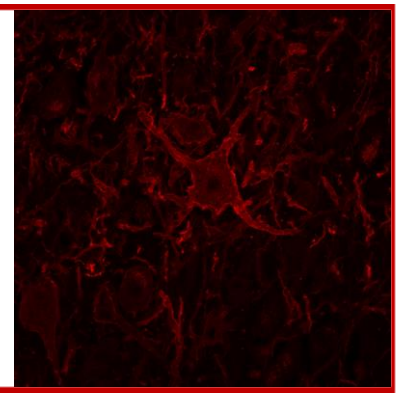
The Autonomic Connection

International Society of Autonomic Neuroscience Newsletter.

March 2025
Vol 1, Issue 1



Welcome to the first issue of 'The Autonomic Connection', where we aim to help build and strengthen our autonomic community. Each issue will showcase an opinion piece written by an expert in the autonomic field, updates from select regional exec reps, submitted data and figures from our autonomic community and much more. Any feedback, please email: isanautonomic@gmail.com

My favourite autonomic centre or pathway with:

Professor Emeritus Elspeth McLachlan FAA

University of New South Wales, Australia

I was involved in research and teaching on the autonomic nervous system for over 40 years but have been out of the game for a long time now. I still read about my old interests when they come up. One thing that continues to bug me is the ongoing misuse of the "fight or flight" response as defining how sympathetic nerves work.

The autonomic nervous system provides the pathways for neural control of all organs and tissues in the body. Activity in these efferent pathways is determined by peripheral, spinal and supraspinal reflexes and by signals arising in e.g. hypothalamus that are involved with the body's homeostasis. Further, during complex body behaviours, such as exercise or sex, and in response to feelings of fear and/or pleasure, etc. distinct patterns of recruitment lead to "appropriate" adjustments to support the body's actions.

The "fight or flight" response, as defined by Walter Cannon in 1915, was used during my undergraduate studies of Physiology in the early 1960s as a mnemonic for the actions of the sympathetic "system" on its different peripheral targets. So we learned that heart rate, blood pressure and blood flow to muscle increased and gut and motility decreased, to help cope with emergencies. Unfortunately, the way this "wisdom of the body" is still taught often leads to invented and erroneous explanations of how sympathetic nerves work, not only by students of Physiology but also members of the public. The notion also spread over time, particularly among clinicians, that the sympathetic system is active ONLY in stressful conditions. This view is still widespread. These were just a part of Cannon's many evidence-free opinions that set back knowledge of autonomic control several decades.

Notably, many sympathetic functions are hard to associate with the body's reactions to aid fight or flight. Consider some teleological examples: Pupillodilation lets more light into the eye which might be useful in the dark or in attracting a mate, but would not improve vision during attack or escape. Raising the hairs on your arm might help to retain heat but would not assist you in running away. Contractions of the vas deferens would not be very useful then either.

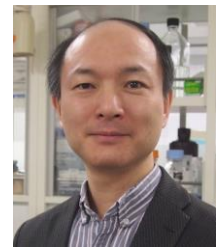
Another convoluted and confused example I can quote from a recent article in The Conversation:

"When a person becomes stressed or anxious, the body goes into fight-or-flight mode through the activation of the sympathetic nervous system. This triggers a cascade of physiological changes designed to prepare the body to face a perceived threat. As part of this response, the muscles surrounding the bladder may contract, leading to a more urgent and frequent need to pee." (cont. overleaf)

The reality is the opposite - sympathetic nerve activity relaxes the bladder and constricts the urinary sphincter. Indeed, teleologically, urine retention is probably quite useful when fleeing.

Modern research tools are enabling the anatomical and functional characteristics of the many distinct central autonomic pathways to be revealed. However, understanding of how the different functional pathways in the periphery operate at the end-organs remains limited (except for several notable examples) and needs to be improved. Sympathetic activity is definitely not turned on or off like a tap.

Regional Rep introduction and update: Asia



Professor Kazuhiro Nakamura, Ph.D.

Nagoya University Graduate School of Medicine, Nagoya, Japan

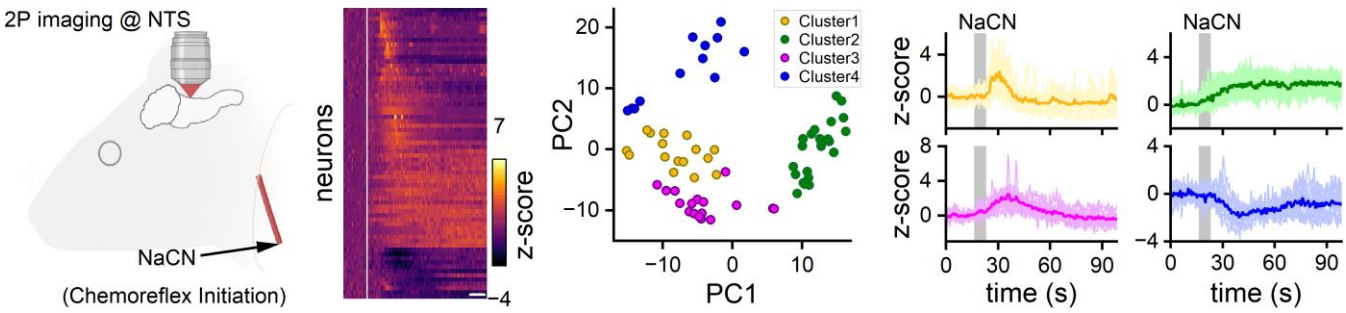
Our research focuses on the brain circuit mechanisms of homeostatic physiological functions, such as body temperature regulation, fever, stress responses, and energy balance. These functions are essential for the maintenance of life. By combining state-of-the-art molecular biology techniques with in vivo physiological and neuroanatomical experimental systems, we have recently elucidated a central principle of body temperature regulation (Science Advances 8:eadd5463, 2022) and discovered a novel mechanism for the development of middle-aged obesity, which involves age-related shortening of primary cilia, an antenna-like structure, of hypothalamic neurons (Cell Metabolism, 36:1044-1058, 2024).

Upcoming autonomic events in Asia: The Japan Society of Neurovegetative Research held its 77th Annual Meeting in Kyoto in October 2024 and will hold its 78th Annual Meeting in Nagoya on 24 and 25 October 2025.

"Our data"

Showcase your work here! In future issues of the newsletter, data will be chosen from those submitted in response to an ISAN call.

Figure shows (unpublished) data presented at the ISAN 2024 meeting in Birmingham. H. Zhu and W. Furuya in the SJ McDougall and AM Allen labs (The Florey, University of Melbourne) utilised the working heart brainstem preparation to record calcium indicator fluorescence in individual NTS neurons. With initiation of the chemoreflex we find four distinct temporal patterns across responding/processing NTS neurons.



From left to right; cartoon of setup used. GCaMP6s responses across a cohort of responding NTS neurons with sodium cyanide administration (NaCN, at vertical white line) to activate the chemoreflex. PCA and K means clustering to classify the response of these NTS neurons. Mean GCaMP6s changes with NaCN administration (at vertical grey line) across the four groups.

ISAN News:

ISAN 2026 – Bologna, Italy

We are excited to announce that ISAN 2026 will be a joint meeting with the European Federation of Autonomic Societies (EFAS) in Bologna, Italy from the 2-5th September 2026. More details to follow!

Watch this space! ISAN Education

One of our strategic goals is to elevate and grow the continuous engagement of our ISAN community. To support this, we will be hosting a virtual two and a half hour workshop on educational resources on April 2nd 2025, from 10 AM to 1 PM in two time zones: Australian eastern daylight time [GMT+11] and Eastern standard time [GMT-5].

The focus of the workshop will be on creating hands-on, low-cost autonomic neuroscience outreach activities, as well as practical classes for undergraduate classes.

Further details and registration information to follow.

Regional Rep introduction and update: Europe

Professeur Bruno Bonaz

I am Professor of Gastroenterology in the Grenoble Faculty of Medicine in France. I am a member of the team "Cerebral Stimulation & Systems Neuroscience" (team leader: Olivier David) at the Grenoble Institute of Neurosciences (GIN, INSERM U1216; https://neurosciences.univ-grenoble-alpes.fr/), and I was previously the team leader of the group Stress and Neurodigestive Interactions at the GIN. I have worked on brain-gut interactions for more than thirty years, both at the pre-clinical and clinical level, focusing on irritable bowel syndrome and inflammatory bowel diseases with a special interest on the role of stress and the autonomic nervous system in the pathogeny of such diseases. In particular, I am working on the anti-inflammatory (anti-TNF) properties of the vagus nerve (VN) through VN stimulation (VNS). We have shown that VNS has an anti-inflammatory role in a model of colitis in rats and, in a translational approach, we have recently published the first pilot study of VNS in patients with active Crohn's disease. I really think that Bioelectronic Medicine, targeting the autonomic nervous system (e.g. the VN), opens new therapeutic avenues in the domain of gut inflammatory disorders and others. I am also interested in interoceptive awareness, based on the involvement of the VN in interoception, in functional digestive disorders and inflammatory bowel diseases and the role of complementary medicines, such as hypnosis I practice in my patients, which are known to increase and re-balance vagal tone through a homeostatic way, and I am the principal investigator of a clinical trial of hypnosis in Crohn's disease. I was the past President of the ISAN.

Upcoming autonomic events in Europe:

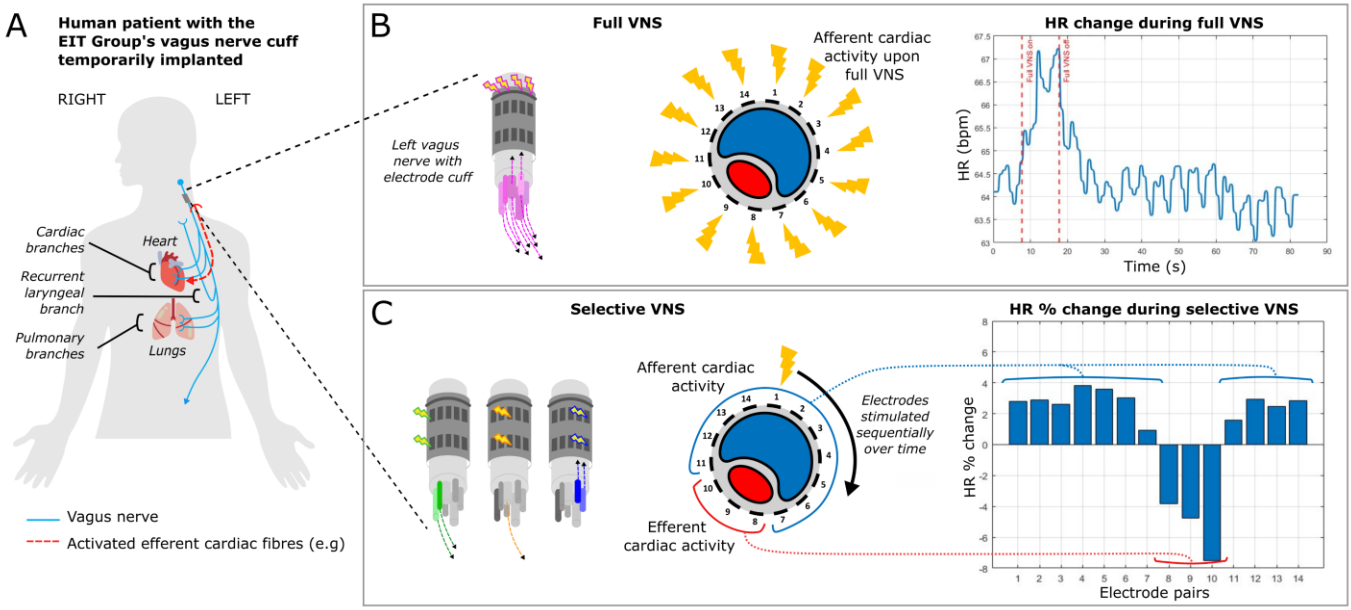
The Role of the Autonomic Nervous System in Stress Response and Resilience. Sicily, Italy 8-13 June 2025. It is organised by Andrea Sgoifo and will be in Eurice, a remarkable medieval city perched on a peak at the western end of Sicily. For more information: https://centromajorana.it/autonomic2025/

The 26th EFAS Meeting 2025 will be hosted by the Club d'Etude du Système Nerveux Autonome (French Autonomic Society) from September 25-27 in Toulouse (France). For more information: https://www.efasweb.com/net/

“Our data”

Showcase your work here! In future issues of the newsletter, data will be chosen from those submitted in response to an ISAN call.

N Thompson, E Rutkovskis, A Miserochhi, A McEvoy, K Aristovich and D Holder (UCL and National Hospital of Neurology and Neurosurgery). Figure presents extended data from ISAN 2024 (unpublished). We performed full vagus nerve stimulation (VNS) and selective VNS in a human patient whilst recording heart rate (HR).



A) The EIT Group’s vagus nerve cuff that is capable of both full and selective VNS was temporarily implanted on a human patient (undergoing surgery for standard VNS stimulator implantation). B) Upon whole nerve stimulation, tachycardia is achieved associated with afferent cardiac fibre activation. C) However, when performing selective VNS, bradycardia (~4-8% HR decrease), associated with efferent cardiac fibre activation, was achieved on 3/14 electrodes whilst the rest of the electrode pairs resulted in tachycardia. Therefore, efferent fibres can be activated to elicit cardioprotective effects on the heart when using spatially-selective VNS.

A final word from the President:

Professor Valentin Pavlov

Institute of Bioelectronic Medicine, Feinstein Institutes for Medical Research and Molecular Medicine, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell

It has been a privilege to serve as president of ISAN, such a vibrant and diverse international community of basic, preclinical, and clinical scientists united by their interests in autonomic regulation. 2024 was a great year for ISAN. We expanded and improved our online communication channels, including the new website. We had wonderful Oxford and Birmingham meetings and enjoyed the opportunity to interact and share our new findings. It is exciting that our discoveries have already led to developing new diagnostic and treatment modalities for many disorders with autonomic dysregulation, including gastrointestinal, cardiovascular, respiratory, and inflammatory diseases. In 2025 my colleagues at the ISAN Executive Committee and I will continue to work towards providing new educational activities and opportunities to engage and communicate your ideas and discoveries.