

Progress in **RESEARCH**

Spring 2024

Each year, spinal cord injury (SCI) strikes nearly 18,000 Americans. Many of these individuals instantly lose their mobility, their livelihoods, and grapple with their identity. Since its inception in 1982, the Christopher & Dana Reeve Foundation has served as a lifeline for this community.

When the Foundation was established, scientists believed devising effective treatments for SCI was impossible. But the Reeve Foundation's staunch refusal to accept that injuries could not be treated fueled an ambitious mission to redefine the future for people living with SCI — and today, the field is brimming with promise.



Today, the Reeve Foundation is accelerating progress with a focus on three key pillars that it believes are essential for advancing cures:

- 1. Catalyze:** The Reeve Foundation is committed to supporting and engaging support for innovative, high-risk, high-reward research initiatives, including preclinical and proof-of-concept clinical trials. For example, funding innovative approaches to address neurogenic bladder and improve quality of life.
- 2. Energize:** One of the Reeve Foundation's top priorities is increasing collaboration within the SCI community to advance the field. This past summer, the Foundation co-hosted the first annual SCI Investor Symposium with Lineage Cell Therapeutics, a first-of-its-kind convening that brought together industry, academia, and individuals living with SCI to discuss the most promising advances in the field. The 2024 symposium is slated for June.
- 3. Educate:** We strive to create an open data culture that enables scientists to evaluate and replicate other investigators' findings, which in turn act as a springboard for developing novel research questions. For example, to pave the way for open data-sharing protocols, the Foundation provided the University of Alberta with a grant to hire a data retrieval specialist who will format SCI research data for easy access and provide specialized training to interested institutions.

As part of these and other Foundation-funded projects and grants, labs around the world are pursuing myriad treatments to restore function and improve the health of people living with paralysis —but there's still much work to do. One of the Reeve Foundation's highest priorities is to fund translational projects and bring together academia and industry to develop targeted treatments and therapeutics that improve health and well-being.

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In the first quarter of 2024, we announced three new grants that are supporting clinical trials and research tools aimed at accelerating the therapeutic development of SCI treatments. These projects include trials focused on: bladder dysfunction; advancing novel brain-spine interface (BSI) technology, which has been shown to enable thought to control movement; and a preclinical study on innovative techniques and technologies to provide standardized lab research resources that do not currently exist.

As we look to the future, the Reeve Foundation will continue to forge powerful partnerships and make strategic investments to address the gaps that stand in the way of progress. Our every endeavor aims to improve our understanding of what the SCI community needs and how we can work together to make a difference in the lives of people living with SCI today, not just years down the line.

I am honored to lead the Reeve Foundation's Research Program during an era of unprecedented discovery in SCI research. Our research initiatives offer great promise for not only improving mobility among SCI patients, but also for addressing important quality of life measures. We look forward to establishing new partnerships that will propel us even further ahead.

To continue our mission and build on the momentum of the moment, we need your support. If you have the means to donate to the Reeve Foundation again, or for the first time, we would be honored to partner with you to make the impossible, possible.

Marco Baptista, Ph.D.
Chief Scientific Officer

SCIENTIFIC ADVISORY BOARD SPOTLIGHT: ONA BLOOM, PH.D.

Ona Bloom, Ph.D., didn't set out to study spinal cord injury. She wasn't even leaning toward a degree in science. But while pursuing a History degree at Barnard College, Dr. Bloom discovered a passion for biology when she took a prerequisite science course.

"I lacked confidence, and I knew nothing about how to keep a lab notebook or run experiments, but I had a fabulous professor who really sparked my interest in biology," Dr. Bloom says. "And Barnard provided tremendous infrastructure to support and encourage women entering science."

Bloom earned a Ph.D. in neuroscience at Rockefeller University under the mentorship of Paul Greengard, Ph.D., a Nobel Laureate in Physiology or Medicine in the year 2000, where she studied the molecular structure of synapses, the points of communication between nerve cells.



Now the director of the Laboratory of Spinal Cord Injury Research and a professor at the Feinstein Institutes for Medical Research and the Zucker School of Medicine at Hofstra Northwell, Dr. Bloom is advancing the field of SCI by focusing on the immune system.

Investigating the Lamprey

During her first year of graduate school, Dr. Bloom learned that an ancient animal, the lamprey, had gigantic synapses in their spinal cords. “I read that lamprey spontaneously regenerate their spinal cords after a complete transection — something that mammals haven’t figured out how to do,” she says.

Intrigued, Dr. Bloom tucked that information in the back of her mind. A few years later, she went on to pursue a postdoc in immunology in the lab of Dr. Ira Mellman, then at the Yale University School of Medicine, where she investigated the concept of an “immunological synapse,” analogous to a neuronal synapse. Just as neurons send signals to one another that trigger a response, immune cells also have the ability to share information to achieve a certain end goal.

Dr. Bloom set out to understand how immune cells communicate with each other and where that messaging takes place. She attended a lecture by the preeminent immunologist, Dr. Max Cooper, now a professor at Emory University, where she learned he was using the lamprey to study the origin of the vertebrate immune system.

“I thought, wow, these animals have this ability to regenerate and yet they have the fundamentals of a vertebrate immune system,” she says. “That stuck with me because we know that the body’s natural inflammatory response after a spinal cord injury can be deleterious to healing in mammals.”

Understanding the Immunological Consequences of SCI

When Dr. Bloom started her own lab at the Feinstein Institute, she was surrounded by leading specialists in immunology, neuroscience, spinal cord injury and trauma. “It was an ideal place to think about how I can use my background in neuroscience and immunology to contribute to the field of spinal cord injury,” says Dr. Bloom. And she began by studying the lamprey to learn more about regeneration.

Over time, Dr. Bloom built collaborations with her clinical colleagues and began doing studies of inflammation and the immune system in individuals with either acute or chronic SCI. The reason: It has become increasingly apparent that there are severe immunological consequences for people with SCI.

“Infections are a leading cause of death and rehospitalization for people with SCI,” Dr. Bloom says. “And when people with SCI develop an infection, it not only impacts their health, but it also impacts their ability to participate in rehab and regain functional mobility.” There’s evidence to suggest that chronic inflammation inhibits plasticity and promotes medical consequences, like cardiovascular disease and stroke.

“Our goal is to understand what’s different about the immune system after an injury and determine how we might be able to modify the immune system to improve functional abilities, life expectancy, and quality of life,” Dr. Bloom says.

Looking Toward the Future for People with SCI

Over the last two to three decades, there has been a huge shift in how researchers view SCI. While scientists used to believe improving function of the injured mammalian nervous system was an impossibility, they now have data that mammals have plasticity in the nervous system.

“We now know that new neurons can be born in the adult brain; that connections remain plastic,” Dr. Bloom says. “And that has encouraged investigators to pursue research projects such as neuromodulation strategies to stimulate the nervous system. In current clinical trials, when coupled with rehabilitation, those technologies are showing promising results.

Dr. Bloom notes that there’s also clinical trials being performed with newer types of assistive devices, such as exoskeletons (mechanical “suits” designed to support and move the body), that may be useful for some people in specific settings. But perhaps the most exciting advancement for Dr. Bloom is the exploration of combinations of new therapies that promote regeneration, plasticity and physical recovery.

“There’s not going to be a single solution for all people with SCI,” Dr. Bloom says. “But we’re coming to a realization that trying a variety of strategies, either alone or in combination, may help produce meaningful improvements for people with SCI — and not just in the acute phase of injury, but we also hope for people who have been living with chronic SCI for decades.” ◦

YOUR SUPPORT ADVANCES CRITICAL SCI SCIENCE

Your donation today will help advance critical SCI research in 2024. The Reeve Foundation is currently fundraising to support studies that will:

- Determine the safety of epidural stimulation placement to control voiding and storage of the bladder in chronic, incomplete SCI individuals. This important work also strategically helps “de-risk” this area of study by establishing baseline, proof-of-concept data that aims to demonstrate to other funders that this research is primed for later-stage, translational research.
- Leverage a brain-spinal interface that translates thoughts into upper extremity

movement via epidural stimulation. This clinical trial will help advance epidural stimulation research so that movement can be triggered in a more natural way.

- Optimize and establish standardized SCI preclinical models with consistent study outcome measures, a prerequisite to engaging more and larger researcher organizations and investors in SCI science.

To learn more about these and other opportunities to support our mission of curing spinal cord injury through innovative research, please contact Robynne Dinkelaker at rdinkelaker@reeve.org. ◦

VIEW TALKS FROM THE INAUGURAL SPINAL CORD INJURY INVESTOR SYMPOSIUM

This past June, the Reeve Foundation and Lineage Cell Therapeutics, Inc., a clinical-stage biotechnology company developing allogeneic cell therapies for unmet medical needs, joined together to co-host the inaugural Spinal Cord Injury Investor Symposium (“SCIIS”). This first-of-its-kind forum brought together healthcare companies, thought leaders, policymakers and individuals impacted by paralysis to shine a light on recent innovations, advancements, and challenges in the treatment of spinal cord injury—for the shared purpose of accelerating new therapies.



View the talks here: www.scisymposium.com/2023-playback/

Learn more about Lineage’s work developing OPC1, an investigational cell transplant, for the treatment of SCI at: <https://blog.christopherreeve.org/en/pioneering-cell-transplants-for-the-treatment-of-sci>

Subscribe to the Reeve Foundation’s emails and follow our social media channels for updates about the **second annual Spinal Cord Injury Investor Symposium**, which will be held at the Sanford Consortium for Regenerative Medicine, Roth Auditorium in La Jolla, California, on **June 26 & 27, 2024**. ◦

PROMISING SPINAL CORD INJURY RESEARCH AT SHIRLEY RYAN ABILITYLAB

During marathon weekend in Chicago this past October, and in celebration of inclusivity and accessibility, we visited the Shirley Ryan Ability-Lab with our Team Reeve marathon athletes and partners at Peloton for an inside peek at promising research underway. This special tour underscores our commitment to helping unite academia, industry and the community in new ways so that, together, we can accelerate the discovery and development of promising treatments.

Mending the Connection Between Brain & Spinal Cord after a Spinal Cord Injury (SCI)

[Monica Perez PT, Ph.D.](#) is leading research at [Shirley Ryan AbilityLab](#) that has demonstrated that noninvasive neurostimulation treatment targeting synaptic connections in the spinal cord both improves and preserves physical therapy functional improvements in patients with SCI — temporarily mending the broken connection between the brain and spinal cord.

Although combining neurostimulation with targeted physical therapy is not new, the way in which [Dr. Perez's](#) team approaches it is unique. Historically, neurostimulation has been used to alleviate neuropathic pain and other problems faced by patients with SCI. Now, for the first time, this protocol is being used to restore function and, importantly, maximize clinical outcomes. By employing precisely targeted and timed neurostimulation, Dr. Perez is helping to re-ignite the damaged communication links between the brain and the body.

Now, Dr. Perez and her team are introducing pharmacologic interventions as well. Learn more about [Dr. Perez's Neuromodulation & Motor Control Lab](#).

Speeding Technological Discoveries & Fueling Innovations

Shirley Ryan AbilityLab's Technology & Innovation Hub (tiHUB) is a unique, one-stop-shop for industry and academic groups developing next-generation rehabilitation technologies. Here, experts offer partners everything from product evaluation, clinical trial implementation, support in achieving regulatory clearance and Medicare and Medicaid reimbursement to product commercialization. The center's partners benefit from wide-ranging expertise and nimble approach, which greatly accelerates their ability to make rapid decisions. Meanwhile, the advantage for Shirley Ryan AbilityLab patients is clear: as tiHUB helps game-changing technologies get to market faster, patients gain access to those technologies years — even decades — sooner than otherwise possible.

[Arun Jayaraman PT, Ph.D.](#), tiHUB Executive Director, directs a diverse mix of 45 clinicians, researchers and technologists. For each project, Dr. Jayaraman curates a specialized group of functional experts from across Shirley Ryan AbilityLab, including clinicians, scientists, engineers and others — forming rosters larger than the rehabilitation research divisions of most universities, hospitals and industry partners. Then, tapping into Shirley Ryan AbilityLab's massive database of diverse and willing research subjects, Dr. Jayaraman's team can study technology at a speed otherwise impossible — often, in just a few months, as opposed to the several years it would take elsewhere.

Learn more [about Dr. Jayaraman](#).

Using Biologics to Aid in SCI Recovery

[Martin Oudega Ph.D.](#) designs clinically relevant translatable strategies to promote neural tissue repair and functional recovery after SCI.

Dr. Oudega's main focus at Shirley Ryan AbilityLab is on using transplantation of repair-supporting cells such as bone marrow stromal cells or

Schwann cells, and biomaterials alone or in combination. He explores the strategies in sub-acute and chronic SCI. In addition, Dr. Oudega's lab combines transplantation with minimally invasive modulation approaches to further maximize tissue repair and functional recovery.

Learn more [about Dr. Oudega.](#) ◦

TEAM REEVE & ALL STARS

Our Team Reeve marathon and All Stars fundraising programs are a hallmark of the Reeve Foundation community. In 2023, New York City marathoners raised \$750,000 and Chicago marathoners raised \$140,000. We also marked a record with more than 85 athletes in New York City and 40 athletes participating in Chicago, our largest teams ever for these world majors. Our Team Reeve All Stars, who create their own fundraisers to support the Foundation's work to advance innovative spinal cord injury research, raised \$126,080 in 2023. Together, these programs raised over \$1 million last year. In 2024, we hope to grow these programs through an

increased allotment of Chicago and New York City bibs.

To join Team Reeve, visit ChristopherReeve.org/teamreeve.

You can join [Team Reeve All Stars](#) by creating your own fundraising event. Choose your activity, set up a fundraising webpage and spread the word! You can participate in an endurance event, plan a bake sale, do a corporate challenge, and do so much more. Recruit teammates to help you reach your goal, or ask everyone to support your efforts by donating, it's up to YOU! ◦

IMPLANTABLE BRAIN-COMPUTER INTERFACE COLLABORATIVE COMMUNITY (IBCI-CC) TO DRIVE INNOVATION IN NEUROTECHNOLOGY

The newly established [Implantable Brain-Computer Interface Collaborative Community](#) (iBCI-CC) is the first Collaborative Community in the clinical neurosciences that has participation from the U.S. Food and Drug Administration (FDA). Cristin Welle, Ph.D., Associate Professor of Neurosurgery at the University of Colorado and a member of the Reeve Foundation's Scientific Advisory Board, joins as a member of the iBCI-CC representing the Foundation.

The iBCI-CC is a groundbreaking initiative aimed at fostering collaboration among diverse stakeholders to accelerate the development,

safety and accessibility of iBCI technologies. The iBCI-CC brings together researchers, clinicians, medical device manufacturers, patient advocacy groups and individuals with lived experience of neurological conditions. This collaborative effort aims to propel the field of iBCIs forward by employing harmonized approaches that drive continuous innovation and ensure equitable access to these transformative technologies.

The iBCI-CC will hold regular meetings open both to its members and the public to ensure inclusivity and transparency. Learn more at: www.ibci-cc.org. ◦