

2026 CANADA GAIRDNER AWARD WINNERS

Explore the science behind today's biggest
breakthroughs



ABOUT GAIRDNER

The mission of the Gairdner Foundation is to celebrate, inform and inspire scientific excellence around the globe.

Established in 1957, the Gairdner Foundation is dedicated to fulfilling James A. Gairdner's vision to recognize major research contributions to the treatment of disease and alleviation of human suffering. Through the prestigious annual Canada Gairdner Awards, the Foundation celebrates the world's most creative and accomplished researchers whose work is improving the health and wellbeing of people around the world. **The Canada Gairdner Awards are recognized internationally as being among the most prestigious in the world, based on our reputation for rigorous review and early recognition of breakthroughs in science.**

The Gairdner Foundation brings people together to openly discuss science in order to better engage the public, understand the problems we face, and work together to find solutions. Through Gairdner Connects, our national outreach program, we bring science to communities across Canada to inspire future innovators and spark public dialogue about the role of research in addressing the world's most pressing health challenges.

BY THE NUMBERS

- 5** CANADA GAIRDNER
International Awards
For excellence in biomedical research
- 2** PETER GILGAN CANADA GAIRDNER
Momentum Awards
For mid-career investigators with exceptional research
- 1** JOHN DIRKS CANADA GAIRDNER
Global Health Award
For outstanding achievements in global health research

443 AWARDS to scientists from over **40** countries

103
Gairdner awardees have gone on to win the **Nobel Prize**



20 CANADIAN UNIVERSITIES | **6000+** ENGAGING students and researchers annually through outreach programs that give Canadians access to world-renowned scientists



ABOUT THE COLLECTION

This article is part of a larger collection introducing the discoveries of the 2026 Canada Gairdner Award winners, among the world's leading biomedical and global health researchers. From the inner workings of our cells to new approaches to preventing disease and improving treatment, these stories explore research shaping the future of human health.

To explore the other stories in this series, [check out the full collection here](#). By viewing the full collection, you'll discover the science behind this year's award-winning research and explore big questions such as:

- How can viruses help us fight antibiotic-resistant bacteria?
- How can technology help regulate blood pressure after spinal cord injury?
- How can we stop misfolded proteins from causing disease?
- How can scientists identify, measure and study thousands of proteins?
- How can scientists use 3D images to see inside cells?
- How can oral vaccines help prevent cholera?

ABOUT THE CREATORS

Each article was written by Gairdner student intern **Leanne Cherry**, an undergraduate student at McGill University studying Cognitive Science and Communication Studies, and developed in collaboration with the Award winners themselves. Passionate about science communication, Leanne is interested in making research accessible and combating science and health misinformation.

The articles were also reviewed by the students from the **Canadian Association of Girls in Science (CAGIS)**, whose thoughtful feedback helped make these stories clear, accurate and engaging for young readers.

Illustrations were created by **Heather Ng-Cornish**, an illustrator and communicator based in Ontario. Heather brings her science communication experience to her illustrations, creating clear, colourful and accessible visuals that help bring scientific ideas to life. To see more of her work, visit www.heatherngcornish.com

The Gairdner Foundation is committed to sharing the excitement of discovery with people of all ages. We hope this collection sparks your curiosity, encourages you to ask big questions, and inspires you to imagine the discoveries still waiting to be made.



LEANNE
CHERRY



HEATHER
NG-CORNISH



A SHOCK TO THE SYSTEM: RESTORING BLOOD PRESSURE FUNCTION AFTER SPINAL CORD INJURY

DR. AARON PHILLIPS

PETER GILGAN CANADA GAIRDNER MOMENTUM AWARD
WINNER

Associate Professor, Departments of Clinical Neurosciences, Cardiac Sciences, Physiology and Pharmacology, University of Calgary; Associate Dean, Innovation and Commercialization, Cumming School of Medicine, University of Calgary, Canada

SUMMARY

Aaron Phillips' research aims to help people with spinal cord injuries (SCI) reduce the challenges and risks associated with blood pressure dysfunction—a common but often overlooked complication of SCI. Over the course of several studies, Phillips identified which specific regions of the nervous system are most important for blood pressure regulation. From there, he developed a device that can be implanted in the spinal cord which monitors blood pressure in real time and sends electrical signals to the nervous system, helping to restore normal blood pressure.

STUDENT REVIEWERS:



CELINE
Grade 9



HARGUN
Grade 9



RHYTHM
Grade 7



ROSE
Grade 8

While many people associate spinal cord injuries (SCI) with losing the ability to walk, SCI patients tend to focus on a much lesser-known side effect of this injury: **blood pressure dysfunction**. SCI often prevents the nervous system from sending the messages needed to effectively manage blood pressure—the metric for how much force the blood exerts against the walls of the blood vessels. Issues with this system can immediately lead to a heart attack, and over time can increase a person's risk of heart problems, impair their brain functioning, and lower their chances of survival overall. Blood pressure dysfunction is particularly troublesome for SCI patients because it can inhibit their ability to sit upright, making treatment and social situations more challenging.

Dr. Aaron Phillips, Professor and Researcher in Clinical Neuroscience at the University of Calgary, is conducting research to fight back against these issues.

After mapping the circuits of the nervous system that influence blood pressure, Phillips developed a device for the spinal cord which monitors blood pressure in real time and sends messages to the circuits he identified. Over the course of several studies, Phillips showed that his device could restore SCI patients' blood pressure control within hours after it was implanted, and continue doing so throughout the duration of its use. As Phillips' device begins to receive approval for widespread medical use, it holds the potential to improve the livelihoods and lifespans of millions of people living with SCI worldwide.

HOW BLOOD PRESSURE IS CONTROLLED

To better understand Phillips' work, it is helpful to first understand how the nervous system functions and how it influences blood pressure (**Figure 1**).

The nervous system is essentially a series of connected wires through which electrical signals can travel, spanning from the very tips of your toes to the neurons in your brain. These signals allow you to coordinate and control your movements, to interpret information from your environment like light and sound, and to regulate unconscious processes like breathing, heart rate, and blood pressure. Almost all of these wires travel through the spinal cord as the central "highway", transmitting information from the brain to body and vice versa.

The body's process for regulating blood pressure has several moving parts. When you exercise, for example, your muscles require more oxygen and nutrients, so your nervous system works with your heart and blood vessels to raise your blood pressure and deliver more oxygen-rich blood around the body. Blood pressure can be affected by something as simple as your body's position. When you transition from sitting to standing, gravity pulls your blood towards your legs, which can briefly lower your blood pressure. But, as soon as the nervous system detects this change, a reaction called the **baroreflex** will kick in. The baroreflex instructs the heart to pump harder and the blood vessels to squeeze tighter, ultimately restoring blood pressure to normal levels.

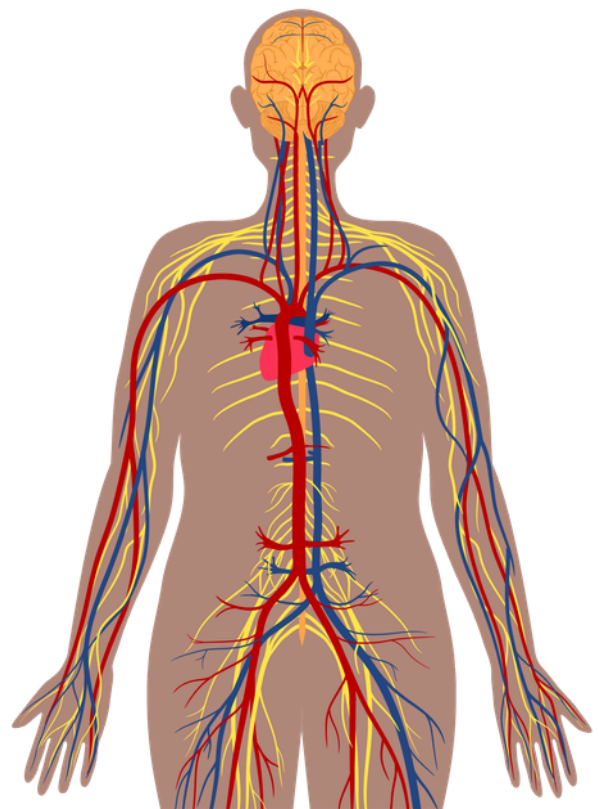


FIGURE 1

A diagram of the nervous system (yellow) and circulatory system (blue and red) from a rear view of the human body.

MOTOR COMMANDS

Signals sent from the brain through the spinal cord that direct muscles to contract, relax, and coordinate movement. These signals turn the brain's plans, such as standing or walking, into physical actions.

The baroreflex depends on the heart and nervous system working in harmony. These systems therefore must be able to communicate with each other. When the spinal cord is damaged, the primary highway for delivering **motor commands** from the brain and sensory information from the body is blocked off, making any attempts at communicating much more difficult. The degree to which the road is blocked depends on the location and severity of the injury, but generally speaking, the systems below the site of the injury are the most affected. This is why a person with an SCI to the lower spine may lose the ability to walk, but may maintain control over their torso and arms.

For blood pressure dysfunction, even if an SCI patient's nervous system detects a change in blood pressure, the damaged connection in their spine may prevent the nervous system from sending the motor commands needed to restore it. However, this does not mean the circuit is incapable of carrying electric messages altogether. It just means that we have to change where the message is coming from.

UNCHARTED TERRITORY: MAPPING THE NERVOUS SYSTEM'S BLOOD PRESSURE CIRCUITS

To solve the problems associated with spinal cord injury and blood pressure dysfunction, Phillips first needed to figure out where blood pressure regulation circuits are located in the nervous system. For this, he leveraged something called **epidural electrical stimulation (EES)**, a medical technique for externally supplying electricity to an SCI patient's nervous system. EES works by implanting tiny metal pins called electrodes beneath the damaged section of a patient's spinal cord and running electricity through the electrodes. This enables electricity to reach areas of the nervous system below the severed connection, which can ultimately restore some of its functioning.

Phillips and his team conducted a number of EES experiments to chart blood pressure regulation in the nervous system. Many of these experiments measured something called the **pressor response**, which is a sudden and dramatic increase in blood pressure triggered by stimulation of the nervous system. The researchers began by placing electrodes in different areas of the spine to figure out which one elicited the strongest pressor response. They found that blood pressure increased most when stimulated near the middle of the spine, suggesting that key blood pressure control circuits were in this area.

EPIDURAL ELECTRICAL STIMULATION (EES)

A technique that uses electrodes implanted near the spinal cord to deliver controlled electrical signals and activate specific nerve circuits.

The fact that EES increased blood pressure when applied in this area has to do with the division of the nervous system. The nervous system has two main branches: **the central branch**, which is composed of the brain and spinal cord, and **the peripheral branch**, which is composed of all the other neurons around the body. The peripheral branch itself has many different sub-branches, with blood pressure primarily being regulated by a sub-branch called the **sympathetic nervous system**. This sub-branch is known for activating the fight-or-flight response in the face of danger, and part of how it prepares the body for action is by increasing heart rate and blood pressure.

As Phillips parsed through blood pressure regulation circuits in the nervous system, he found that sympathetic neurons were densely populated near the middle of the spine—the area that they had previously shown to induce the greatest pressor response when stimulated with EES. The team called these densely populated areas “**haemodynamic hotspots**” because stimulating them could produce changes in blood pressure and blood flow.

Next, Phillips and his team had to figure out which exact path the signals from EES took to induce a blood pressure response. It turns out that the pressor response depends on the complex interplay of several different kinds of neurons.

There are over 86 billion neurons in the brain alone, but they can be broadly grouped into three categories: **sensory neurons**, which detect information from the body and environment; **motor neurons**, which send signals that control movement and other bodily functions; and **interneurons**, which act as bridges, passing signals between different neurons. Interneurons turned out to play an important role in understanding how blood pressure is regulated.

HAEMODYNAMICS

The movement of blood through the body and the forces, including blood pressure, that influence it.



EES signals first travel through sensory neurons. These neurons tend to be closer to the outer surface of the spine, where the electrodes are placed, and they are particularly responsive to electrical stimulation. The researchers confirmed that sensory neurons were important for blood pressure during some of their early experiments working with mice; when they prevented signals from travelling through these neurons, EES no longer induced a pressor response.

After passing through sensory neurons, the electric signals go through sympathetic interneurons—rather than going directly to the sympathetic motor neurons that control blood pressure. Phillips and his team uncovered this pathway after observing that there were no direct connections between the sensory neurons and the sympathetic motor neurons. Finally, the signals travel from the interneurons to the sympathetic motor neurons, where they cause a chemical release which instructs the blood vessels to contract. This ultimately increases blood pressure (**Figure 2**).

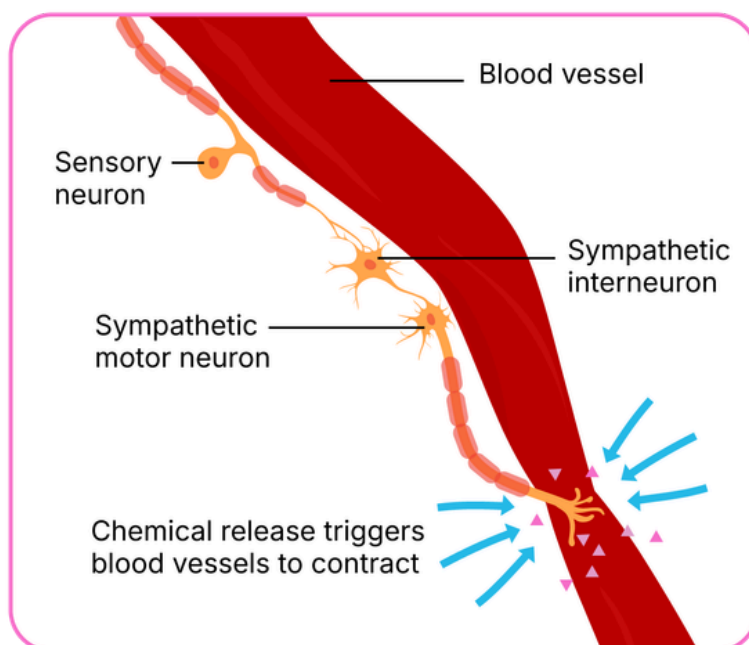


FIGURE 2

Three types of neurons connect and transmit the electrical signal, ending at the sympathetic motor neuron which causes a chemical release.

By studying large segments of the spine, tiny clusters of individual neurons, and all of the pathways in between, Phillips and his team were able to map precisely which parts of the nervous system regulate blood pressure—and how we might be able to control and restore them after SCI.

CONTROLLING BLOOD PRESSURE ELECTRONICALLY

To regulate blood pressure using an external device, it is important that we mimic the body's natural regulatory signals as closely as possible. Otherwise, we risk causing further damage to the nervous system, as well as introducing more problems to circulation. To achieve these natural patterns, Phillips recorded the nervous system's natural blood pressure signals and encoded them into the EES implant. This would ensure that signals produced by the implant are similar in length, frequency, and strength to the signals that would normally emerge from the nervous system.

Another key feature of this device is that it operates in closed loop, meaning it constantly monitors a patient's blood pressure and updates its output accordingly. For example, if an SCI patient were to transition from lying down to sitting up, their blood pressure may temporarily drop. The implant would detect this change, and it would send electric signals that cause the blood vessels to squeeze, ultimately restoring blood pressure. This implant is a kind of neuroprosthetic—a device that can be used to restore some lost function of the brain and nervous system. This is similar to how a prosthetic leg can help restore one's ability to walk after amputation. Phillips' implant works very similarly to our body's natural blood pressure reflex—the baroreflex—and has since been termed the “neuroprosthetic baroreflex”.

Phillips ran several trials to assess the device's effectiveness, beginning by testing it in mice and eventually working up to using it in human patients with SCIs. The results showed the same thing across all species: By placing the neuroprosthetic baroreflex over the spinal regions that Phillips identified, Phillips' device can correct both the immediate and long-term blood pressure dysfunction associated with SCI.

IMPACT FOR SCI PATIENTS AND BEYOND

Before the invention of the neuroprosthetic baroreflex, many of the treatments—or, more accurately, management techniques—for blood pressure dysfunction in SCI were uncomfortable for the patient and ineffective at dealing with the problem in the long run. These management techniques include consuming a diet high in salt or wearing a compressive sleeve around the torso to keep blood pressure elevated, among other measures. Phillips analyzed survey data from over 1400 SCI patients, and he found that even those who used these management techniques were still often left with dizziness, blurred vision, and overall feelings of weakness—all of which are symptoms of blood pressure dysfunction. Phillips' neuroprosthetic baroreflex was shown to alleviate these issues by sending signals that mimic and subsequently restore the body's natural blood pressure regulation processes, even in the face of a damaged spinal cord.

Beyond its applications in SCI treatment, Phillips' device could also potentially be effective for treating blood pressure regulation issues more broadly. Indeed, high blood pressure affects billions of people without SCIs. Phillips and his team are currently conducting research to understand how something like the neuroprosthetic baroreflex could help restore blood pressure functioning for people around the world. While this has yet to be applied in practice, Phillips' work takes us one step closer to getting there.

Article written by Leanne Cherry

Illustrated by Heather Ng-Cornish

This article has been reviewed by Dr. Aaron Phillips and colleagues for accuracy and accessibility.

MEET THE SCIENTIST: Dr. Aaron Phillips

Aaron Phillips is a professor at the University of Calgary whose research focuses on restoring cardiovascular function after spinal cord injury. His interdisciplinary work combines neuroscience, cardiovascular physiology, bioengineering and clinical research. Phillips and his team identified regions of the spinal cord involved in blood pressure control, helping reveal how spinal cord injury can disrupt the body's ability to maintain stable blood pressure. Building on these discoveries, he has developed a "neuroprosthetic baroreflex," which uses targeted spinal cord stimulation to help restore blood pressure control. His research is advancing new approaches to treating autonomic dysfunction and improving health and rehabilitation for people living with spinal cord injury.



YOUTH ACCESSIBILITY REVIEW

This article was reviewed by high school students through the Canadian Association for Girls in Science (CAGIS)—Canada's largest and longest-running STEM (science, technology, trades, engineering, and math) club for girls and gender-diverse youth aged 7-17. This award-winning club, founded in 1992, supports interest in STEM with virtual programming and local clubs that visit labs, workshops, and field sites to meet mentors and do fun, hands-on activities. Their thoughtful feedback on clarity, accessibility, and reader engagement helped shape the final version of this article and ensure it is engaging and accessible for youth readers.



Rhythm Sehgal • Grade 7

"I hope to study Health Science and Genomics to make new discoveries in healthcare."



Rose Isakson • Grade 8

"I hope to study biology, particularly animal behaviour."



Celine C.A. Chen • Grade 9

"I hope to study biomedical informatics and enjoy learning about how technology can improve healthcare."



Hargun Kaur • Grade 9

"I'm interested in environmental science and how STEM can help create a more sustainable future."

GAIRDNER CONNECTS

Gairdner Connects brings award-winning scientists to communities across Canada to engage, inspire, and spark dialogue. In doing so, it fosters meaningful connections between Gairdner Award winners and the next generation of researchers. **Through interactive events, classroom visits, community discussions, and digital resources, we inspire future innovators and spark dialogue about the role of science in addressing global health challenges.**

This article, developed in partnership with the **Canadian Association for Girls in Science (CAGIS)**, is part of the Gairdner Foundation's student outreach program to bring science to communities across Canada.

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