visionary ’15
Dr. Chang is developing a novel therapy to improve wound healing and prevent amputations in people with diabetes.

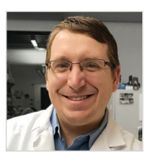
DANIEL J. CERADINI, MD
New York University School of Medicine
Accelerator ’16
Dr. Ceradini is investigating a novel nanoparticle technology to improve wound healing in diabetes.

KATHLEEN A. PAGE, MD*
University of Southern California
Accelerator ’14
Dr. Page is studying how maternal-fetal programming changes brain pathways in children of mothers with diabetes.



SUI WANG, PHD
Stanford University School of Medicine
Initiator ’16
Dr. Wang seeks to determine the role of genetics in the progression of vision loss related to diabetes.

MARIE-FRANCE HIVERT, MD
Harvard Medical School
Accelerator ’15
Dr. Hivert is working to understand the genetics underlying risk of gestational diabetes.



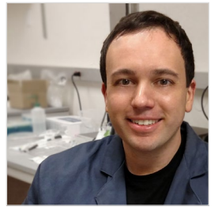
JONATHAN N. FLAK, PHD
Indiana University School of Medicine
Initiator ’17
Dr. Flak is studying a certain region of the brain that senses and responds to low-blood glucose.

EBONY BOYCE CARTER, MD
Washington University School of Medicine | Accelerator ’19
Dr. Carter is conducting a clinical trial to test a simple intervention designed to mitigate the risk of gestational diabetes.

Gestational Diabetes

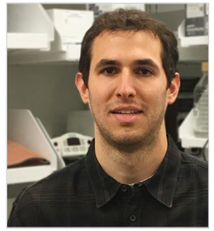
> As long as people continue to live with diabetes, research that leads to better outcomes is needed. Lilly supports the Pathway program because we are committed to finding new ways to improve the lives of people who are affected by this condition. With federal funding under increased pressure, diabetes research is at risk without important initiatives such as the Pathway program. We applaud the American Diabetes Association for its commitment to funding this important work."
>
> —Sherry Martin, MD, Vice President of Medical Affairs, Eli Lilly and Company

Innovative Research from Pathway Scientists in 2019



Pathway scientist **Dr. Zachary Knight** has identified a novel mechanism whereby cells within the intestines regulate appetite centers in the brain responsible for hunger. His findings provide a potential target for treatment of obesity and explanation for the mechanisms underlying dramatic weight loss following gastric bypass surgery.

Bai, L., Mesgarzadeh, S., Ramesh, K. S., Huey, E. L., Liu, Y., Gray, L. A., … Knight, Z. A. (2019). Genetic Identification of Vagal Sensory Neurons That Control Feeding. *Cell*, 179(5), 1129-1143.e23. https://doi.org/10.1016/j.cell.2019.10.031



Pathway scientist **Dr. Alexander Nectow** discovered that a specific type of neuron in the brain potently regulates energy expenditure. These neurons sense increases in external temperature and respond by transmitting signals to reduce internal heat production, and therefore energy expenditure. This research will help further our knowledge of the mechanisms regulating energy balance by the brain and how it changes in obesity.

Schneeberger, M., Parolari, L., Das Banerjee, T., Bhave, V., Wang, P., Patel, B., … Nectow, A. R. (2019). Regulation of Energy Expenditure by Brainstem GABA Neurons. *Cell*, 178(3), 672-685.e12. https://doi.org/10.1016/j.cell.2019.05.048

Pathway scientist **Dr. Sumita Pennathur** and her team are working on a new way to monitor glucose continuously. This year, they published an article detailing a novel molecule capable of detecting glucose stably over long periods of time.

Wang, B., Chou, K.-H., Queenan, B. N., Pennathur, S., & Bazan, G. C. (2019). Molecular Design of a New Diboronic Acid for the Electrohydrodynamic Monitoring of Glucose. Angewandte Chemie (International Ed. in English), 58(31), 10612–10615. https://doi.org/10.1002/anie.201904595

Pathway scientist **Dr. Thomas Delong** has dedicated his project to identifying the underlying causes of type 1 diabetes. He has previously identified a class of proteins called Hybrid Insulin Peptides (HIPs) that can trigger type 1 diabetes onset in mice. Now, he has obtained evidence that HIPs may also play an important role in causing type 1 diabetes onset in humans, a significant step toward clinical significance.

Baker, R. L., Rihanek, M., Hohenstein, A. C., Nakayama, M., Michels, A., Gottlieb, P. A., … Delong, T. (2019). Hybrid Insulin Peptides Are Autoantigens in Type 1 Diabetes. *Diabetes*, 68(9), 1830–1840. https://doi.org/10.2337/db19-0128

Pathway's 2019 Graduating Class

This year, four stellar Pathway scientists completed the final year of their awards. The four scientists represent each of the three award categories: Initiator, Accelerator and Visionary. Each came to the program with a unique idea for how to improve the lives of people with diabetes through cutting-edge research. Now, as they depart the program, they reflect on their time in the program and the most significant outcomes related to their awards.

Stephen C.J. Parker, PhD

University of Michigan, Ann Arbor, MI

Unraveling the genetics of insulin-producing beta-cells

"Receiving a Pathway award was a career-defining moment. The funding has allowed me to obtain a position at a top-notch university, build up a strong lab, and focus on important research questions. The Pathway award should position me well to make a long-term contribution to diabetes research."

Dr. Parker's Pathway to Stop Diabetes project was geared toward understanding how one's personal genome affects diabetes risk. Because we all have different genetics, the underlying reasons for the development of diabetes likely varies from person to person. The results that Dr. Parker has generated as part of this Pathway award have helped to partition the genome into segments that are more likely related to specific tissues, enabling future individualized tissue-specific pathology scores based on genetic profiles. Based off of results obtained through his Pathway award, Dr. Parker secured a large National Institutes of Health (NIH) award to continue his innovative research.

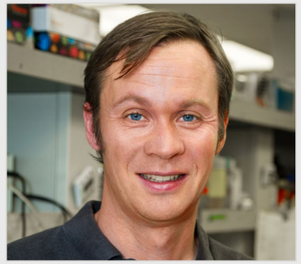
Mayland Chang, PhD

University of Notre Dame, Notre Dame, Indiana

A strategy to accelerate diabetic wound healing

"I am grateful for the Pathway program support. This award has enabled me to investigate why diabetic foot ulcers do not heal and arrive at a potential solution. As diabetes affects my family, I thank Pathway donors and sponsors for the opportunity given to me to contribute to the field of diabetes."

Diabetic foot ulcers are chronic wounds affecting 1 in 4 people with diabetes. The lack of effective therapies result in more than 100,000 lower-limb amputations every year in the United States. Dr. Chang's project identified an enzyme in diabetic wounds in both mice and humans that prevents wound healing. Dr. Chang went on to discover a new topical drug named (R)-ND-336 that targets the detrimental enzyme. As a result of her Pathway work, Dr. Chang was recently awarded funding from the Department of the Army to complete studies that demonstrate (R)-ND-336 is safe to enter human clinical trials, which are planned to begin in 2021.



Thomas Delong, PhD

University of Colorado, Denver

A new player in the development of type 1 diabetes

"At the time of my application for the ADA Pathway program, I was on the verge of a breakthrough discovery. However, my funding situation was limited and about to expire. This was a very stressful situation in my life as I started to think about what to do next so I could continue to do my research. The Pathway program recognized the potential impact of my discovery at that time and their funding decision in my favor put me into a highly competitive position to start my own lab. Today, my lab is among the leading labs studying antigens in type 1 diabetes."

In type 1 diabetes, cells of the immune system mistakenly attack insulin-producing beta-cells. A driving question in type 1 diabetes research is what targets (antigens) the immune system recognizes on the beta-cell that leads to their demise. Dr. Delong's research led to the discovery of a new family of antigens that are present in people with type 1 diabetes. The existence of these previously unknown molecules provide a plausible explanation on how the immune system gets tricked into attacking the insulin-producing beta-cells, and provides a potential therapeutic target. One of Dr. Delong's discoveries was featured on the cover of *Science*, a very prestigious scientific journal.

Zhen Gu, PhD

University of California, Los Angeles

Toward a fully-automated artificial pancreas

"My Pathway Accelerator award has already significantly impacted my career development. As a result of this award, I have been able to concentrate on emerging research in my lab without funding pressure and can carry out high-risk, high-reward projects in an efficient way. To date, we have published several research papers in high-impact journals. More importantly, we have filed six patent applications, aiming to translate our "smart insulin" techniques directly generated by the terrific support of this Pathway award."

The overall goal of Dr. Gu's Pathway to Stop Diabetes project was to develop glucose-responsive insulin delivery systems. Such systems have the potential to improve glucose control by preventing low and high blood glucose in the absence of any input from the patient, thereby significantly reducing burden and improving outcomes for people with diabetes. In 2015, Dr. Gu and his team pioneered the concept and made the first prototype of the "smart-insulin patch." In 2017, they invented a new type of glucose-responsive, long-acting insulin. In 2018, they developed a synthetic artificial beta-cell. As a result of this productivity, Dr. Gu was recruited to UCLA as a full professor in 2018.

Select Publications from Pathway Scientists in 2019

1. Kim, H., & **Jaffrey, S. R.** (2019). A Fluorogenic RNA-Based Sensor Activated by Metabolite-Induced RNA Dimerization. *Cell Chemical Biology*. https://doi.org/10.1016/j.chembiol.2019.09.013

2. Chen, Y., Essner, R. A., Kosar, S., Miller, O. H., Lin, Y.-C., Mesgarzadeh, S., & **Knight, Z. A.** (2019). Sustained NPY signaling enables AgRP neurons to drive feeding. *ELife*, *8*. https://doi.org/10.7554/eLife.46348

3. Singh, A. P., Hung, Y.-H., Shanahan, M. T., Kanke, M., Bonfini, A., Dame, M. K., … **Sethupathy, P.** (2019). Enteroendocrine progenitor cell enriched miR-7 regulates intestinal epithelial proliferation in an Xiap-dependent manner. *Cellular and Molecular Gastroenterology and Hepatology*. https://doi.org/10.1016/j.jcmgh.2019.11.001

4. Hung, Y.-H., Kanke, M., Kurtz, C. L., Cubitt, R. L., Bunaciu, R. P., Zhou, L., … **Sethupathy, P.** (2019). MiR-29 Regulates de novo Lipogenesis in the Liver and Circulating Triglyceride Levels in a Sirt1-Dependent Manner. *Frontiers in Physiology*, *10*, 1367. https://doi.org/10.3389/fphys.2019.01367

5. Li, M. M., Madara, J. C., Steger, J. S., Krashes, M. J., Balthasar, N., **Campbell, J. N.**, … Lowell, B. B. (2019). The Paraventricular Hypothalamus Regulates Satiety and Prevents Obesity via Two Genetically Distinct Circuits. *Neuron*, *102*(3), 653-667.e6. https://doi.org/10.1016/j.neuron.2019.02.028

6. Layton, J., Powe, C., Allard, C., Battista, M.-C., Doyon, M., Bouchard, L., … **Hivert, M.-F.** (2019). Maternal lipid profile differs by gestational diabetes physiologic subtype. *Metabolism: Clinical and Experimental*, *91*, 39–42. https://doi.org/10.1016/j.metabol.2018.11.008

7. Tierney, B. T., Yang, Z., Luber, J. M., Beaudin, M., Wibowo, M. C., Baek, C., … **Kostic, A. D.** (2019). The Landscape of Genetic Content in the Gut and Oral Human Microbiome. *Cell Host & Microbe*, *26*(2), 283-295.e8. https://doi.org/10.1016/j.chom.2019.07.008

8. Dierschke, S. K., Miller, W. P., Favate, J. S., Shah, P., Imamura Kawasawa, Y., Salzberg, A. C., … **Dennis, M. D.** (2019). O-GlcNAcylation alters the selection of mRNAs for translation and promotes 4E-BP1-dependent mitochondrial dysfunction in the retina. *The Journal of Biological Chemistry*, *294*(14), 5508–5520. https://doi.org/10.1074/jbc.RA119.007494

9. Scheiman, J., Luber, J. M., Chavkin, T. A., MacDonald, T., Tung, A., Pham, L.-D., … **Kostic, A. D.** (2019). Meta-omics analysis of elite athletes identifies a performance-enhancing microbe that functions via lactate metabolism. *Nature Medicine*, *25*(7), 1104–1109. https://doi.org/10.1038/s41591-019-0485-4

10. Nguyen, T. T., Jones, J. I., Wolter, W. R., Pérez, R. L., Schroeder, V. A., Champion, M. M., … **Chang, M.** (2019). Hyperbaric oxygen therapy accelerates wound healing in diabetic mice by decreasing active matrix metalloproteinase-9. *Wound Repair and Regeneration: Official Publication of the Wound Healing Society [and] the European Tissue Repair Society*. https://doi.org/10.1111/wrr.12782

11. Kim, N. Y., Goddard, T. N., Sohn, S., **Spiegel, D. A.**, & Crawford, J. M. (2019). Biocatalytic Reversal of Advanced Glycation End Product Modification. *Chembiochem: A European Journal of Chemical Biology*, *20*(18), 2402–2410. https://doi.org/10.1002/cbic.201900158

12. Varshney, A., VanRenterghem, H., Orchard, P., Boyle, A. P., Stitzel, M. L., Ucar, D., & **Parker, S. C. J.** (2019). Cell Specificity of Human Regulatory Annotations and Their Genetic Effects on Gene Expression. *Genetics*, *211*(2), 549–562. https://doi.org/10.1534/genetics.118.301525

13. Wang, J., Yu, J., Zhang, Y., Zhang, X., Kahkoska, A. R., Chen, G., … **Gu, Z.** (2019). Charge-switchable polymeric complex for glucose-responsive insulin delivery in mice and pigs. *Science Advances*, *5*(7), eaaw4357. https://doi.org/10.1126/sciadv.aaw4357

Pathway Drives Collaboration to Fuel Progress in Diabetes Research

A core tenet of the Pathway to Stop Diabetes program is to provide opportunities for collaboration. By connecting scientists with complementary expertise, the Pathway program helps accelerate advances in diabetes research. This year, 2017 Pathway Accelerator awardee Dr. Praveen Sethupathy furthered his Pathway project through successful collaborations.

Drs. Sethupathy, Parker and Stitzel

Lawlor, N., … **Sethupathy, P.**, ... **Parker S.C.J., Stitzel, M. L.** (2019). Multiomic Profiling Identifies cis-Regulatory Networks Underlying Human Pancreatic β Cell Identity and Function. Cell Reports, 26(3), 788-801.e6. https://doi.org/10.1016/j.celrep.2018.12.083

Drs. Sethupathy and White

Hung, Y.-H., Kanke, M., Kurtz, C. L., Cubitt, R., Bunaciu, R. P., Miao, J., …**White, P.J.**, **Sethupathy, P.** (2019). Acute suppression of insulin resistance-associated hepatic miR-29 in vivo improves glycemic control in adult mice. *Physiological Genomics*, *51*(8), 379–389. https://doi.org/10.1152/physiolgenomics.00037.2019

“This year, I have interacted extensively with several other Pathway awardees. I published a paper earlier in the year with two other awardees, Michael Stitzel and Stephen Parker. I continued a collaboration with Phillip White. And I established and solidified a partnership with Paul Cohen, which has blossomed into an NIH grant application that I aim to submit in February 2020.”

—Praveen Sethupathy, PhD

Creating the Next Generation of Diabetes Research Leaders

Due to resource constraints, younger scientists are often locked out of funding opportunities by scientists who are already established in the field. The National Institutes of Health (NIH) trend toward funding established researchers is a relatively recent development. In 1980, the average age of a first R01 (a large NIH grant) recipient was 35. Today, it's 44. Early-career researchers—at the peak of their creativity—are finding research dollars scarce. The lack of funding and resultant lack of new talent are conspiring to threaten progress in diabetes research. We must reverse both trends.

Pathway is dedicated to finding the next generation of diabetes research leaders. With an average age of 37 for Initiator and Accelerator awardees, Pathway scientists are poised to be just that.

All nine Pathway Initiator scientists—awarded as postdoctoral fellows—have gone on to receive faculty appointments, a testament to the Pathway program and the brilliant diabetes researchers it funds.

"The Pathway award has shaped my research trajectory and afforded me the opportunity to make important contributions that would not have been possible otherwise."

Stephen C.J. Parker, PhD
2014 Initiator awardee
University of Michigan

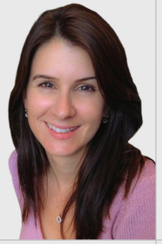
"As a young investigator, I found the Initiator award to be instrumental in allowing me to obtain specialized training to differentiate my research from that of my postdoctoral mentors and to establish an independent diabetes research program."

Michael D. Dennis, PhD
2014 Initiator awardee
Pennsylvania State University, Hershey*

"The Pathway award has opened doors for me to interact and collaborate with established diabetes investigators, which has been rewarding and substantially enhanced the depth of my research program."

Stephanie Stanford, PhD
2015 Initiator awardee
University of California San Diego

"Getting the Pathway award in 2015 has allowed me to orient my career toward academic research in a difficult and competitive funding climate."

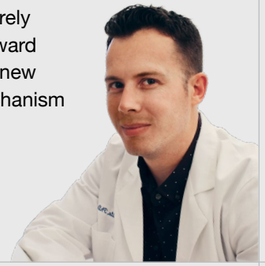


Celine E. Riera, PhD
2015 Initiator awardee
Cedars-Sinai Medical Center

"My Pathway award has allowed me to perform high-risk, high-reward research, meet experts in diabetes research, discuss ideas with collaborators, and receive mentoring by world renowned scientists."

Sui Wang, PhD
2016 Initiator awardee
Stanford University

"My Pathway Initiator award has provided me with the resources to build a new research team that is entirely dedicated to pushing forward our understanding of the new metabolic regulatory mechanism we have discovered."

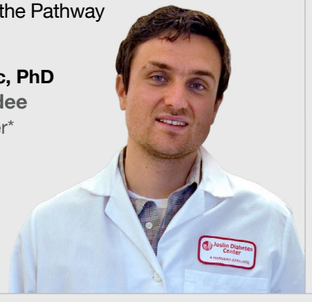


Phillip James White, PhD
2016 Initiator awardee
Duke University*

"The Pathway program has made my dream of becoming an independent academic scientist a reality."

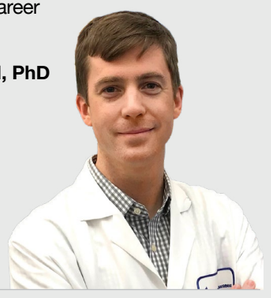
Jonathan N. Flak, PhD
2017 Initiator awardee
Indiana University

"I certainly would not have been able to pursue my current research without funding from the Pathway Initiator award."



Aleksandar D. Kostic, PhD
2017 Initiator awardee
Joslin Diabetes Center*

"If I did not receive Pathway funding through my Initiator Award, I would likely be in a research career outside of diabetes."



John Nelson Campbell, PhD
2018 Initiator awardee
University of Virginia

*Accepted an internal promotion at postdoctoral training institution

Pathway to Stop Diabetes
2020 Class of Scientists

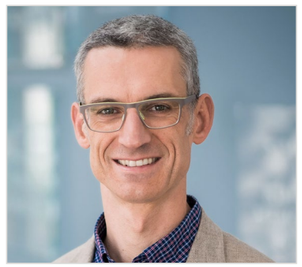
Accelerator Awardee

Judith Agudo, PhD
Dana-Farber Cancer Institute
Boston, MA

Harnessing immune privilege mechanisms from stem cells to protect beta-cells from immune attack

Despite notable improvement in treatments with exogenous insulin, people with diabetes often have difficulty adequately controlling glucose levels, which can lead to serious complications. To definitively cure type 1 diabetes, the insulin-producing beta-cells that were lost need to be replaced. Strategies to accomplish this, including transplantation of cells provided by donors or the conversion of stem-cells, have seen limited success because the transplanted cells inevitably succumb to the same autoimmune attack that killed the original beta-cells. Thus, it is of the utmost importance to develop strategies to preserve newly generated or transplanted insulin-producing cells. Dr. Agudo's Pathway to Stop Diabetes project will investigate such a strategy. Her lab recently discovered the existence of specialized stem cells in the skin and muscle that are somehow protected from attack by immune cells. The goal of her project is to determine the molecular underpinnings that allow these stem cells to be 'cloaked' from activated immune cells, and then apply them to beta-cells. In effect, this could indefinitely protect the transplanted beta-cells without the need for immunosuppressive drugs and lead to better outcomes and reduced burden for people living with diabetes.

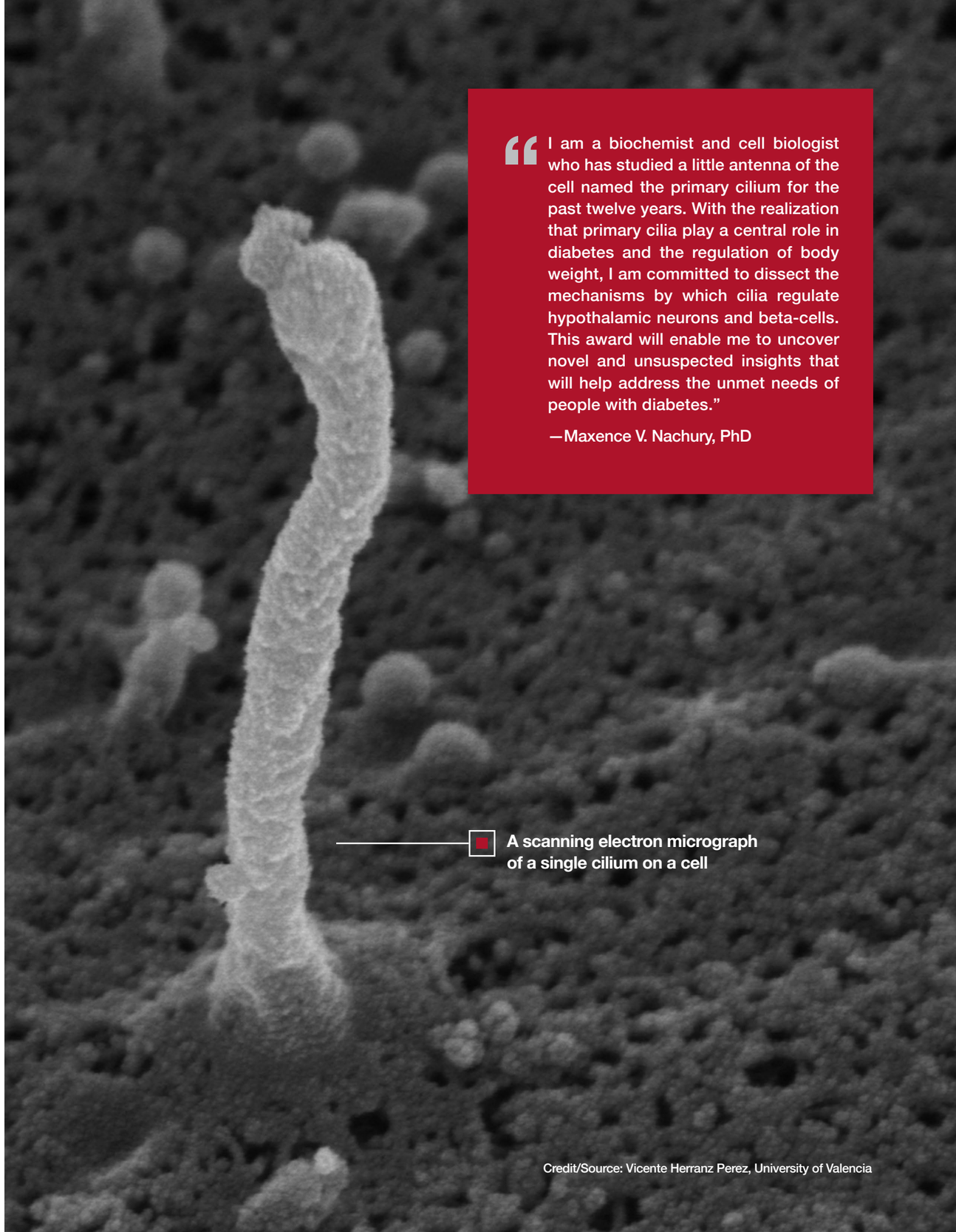
Visionary Awardee



Maxence V. Nachury, PhD
University of California,
San Francisco

Regulation of body weight homeostasis and beta-cell function by primary cilia

Nearly every cell in the human body possesses a sensory 'antenna' that is used to sense changes occurring outside of the cell. These antennae are called primary cilia. In a group of rare genetic disorders dubbed ciliopathies, malfunction of the primary cilium results in profound obesity, kidney anomalies, vision loss, altered glucose tolerance and a host of other symptoms. The range of symptoms present in the ciliopathies suggests a broad physiological importance for primary cilia. However, little is known about how primary cilium affect regulation of blood glucose and body weight. Dr. Nachury's Pathway to Stop Diabetes project seeks to determine the role that primary cilium play in two distinct areas that are of importance to the development of obesity and type 2 diabetes. First, he will determine how primary cilium influence the processes that control appetite in the brain. Second, Dr. Nachury will study how primary cilium affect the function of the cells that produce insulin, pancreatic beta-cells. Ultimately, the goal of Dr. Nachury's project is to determine if primary cilium can be targeted therapeutically to improve treatments available for people with diabetes.



> "I am a biochemist and cell biologist who has studied a little antenna of the cell named the primary cilium for the past twelve years. With the realization that primary cilia play a central role in diabetes and the regulation of body weight, I am committed to dissect the mechanisms by which cilia regulate hypothalamic neurons and beta-cells. This award will enable me to uncover novel and unsuspected insights that will help address the unmet needs of people with diabetes."
>
> —Maxence V. Nachury, PhD

A scanning electron micrograph of a single cilium on a cell

Credit/Source: Vicente Herranz Perez, University of Valencia

Behind ADA's Pathway Program

34
scientists selected
from more than
700 applicants

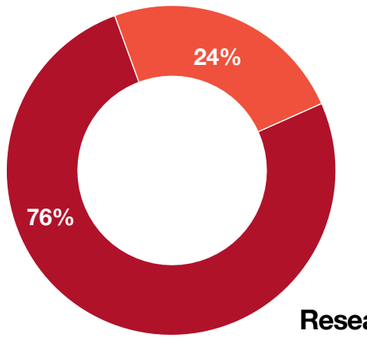
37
age of Pathway Initiator and Accelerator awardees
compared to 44
for first-time NIH R01 recipients

$53.6 M
donated by
corporate sponsors and
individual philanthropists

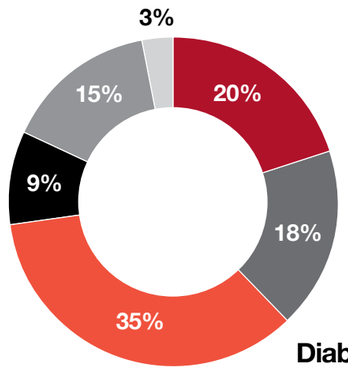
160+
peer-reviewed publications
authored by
Pathway awardees

13
invention disclosures and patent applications

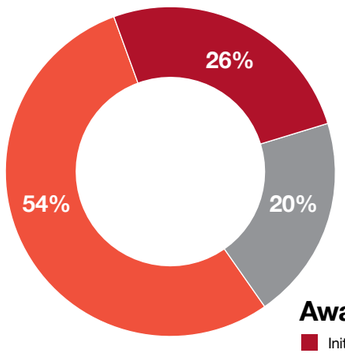
The goal of Pathway to Stop Diabetes is to bring 100 brilliant scientists to diabetes research, helping to cultivate the next generation of diabetes research leaders. In addition to their research projects, the Pathway program also supports the careers of the scientists, giving them the mentorship, collaborative avenues, and communication channels they need to deliver on their potential to help prevent, treat and ultimately cure diabetes.



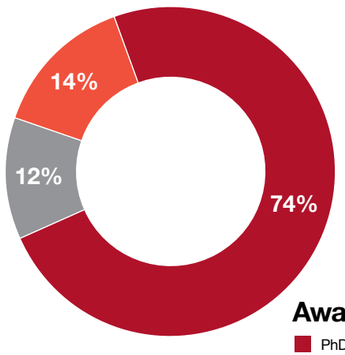
Research Type
- Basic Science
- Clinical and Translational Science



Diabetes Type
- Type 1 Diabetes
- Both Type 1 and Type 2
- Type 2 Diabetes
- Gestational Diabetes
- Obesity
- Prediabetes



Award Type
- Initiator
- Accelerator
- Visionary



Awardee Type
- PhD
- MD
- MD/PhD

The Mentor Advisory Group

The Mentor Advisory Group is a distinguished group of diabetes research leaders that play an integral role in the success of the program. Each year, the Mentor Advisory Group reviews each proposal and ultimately determines which applicants most embody the program: brilliant scientists with the potential to become future diabetes research leaders. Their contribution does not stop there. The members of the Mentor Advisory Group serve as both scientific and career mentors to ensure that Pathway scientists are successful in their research, both now and in the future.

Silvia Corvera, MD | Chair, Mentor Advisory Group
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Columbia University

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Baylor College of Medicine

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University of Washington

Andrew Stewart, MD
Icahn School of Medicine at Mount Sinai

Karen Talmadge, PhD
Nabu Strategic Advisors

"Pathway to Stop Diabetes provides exceptional scientists with a unique combination of funding resources and human collaborative networks necessary to perform the multidisciplinary, innovative research required to bring us closer to a cure."

—Silvia Corvera, MD
Chair, Mentor Advisory Group

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We are tremendously grateful to the Corporate Sponsors and Philanthropic Supporters that have made this impactful program possible in 2019.

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BD

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> Merck is proud to offer our continued support of the Pathway program, which is transforming the future of diabetes research and striving to make a meaningful difference for patients. The fight against diabetes is not an easy undertaking, but with initiatives such as the Pathway program and its vision of finding a new generation of brilliant scientists, important progress is being made."
>
> —Sam Engel, MD | Merck, Associate Vice President, Clinical Research (Diabetes and Endocrinology)

To learn more about this program and sponsorship opportunities

Corporations should contact:
Tricia Cedotal
tcedotal@diabetes.org
1-800-676-4065, Ext. 2066

Individuals and family foundations should contact:
Elaine Curran
ecurran@diabetes.org
1-800-676-4065, Ext. 3413

To donate online, visit:
diabetes.org/pathway

> Scientific research conducted under rigorous universally accepted protocols is the most promising way to learn and understand the complexities of diabetes. We believe that the Pathway program offers an excellent chance to realize significant scientific breakthroughs in this understanding. As grandparents in an expanded family with several diabetic members and direct experience with the trauma of uncontrolled diabetes, we want to do as much as possible to protect our children and grandchildren from this dreadful disease. Direct support of the Pathway program is our chosen mechanism to achieve this goal."
>
> —Anonymous Private Donors

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in the fight for a
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