ReWIRE Newsletter

Technology-driven combinatorial therapy to rewire the spinal cord after injury.

Welcome to the ReWIRE Newsletter!

We are excited to introduce you to the ReWIRE project, a groundbreaking initiative aimed at training the next generation of scientists to create therapies for patients with paralysis caused by spinal cord injury (SCI). Our mission is to translate cutting-edge combinatorial SCI therapies from the laboratory to the bedside, improving the quality of life for patients and reducing the societal burden associated with SCI.

SCI is a devastating condition that affects millions of people worldwide, leading to partial or complete loss of motor and sensory functions. The ReWIRE project recognizes the need for innovative approaches to address this challenge and bridge the gap in traditional education programs. By fostering research and development competence in the field of medical products and therapies focused on SCI, we aim to make a significant impact on the lives of individuals affected by paralysis.

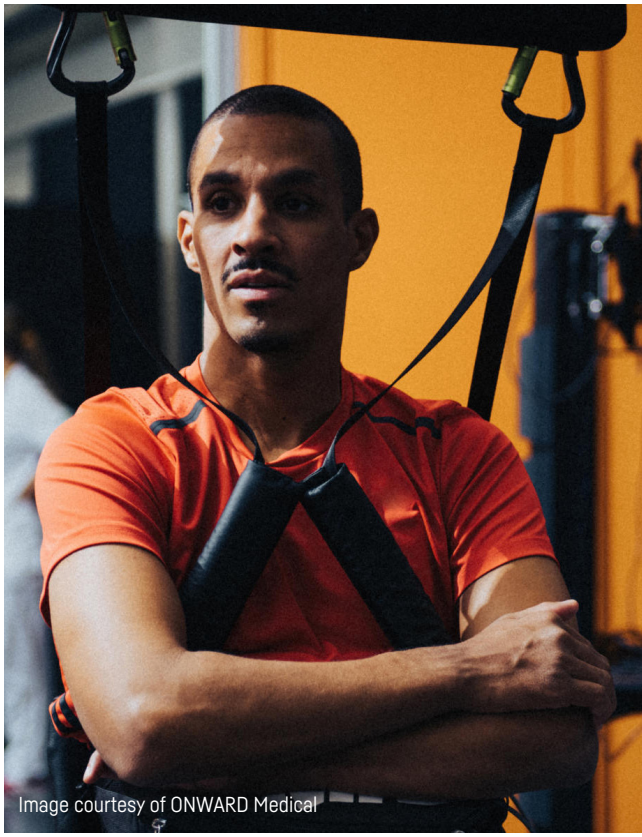
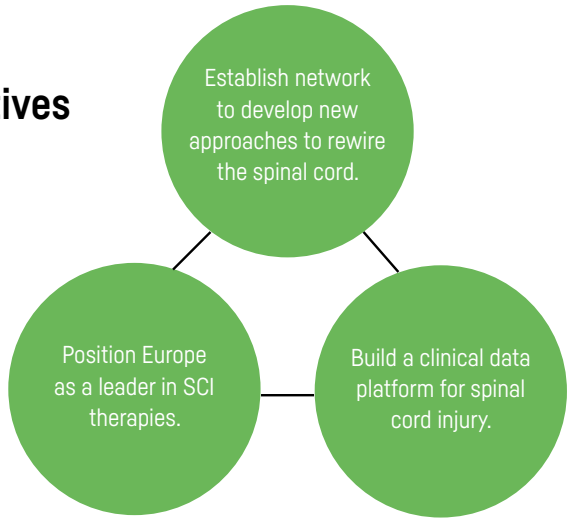


Image courtesy of ONWARD Medical

Recent technological breakthroughs have revolutionized our understanding of SCI therapies, enabling us to develop novel drug delivery systems, biomaterial bridges, and neuromodulation techniques. These advancements facilitate reduced secondary injury, nerve fiber regeneration, functional reconnection, and the restoration of voluntary control over walking.

ReWIRE will leverage these exciting developments through multiple PhD projects that will interact and collaborate, working towards effective combinatorial treatments for SCI.

Three objectives of ReWIRE:



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Introducing the PhD Students!

Tristan Tarasi recently joined ONWARD to take part of the ReWIRE program. Epidural electrical stimulation (EES) is a promising technique used to help restore movement and function in individuals with SCI. The main goal of his project is to develop solutions to enhance rehabilitation with EES. His thesis will be focused on two axes. The first one will involve the development of sensors and real-time algorithms for motion intention recognition in combination with personalized EES. The second axis will focus on investigating state-of-the-art orthoses and their potential to improve mobility in conjunction with EES.

Maria Justino is a PhD student at Clinatec and the main objectives of her program are to establish novel algorithms of intended movement decoding from epidural cortical (brain) recording to provide corresponding stimulation patterns to central or periphery nervous system aiming at recovering motor control after spinal cord injury in humans. She looks forward to expanding her competencies in designing appropriate acquisition systems, acquiring and processing data, establishing new datasets, data imaging and visualization, and developing interpretable and accurate machine learning models.

Miklovana Tuci was born in Albania and obtained her MSc in Machine Learning at KTH Royal Institute of Technology, Sweden. Her master's thesis focused on Representation Learning and Manifold Learning. In June 2023, she joined the Biomedical Data Science Lab at ETH Zurich as a PhD student, under the supervision of Prof. Catherine Jutzeler, and will work at the Balgrist research campus, under the co-supervision of PD Dr. Marco Bolliger. She will focus on applying machine learning techniques to counsel preclinical research and to advance translational trial protocols in human spinal cord injury.

Simay Genişcan is from Turkey, Izmir, and completed her Master's degree in Neuroscience in Ajou University, South Korea. She is working in the lab of Prof. Elizabeth Bradbury at King's College. With a focus in spinal cord repair, she has been utilizing different approaches to regenerate damaged spinal cord, including cell and organoid transplantation, biomaterial injection, and modulation of inhibitory spinal cord ECM environment with therapeutic drugs. Her thesis project is on an in vitro scar model with primary fibroblasts and astrocytes and screened drugs that can modulate fibrosis.

Navami Prabhakar Koyande was born in Mumbai, India and obtained her MSc degree in Biotechnology from University of Mumbai. She will start working as a PhD student at Biosynth, Lelystad under the supervision of Prof. Dr. Peter Timmerman (Biosynth) and Prof. Dr.-Ing. Laura De Laporte (RWTH Aachen University). She will work on developing high-affinity CLIPSTM peptides that mimic functions of cell adhesive proteins, like laminins, to support in vitro and in vivo cell and nerve attachment and migration.

Yayue Song is from Beijing, China, and studied medicine in China. She completed her MSc degree in Translational Neuroscience at Imperial College London, under the guidance of Professor Simone Di Giovanni. Yayue is undertaking a PhD project at Imperial College London under the supervision of Professor Simone Di Giovanni, with a focus on investigating the molecular mechanisms that promote regeneration and repair following spinal cord injuries. Within the consortium, she aims to combine the molecular stimulation of neuronal regeneration with biomaterials or other combinatorial approaches to enhance the repair potential after spinal injury.

Alessandro Ippoliti was born in Milan and studied at the Politecnico di Milano where he obtained a Bachelor's degree in Engineering Physics and a Master's in Biomedical Engineering. His thesis was conducted at the "Institut de Ciències Fotòniques" (ICFO) in Barcellona under Dr. Turgut Durduran. In May, he began in the ReWIRE program at TUHH under the supervision of Prof. Kim Trieu, with a focus on looking to build fully biocompatible and biodegradable spinal implants out of hydrogels through a stereolithographic technique called "two photon polymerization" (2PP). This is done with the scope of promoting spinal cord regeneration after traumatic injuries.

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