

# 1<sup>st</sup> Workshop on Active Implantable Medical Devices

## 'Trends and challenges in bioelectronic medicine'

# LASCAS 2024

An IEEE CASS Flagship Conference

February 27 - March 1, 2024

Punta del Este, Uruguay

[ieee-lascas.org](http://ieee-lascas.org)

15th IEEE LATIN AMERICAN SYMPOSIUM ON CIRCUITS AND SYSTEMS

The **IEEE LASCAS 2024** will feature a CASS Satellite Workshop dedicated to **Active Implantable Medical Devices (AIMDs)**. This specialized workshop aspires to assemble prominent figures from both **industry and academia**, fostering a comprehensive dialogue and exchange on the latest advancements, emerging trends, and prevailing challenges within the AIMDs field.

Uruguay boasts a rich heritage of industrial and academic pursuits in the field of Active Implantable Medical Devices (AIMDs), dating back to the 1960s with the innovation of the first long-term use pacemakers. This workshop seeks to capitalize on this local expertise, offering the CASS community a high-profile, global forum to discuss the current state of the art and emerging trends in a field that has consistently led the way in electronic technology innovation.

The program includes **Tutorials** and **Keynotes** by industry experts, along with a **Panel discussion** to synthesize the perspectives of both industry and academia. Attendees will also have access to **industry stands** and selected **posters** during the event. In addition, the main LASCAS program features Keynotes on AIMD-related subjects and a Special Session devoted to **AIMD research papers**.

Refer to the next pages for the program and last page for the Call for Abstracts.

### Venue:

Jean Clevers Parque Hotel ([jeanclervers.com](http://jeanclervers.com))  
Budapest y Villa Princesa, Bulevar Artigas, Parada 7  
Punta del Este, Uruguay  
Hotel contact: +598 4249 3494  
[contactenos@jeanclervers.com](mailto:contactenos@jeanclervers.com)

### AIMD Workshop organization committee:

Dr. Nicolas Barabino ([nbarabino@ieee.org](mailto:nbarabino@ieee.org)),  
Dr. Fernando Silveira ([silveira@fing.edu.uy](mailto:silveira@fing.edu.uy))

### Registration:

<https://ieee-lascas.org/#registration>



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**Workshop Program – Friday March 1**

9:00 AM - 10:00 AM	LASCAS/AIMD Keynote: <b>Rikky Muller (UC Berkeley)</b> – ‘Putting the Doctor in the Device – Intelligent Closed-loop Neural Therapeutics’
10:00 AM - 10:30 AM	30’ Refreshment Break
10:30 AM - 11:30 AM	AIMD Presentation: <b>Pedro Arzuaga (Impulse Dynamics) and AIMD-UY</b> – ‘50 years of AIMD development in Uruguay and presentation of the Uruguayan AIMD Industry Cluster’
11:30 AM - 12:00 PM	AIMD Presentation – <b>Marcelo Barú (Biotronik)</b> – ‘Spinal Cord Stimulation for Pain Management: A Chronicle of Evolution and Innovation’
12:00 PM - 2:00 PM	120’ Lunch Break at Industry Exhibit Hall and Poster Session
2:00 PM - 3:00 PM	LASCAS/AIMD Keynote – <b>David Prutchi (Impulse Dynamics)</b> – ‘AIMD-based Therapies of Heart Failure’
3:00 PM - 3:30 PM	30’ Refreshment Break
3:30 PM - 4:15 PM	AIMD Presentation – <b>Federico De Mula (Integer)</b> – ‘Trends in Active Implantable Medical Devices’
4:15 PM - 5:00 PM	AIMD Presentation – <b>Victor Pikov (Medipace)</b> – ‘Open-source AIMDs drive clinical adoption of bioelectronic medicine’
5:00 PM - 5:15 PM	15’ Refreshment Break
5:15 PM - 6:30 PM	AIMD Discussion Panel – <b>Moderator: Nicolás Barabino (Focus, Ad Corpus MedTech)</b> – ‘Bridging the Gap Between the AIMD Industry and the Academia’
6:30 PM - 7:00 PM	Closure and networking

**Registration:** <https://ieee-lascas.org/#registration>



## AIMD Presentations and Keynotes (1/6)

Rikky Muller

### *Putting the Doctor in the Device - Intelligent Closed-loop Neural Therapeutics*



**Abstract:** Neural interface technologies stand to revolutionize disease care for patients with neurological conditions and in the future, the human experience. Unifying recording and stimulation technologies with on-device machine learning in a small form factor will enable, intelligent, autonomous devices that can monitor, learn, diagnose, and treat disease. This talk will explore the evolution of neural therapeutic technologies and the advances that are enabling miniaturized devices to be implanted into our bodies and to think like doctors, providing continuous care.

**Bio:** Rikky Muller, PhD is an Associate Professor of Electrical Engineering and Computer Sciences (EECS) at the University of California, Berkeley where she holds the S. Shankar Sastry Professorship in Emerging Technologies, and is a Co-director of the Berkeley Wireless Research Center (BWRC). She received her BS and MS degrees from MIT and her PhD from UC Berkeley all in EECS, and was a McKenzie Fellow and Lecturer of EE at the University of Melbourne in Australia. She is the Co-founder of MZR Neurotech and Cortera Neurotechnologies, a medical device company that was acquired in 2019. Prior to her PhD she was an integrated circuit designer at Analog Devices. Dr. Muller was named one of MIT Technology Review's top 35 global innovators under the age of 35 (TR35), and one of MedTech Boston's top 40 healthcare innovators Under 40.

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## AIMD Presentations and Keynotes (2/6)

Pedro Arzuaga

*50 years of AIMD Development in Uruguay and presentation of the Uruguayan AIMD Industry Cluster*



**Abstract:** In contrast with the majority of the electronics industry in Uruguay, which is relatively underdeveloped, there is a field in which Uruguay is surprised for its development considering its small population: Active Implantable Medical Devices (AIMDs). The design and manufacture of AIMDs in Uruguay started in the early 70s and has grown steadily ever since. This talk will delve into the reasons for this engineering design area's development in Uruguay from its origin to the present, including the author's prospect for its future.

**Bio:** Pedro Arzuaga was born in Montevideo in 1965. He is an Electronic Engineer who graduated from the Universidad de la República del Uruguay with more than 30 years of experience in active implantable medical device development. Pedro worked in CCC del Uruguay from 1989 to 2015, where he was its Engineer Manager for ten years. He joined Impulse Dynamics in 2021 as Director of Impulse Dynamics Montevideo.

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## AIMD Presentations and Keynotes (3/6)

Marcelo Barú

### *Spinal Cord Stimulation for Pain Management: A Chronicle of Evolution and Innovation*



**Abstract:** This talk will chronicle the captivating journey of Spinal Cord Stimulation (SCS) from its historical inception to the cutting-edge 3<sup>rd</sup>-generation waveform systems with automatic remote monitoring/programming capabilities. We delve into the advancements of each generation, from 2<sup>nd</sup> gen's sub-perception Burst and High-frequency options to 3<sup>rd</sup> gen's sub-perception therapies, such as Biotronik Neuro's Resonance, also covering closed-loop approaches and ultra-low-frequency stimulation. Finally, we peer into the future, unveiling possibilities of SCS beyond pain management and discussing AI integration for personalized therapy management.

**Bio:** Marcelo is Member of Technical Staff at Biotronik Neuro. During the last decade he led the HW Architecture and System Engineering of Prospera, Biotronik Neuro's first implantable Spinal Cord Stimulator (SCS) introduced in the market in April 2023. Mr. Barú is also the principal inventor of the Resonance SCS sub-perception therapy run by the Prospera system. He has almost 30 years of experience conceiving and designing AIMDs with focus on neuromodulation/CRM. He has over 34 patents filed with more than half of them granted. He holds an Electrical Engineering degree from Universidad de la República, Uruguay, and a M.A.Sc. degree from Simon Fraser University, Canada.

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## AIMD Presentations and Keynotes (4/6)

David Prutchi

### *AIMD-based Therapies of Heart Failure*



**Abstract:** Heart failure, which affects an estimated 64 million people worldwide, is a condition in which the heart weakens to the point that it cannot pump sufficient oxygen-rich blood to meet the body's needs. Today, most heart failure patients are prescribed medications intended to slow the progression of the disease and manage their symptoms, but which provide limited or no improvement to the heart's pumping ability. This talk will describe new implantable device-based therapies that have emerged to address the heart's insufficient capacity, and which are demonstrating significant improvements in quality of life, and even reversion in the disease state.

**Bio:** David Prutchi received the Ph.D. in Biomedical Engineering from Tel-Aviv University. He conducted post-doctoral research at Washington University in St. Louis, after which he worked at Sulzer-Intermedics developing the company's next-generation cardiac pacing platform. In 1998 he joined Impulse Dynamics, to lead the development of active implantable devices for the treatment of heart failure through cardiac contractility modulation. He is currently Impulse Dynamics' Chief Technology Officer and Executive Vice-President.

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## AIMD Presentations and Keynotes (5/6)

Federico De Mula

### *Trends in Active Implantable Medical Devices*



**Abstract:** The accelerated advance in technology opens a huge area of opportunity for the development of new active implantable medical applications. Similarly to the early days of the invention of the pacemaker, small and reliable technology can be a key enabler to turn ideas in the medical space into a reality that is available for patients at a reasonable cost. We will present a perspective of the trends that we are observing in the medical industry, and share some of the recent developments that we pursuing in anticipation for customer needs in the upcoming years.

**Bio:** Federico de Mula is an Electronic Engineer from Universidad de la República. During the last 23 years, as part of CCC del Uruguay and Integer, Federico has participated in the design of a wide variety of active implantable medical systems for medical companies all across the globe. He led the Electronics Design team of CCC / Integer for 10 years, between 2005 and 2015, and has served as director of Product Development for Uruguay from 2015 until today. The engineering team lead by Federico has been responsible for the development of more than 60 implantable systems, and is currently developing more than 10 new applications to implement novel treatments for chronic pain, sleep apnea, heart failure, epilepsy and depression, among others.

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## AIMD Presentations and Keynotes (6/6)

**Victor Pikov**

### *Open-source AIMDs drive clinical adoption of bioelectronic medicine*



**Abstract:** In 2022, the NIH's SPARC program launched their new Human Open Research Neural Engineering Technologies (HORNET) Initiative, aimed at bridging the technology push and the market pull to tackle the "valley of death" obstacle by funding development of clinical-grade AIMDs. One of the programs funded by this initiative is the CARSS AIMD, which is focused on VNS and SNS by developing an IPG and an assortment of implantable stimulation leads. Such AIMDs could be rapidly applied toward a wide range of clinical applications.

**Bio:** Victor is a CEO at Medipace Inc, and a Vice President of Product Development at Transtimulation Research Inc. Victor previously worked at Galvani Bioelectronics and GSK, where he oversaw development and testing of implantable pulse generators and stimulation electrodes for several clinical applications, including auto-immune and metabolic diseases. At the Huntington Medical Research Institutes, Victor developed neural electrodes for various chronic diseases, such as obesity, infertility, bladder paralysis and spasticity, hearing and vision loss, tinnitus, and obstructive sleep apnea. Victor has an issued patent for RF-based non-invasive glucose measurement and several patent applications for neural electrode technologies and neuromodulation therapies.

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LASCAS AIMD related activities during previous days  
- needs separate registration (1/2)

Tuesday 27  
4:00 PM

Santiago Martinez

*Tutorial: Trends in implantable neurostimulators*



**Abstract:** This tutorial presents a comprehensive review of state-of-the-art, commercially available neurostimulators. The fundamentals of implantable neurostimulators will be introduced, followed by the identification of trends in device size, electrode number, battery technology (i.e., primary and secondary, and chemistry), power consumption and longevity. This information will be analyzed to show the course of design decisions adopted by industry and to identify opportunities for further innovation. Fundamental limits in power consumption, longevity and size as well as the interdependencies and trade-offs between them will be presented.

**Bio:** Santiago is currently Assistant Professor at the Electrical Engineering Department of the School of Engineering of Universidad de la República, Uruguay, activity in which he is involved part-time since 2011. He is also a Senior Engineer at the R&D department of Integer Holdings Corporation (CRM and Neuromodulation), since 2012. In the last decade, he has been involved in design, risk analysis and design verification activities for 15 implantable class III devices.

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## LASCAS AIMD related activities during previous days – needs separate registration (2/2)

Thursday 29  
2:00 PM

Jan Rabaey

### *When technology meets biology – focus: brain*



**Abstract:** The invention and subsequent explosive growth of semiconductor integrated circuits have had a tremendous impact on human society. Yet, when we reflect on that evolution, it is mostly the advance in computational complexity that comes to mind. Extreme miniaturization, heterogeneous interfaces, innovative communication and advanced packaging have opened the door for a whole new class of medical devices that directly interact with the living tissue made of biological cells. This intimate interaction between biology and technology enables functionality that is just in its infancy, but already is changing the way medical care is administered. In this presentation, we will discuss the aforementioned evolutions in detail, with a special focus on the brain – as this is the least understood part of the human body and also the source of many diseases that greatly affect humanity.

**Bio:** Jan is a Professor in the Graduate School in the EECS Department the University of California at Berkeley, after being the holder of the Donald O. Pederson Distinguished Professorship at the same institute for over 30 years. He is a founding director of the Berkeley Wireless Research Center (BWRC) and the Berkeley Ubiquitous SwarmLab, and has served as the Electrical Engineering Division Chair at Berkeley twice. In 2019, he also became the CTO of the System-Technology Co-Optimization (STCO) Division of IMEC, Belgium. Prof. Rabaey has made high-impact contributions to a number of fields, including low power integrated circuits, advanced wireless systems, mobile devices, sensor networks, and ubiquitous computing. His current interests include the conception of the next-generation distributed systems, as well as the exploration of the interaction between the cyber and the biological worlds. He is the recipient of numerous awards among which the 2009 EDAA lifetime achievement award, is a Life Fellow of the IEEE, and has been involved in a broad variety of start-up ventures.

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## Call for Abstracts – AIMD Poster Session

We invite researchers, practitioners, students and innovators from academia and industry to submit abstracts for poster presentations that encapsulate novel research findings, technological advancements, and insightful analyses within the AIMD domain. This session is a unique opportunity to showcase your work to a global audience, engage with peers, and contribute to the discourse shaping the future of active implantable medical devices.

### Submission Guidelines

**Topics:** Submissions should align with AIMD themes, including but not limited to device innovation, circuit and mechanical design, software, system integration, regulatory landscapes, and clinical applications.

**Format:** Abstracts must be in English, structured with a clear objective, methodology, results, and conclusion, and not exceed 300 words.

**Submissions Reception:** Abstracts shall be sent by email to [nbarabino@ieee.org](mailto:nbarabino@ieee.org)

**Deadline:** Please submit your abstracts by February 19. Early submissions are encouraged.

**Review Process:** Each abstract will undergo a rigorous review by our panel of experts, with selections made based on relevance, originality, and potential for impact in the field. Notification of acceptance will be communicated by February 21.

**Presentation Details:** Accepted abstracts will be presented as posters during the dedicated session of the workshop. Further instructions regarding poster format and presentation guidelines will be provided upon acceptance.

#### AIMD Workshop Poster Session co-chairs:

Dr. Nicolas Barabino ([nbarabino@ieee.org](mailto:nbarabino@ieee.org)),

Dr. Victor Pikov ([pikov@medipaceinc.com](mailto:pikov@medipaceinc.com))

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