

# newsletter 04



Inside  
The Sense *6-11*

Introducing the new research units of Prof. David Pascucci (Vision & Sight Recovery) and Prof. Lukas Anschutz (Neuro-otology)

Interview with the SNSF HAPP-I project led by Prof. Simone Gafner

Interview: Olivier Lorentz

2-3

## Edito

Discovering the Scientific Advisory Board (SAB) of The Sense

A look back at the I2I Round Table

4-5

## News

Find the latest news and upcoming events

This edition of the newsletter highlights a key element of innovation within Sense: the Scientific Advisory Board (SAB). This board plays an advisory role in defining the strategy and scientific direction of Sense, thus contributing to the advancement of its innovative projects.

The main missions of the SAB are as follows:

- **Advising on Strategy:** It guides the Executive Committee in formulating the overall strategy and scientific direction of Sense, ensuring that decisions align with the highest international standards.
- **Evaluating projects funded by Sense:** The board regularly reviews the projects of affiliated teams, thus ensuring the continued quality and relevance of their work.
- **Conducting External Expertise:** Every three years, the SAB performs in-depth external evaluations at the request of the Council to measure the impact and scientific rigor of the research carried out by Sense.

Composed of three to five internationally renowned experts, including one member from a Swiss academic institution, the SAB provides valuable expertise to the Council. These members, selected for their scientific and managerial excellence, are entirely external to Sense's stakeholders, ensuring impartial and informed advice. The committee is honored to count among its members Prof. Mark T. Wallace (Vanderbilt University, USA), President of the board, Prof. David Sander (University of Geneva, CH), Prof. Fiona Newell (Trinity College Dublin, Ireland), Dr. Mickael Tanter (INSERM, France), and Prof. Robert Desimone (MIT, USA), each bringing valuable expertise and unique perspectives to the SAB.

The work of the SAB forms a fundamental pillar for Sense, ensuring that its research and projects remain at the cutting edge of scientific innovation.

## Dr. Mickael Tanter joins The Sense Scientific Advisory Board

The Sense Council is pleased to announce the arrival of Dr. Mickael Tanter to the Scientific Advisory Board (SAB). We are eager to collaborate with him and benefit from his expertise in the economic valorization of technological innovations. We also take this opportunity to express our gratitude to Prof. José-Alain Sahel for his valuable service and expertise during the launch phase of The Sense, as he leaves his position on the SAB to join the Presidential Science Council.

### Profile and Expertise:

Mickael Tanter is currently Research Director at INSERM and Director of the Institute of Physics and Technologies for Health in Paris at ESPCI PSL Paris. He also leads INSERM's first technological research accelerator in biomedical ultrasound. A specialist in medical imaging and ultrasound therapy, he earned his habilitation to direct research in physics from Paris VII University in December 2004 with the thesis "New Perspectives in Ultrasonic Medical Imaging and Therapy." He also completed his PhD in physics with highest honors at Paris VII University between October 1995 and May 1999, with a thesis entitled "Application of Time-Reversal Focusing to HIFU Treatments of the Brain," under the supervision of Professor Mathias Fink. Since 1998, Mickael Tanter has co-invented and developed groundbreaking technologies in biomedical imaging, including ultrafast ultrasound imaging (up to 10,000 images/s) and Shear Wave Elastography (SWE) for advanced diagnostics of diseases such as cancer and cardiovascular conditions. As a co-founder of Supersonic Imagine in 2005, his technology has been used in tens of millions of examinations.



He also expanded SWE to the quantification of myocardial elasticity and co-founded EmyoSound in 2023. Mickael Tanter has facilitated the transfer of his innovations to industry, accelerating their availability to patients. His research has led to the creation of six French companies: Echosens, Supersonic Imagine, CardiaWave, Iconeus, eMyoSound, and SonoMind.

# A Look Back at the Round Table "I2I: From Innovation to Inclusion"



On September 2, 2024, more than 80 people gathered at the Cantonal Museum of Fine Arts in Lausanne to participate in the Round Table organized by Sense. This event, titled "I2I: From Innovation to Inclusion," brought together speakers from academic, political, cultural, and economic backgrounds to discuss the challenges of accessibility and inclusion in our society.

## Crucial questions for our society

Discussions focused on ways for universities, companies, and public institutions to make society more inclusive. Crucial issues were addressed, such as how to promote high-impact innovations, assess their relevance, and overcome obstacles that hinder the transformation of research into tangible innovation.

This Round Table offered a collective reflection on how to build a more inclusive society and explored innovative solutions to meet tomorrow's challenges. To relive the highlights of the event, check out our video.

[→ VIDEO](#)

**Prof. Benoît Dubuis**

President of the Inartis Foundation

# News



## First Edition of "Pizza and Science"

The first edition of Pizza and Science took place on May 23, 2024, in an atmosphere that was both scientific and professional, yet friendly and relaxed. This event, organized to promote knowledge sharing and collaboration among researchers, particularly young researchers, captivated and inspired its audience, immersing them in an enriching scientific adventure.

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## A Springboard for Scientific Innovation: The Importance of Student Exchanges

Student exchanges play a crucial role in the personal and professional development of young researchers. The University of California, San Diego (UCSD) is a brilliant example with its Merkin Fellowships (Merkin Graduate Fellows Program ([ucsd.edu](http://ucsd.edu))), aimed at outstanding students, offering them the opportunity to have enriching experiences abroad. These programs not only foster the acquisition of new skills but also establish essential international collaborations for scientific progress. It is within this framework that Sense welcomed the doctoral student of Prof. Greg Appelbaum: Louise Stolz.

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## Upcoming events

# News



## Annual Report 2023

Our interactive annual report for 2023 is now available online! Dive into our digital annual report to explore the key indicators that have shaped our journey in innovation and research. Discover the highlights of the past year and gain insights into our ambitious goals for the future.

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## Looking Back at The 2024 Sense Symposium

On September 2, 2024, Sense organized its very first Symposium, dedicated to presenting projects and research work in the field of sensory systems. From 9:00 AM to 5:00 PM, around sixty participants gathered at the Palais de Rumine in Lausanne for a day rich in scientific exchanges and discoveries.

This day, structured by a rigorous program, highlighted the projects funded by Sense in 2022 and 2023. Project leaders presented in detail the current progress of their respective work, including: BrainTRACE, Dream Detector, Attentive Slippers, ARBORELE, Flavor, KiCk fMRI, MVO, and WildCom. A panel of experts from the fields of innovation, entrepreneurship, and law then convened to discuss the journey of revolutionary ideas from discovery to realization. These captivating presentations provided enriching perspectives on the innovation process for all affiliates of The Sense.

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# Inside The Sense

Two new Principal Investigators join The Sense: Prof. Lukas Anschütz with the Neuro-otology unit, focused on hearing and balance, and Prof. David Pascucci with the Vision & Sight Recovery unit, dedicated to visual perception. Let's discover their research.

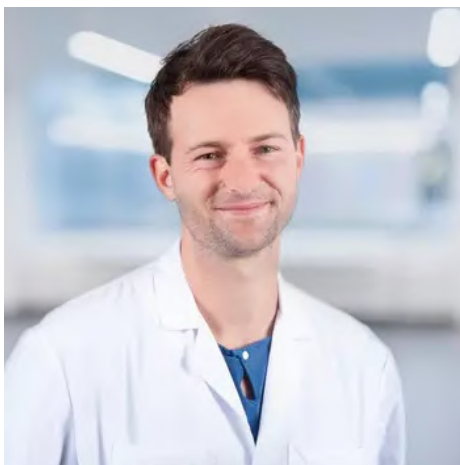
## The Neuro-otology Unit

The interdisciplinary translational auditory research unit studies the ear, hearing, and balance by seeking new and innovative therapeutic approaches. Our sense of hearing is among the most vital, as it serves as a bridge to the world starting from the eighth week of pregnancy. Most importantly, it allows us to connect with people, facilitating communication in a way unmatched by our other senses. As the famous advocate for the rights of deaf-blind people, Helen Keller, once said, "Blindness separates us from things, but deafness separates us from people."

Hearing loss is a significant global issue, affecting more than 5% of the world's population. The lab focuses on describing structural and physiological mechanisms, identifying treatment targets, and developing innovative therapeutic solutions. The main focus of the structural research is on the endoscopic anatomy of the middle ear and the interface between the ear and the central nervous system. To this end, direct endoscopic observations are correlated with advanced imaging techniques such as phase contrast X-ray imaging based on multi-scale synchrotron sources. Additionally, dynamic imaging methods have recently been developed to decode the transfer function of the middle ear, ultimately improving the success of reconstructive surgery. This project, funded by the FNS in collaboration with the Paul Scherrer Institute, has been developed. Furthermore, the use of grid interferometry tomography



is being developed for application to the auditory system in an interdisciplinary project involving ETH and the University Hospital of Zurich. This project has recently been approved for funding by the FNS. Regarding neuroscientific investigations, a direct approach to cortical auditory coding is being studied using soft surface electrodes to develop a cortical auditory implant.



## Lukas Anschütz

Prof. Anschütz is the Head of Otolaryngology and Neurotology at CHUV and an Associate Professor at the University of Lausanne. Graduating in 2011 from the University of Bern, he trained in Otorhinolaryngology in Bern and Fribourg. In 2016, he spent a year in Modena with Prof. Livio Presutti, where he developed a passion for endoscopic ear surgery and lateral skull base surgery. This approach allows for the treatment of a variety of auditory pathologies. He obtained the Venia docendi in 2020 and was appointed Associate Professor in 2022. He is interested in interdisciplinary research involving biomedical engineers, biologists, physicists, psychologists, neuroscientists, and education specialists. Medical education is an important part of his work. He has developed the Swiss course on endoscopic ear surgery and teaches in several international courses. He employs innovative methodologies such as eye tracking to study the impact of endoscopic surgery on ear anatomy and surgical skills. He has also created a sheep model for surgical training and was elected "Teacher of the Year" in 2022.

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## Current Studies

Currently, Lukas Anshütz's team is pursuing two imaging projects on the peripheral auditory system as part of an interdisciplinary collaboration with researchers from the Paul Scherrer Institute (PSI), ETH, and the University Hospital of Zurich. The first is a fundamental research project utilizing advanced imaging at the Swiss Light Source at PSI. With the help of a synchrotron, the team produces a highly coherent X-ray beam, generating brilliant images at extraordinary resolution, allowing for the investigation of the structure of the auditory system. Additionally, the team has developed a unique and innovative technique that allows for the investigation of the middle ear during auditory stimulation and analysis of its biomechanics.

A second project addresses a translational application of the principles of advanced imaging. The size and location of the middle ear, for example, are fundamental issues in the research and medical diagnosis of the auditory system. By not only measuring X-ray absorption but also their deviation, the team can significantly improve imaging of the auditory system. Therefore, the team aims to bring these advantages to patients with this project, which has recently received funding from the FNS.

Still within the field of imaging, the team has also established a multiscale investigation of the auditory ossicles, not only through micro-tomography but also by analyzing the structure and orientation of collagen and bone mineralization. By examining healthy and pathological ossicles, the team hopes to provide important information for reconstructive ear surgery. This is precisely where clinical research comes in. With the introduction of the endoscope in otology, a new chapter has opened up, offering



multiple possibilities in minimally invasive middle ear surgery. By analyzing surgical techniques and their respective outcomes, the team aims to continually improve its performance to provide modern and effective therapy for patients. Specifically, the analysis of reconstructive middle ear surgery is being investigated in both adults and children.

Another pillar of the team's scientific activity focuses on medical education. In collaboration with the medical education institute at the University of Bern, the team is analyzing the impact of artificial intelligence on the establishment of exams for medical students. With this project, the team is at the forefront of technological evolution to assess the possibilities, but also and especially the quality of these artificial intelligences.

## Future Developments and Collaboration with The Sense

In the future, Lukas Anshütz's team aims to establish an interdisciplinary research group covering all aspects of the ear and hearing. With a translational approach, the goal is to investigate the human ear and, based on this knowledge, develop solutions that directly aid in patient treatment. Advanced imaging projects will be enhanced by artificial intelligence and simulation tools on models. Clinical questions will be explored in depth to improve minimally invasive surgical treatment. Furthermore, the team wishes to develop neurophysiological analysis in fundamental research to create new treatments for deafness and for intraoperative implementation, for example, to guide the placement of auditory implants.

Sense plays a crucial role in these developments, as all these investigations require collaboration among specialists in different and highly specialized fields. This will not only enable the foundational work needed to decode the functioning of the auditory system but also to develop innovative solutions that can then be applied for modern and effective treatment of ear disorders and hearing loss.

# Inside The Sense

## Vision & Sight Recovery Unit

What makes us perceive and interact with our visual environment the way we do?

This seemingly simple question is far from trivial. The mere act of looking at an image can sometimes lead to very different perceptual interpretations between individuals and even within the same person at different moments. The nature of this variability has intrigued researchers and scholars for centuries and remains one of the key problems in the science of vision and cognition. In David Pascucci's unit, the research team focuses on several factors that may contribute to this variability. These include an individual's prior experiences, the influence of temporal and spatial context, and the intrinsic dynamics of neural activity patterns. These factors may interact in ways that are highly specific to each individual, much like fingerprints, and can vary considerably, especially under clinical conditions. The goal is to understand how these factors interact to shape visual capabilities over time, beyond what is perceptible to the naked eye.

To this end, his research follows two main axes:

1. Understanding the role of spatial and temporal context in visual perception.
2. Characterizing the relationship between inter- and intra-individual variability in visual performance and the temporal dynamics of neural activity patterns



Within these frameworks, the unit adopts a multidisciplinary approach, integrating studies of human behavior (psychophysics), neural activity (EEG, fMRI, brain connectivity), and computational/network modeling. The research covers various topics, from visual perception, attention, and memory to spatial and temporal processing, brain rhythms, and networks. The main goal is to explain the variability in perceptual performance within and between individuals, including clinical populations.



## David Pascucci

David Pascucci earned a Master's degree in Experimental Psychology at the University of Florence in 2009, with a thesis on the integration of auditory and visual signals. In 2014, he completed a PhD in Cognitive Sciences at the Center for Mind and Brain Sciences (CIMeC) in Rovereto, under the supervision of Professor Turatto, where he explored the plasticity and learning of attention and visual perception using psychophysics and functional magnetic resonance imaging (fMRI).

After his PhD, he completed a postdoctoral fellowship at the Department of Movement and Neurosciences at the University of Verona in Professor Chelazzi's lab, studying the role of temporal context in human vision. From 2015 to 2019, he was a senior postdoctoral researcher at the University of Fribourg, in the Perceptual Network group led by Professor Plomp, where he combined EEG, fMRI, and Granger causal modeling.

In 2019, he received an SNSF Ambizione grant and joined the Brain Mind Institute (EPFL) while also serving as a co-principal investigator at the University of Iceland. Since 2024, he has been an FNS Assistant Professor at the Lausanne University Hospital (CHUV), the University of Lausanne (UNIL), and the Sense Innovation and Research Center.

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## Current Studies

Naively, we all believe we perceive the world as it truly is. When we look out of the window, we feel like we are “perceiving” every tree, car, and pedestrian in real-time and in great detail, as if we were capturing a photograph of reality. Yet, this is an illusion. Our perception is far from a perfect capture of reality; it is more like a painting where details can be lost or even distorted. For example, the two photos presented below show an illusion called the “Tilted Road Illusion.” The image seems to consist of two photos taken from different angles, but in fact, it is the same photo repeated twice. The illusion demonstrates how the brain uses contextual cues to incorrectly infer perspective. Another striking example is the ‘Waterfall Illusion.’

David Pascucci’s unit examines the extent to which our perception is shaped, or even misled, by contextual aspects and internal brain states. The team adopts a multidisciplinary approach, combining psychophysics and brain imaging techniques, in collaboration with a vast network of experts.

The team’s work focuses on two main objectives: understanding how contextual aspects capture our attention and influence our perception, and studying the relationship between perception, cognition, and the dynamics of neural activity, which are unique to each individual. The ongoing research, funded by an SNSF Starting Grant, explores the relationship between spontaneous fluctuations in neural activity and perceptual and cognitive abilities. The team designs visual experiments to assess these aspects, recording



electroencephalograms (EEGs) and developing statistical tools to link brain activity to performance. One of the long-term goals is to develop new avenues for clinical research, particularly in understanding the idiosyncratic aspects of perception in disorders such as schizophrenia.

## Future Developments and Collaboration with The Sense

The Sense offers an innovative interdisciplinary framework that integrates knowledge from various fields, including medicine, neuroscience, psychology, AI, and beyond. This approach provides fertile ground for transdisciplinary interactions under shared computational objectives, which he believes is the key to driving innovation and developing new research avenues. This also aligns very well with his background and approach, which involve diverse research areas and questions spanning cognitive psychology and vision science to the development and application of signal processing algorithms and techniques for analyzing neural data and brain connectivity dynamics.

In this environment, his group, consisting of postdoctoral researchers, PhD students, and Master’s students, will focus on the relationship between the temporal dynamics of perceptual and cognitive processes and the fluctuations in neural activity. This research will undoubtedly benefit from interactions and collaborations with other groups in the Sense project, drawing on the wide range of expertise available.

# Interview Simone Gafner

Professor Simone Gafner from the School of Health Sciences/The Sense has secured funding from the Swiss National Science Foundation for her research project "Hospital Emergency Department Advanced Physiotherapy Practitioners-Implementation and Evaluation (HAPP-I)." This project, supported by the leadership of the HES-SO Valais-Wallis School of Health, will be carried out in collaboration with the Valais Hospital and will include Sarah Fournier, head of medical-therapeutic services, as well as physiotherapists, emergency physicians, and emergency department nursing staff.

## Can you explain in more detail what advanced physiotherapy practice is and how it differs from traditional physiotherapy?

**Simone Gafner:** An advanced practice physiotherapist (APP) plays a critical role by going beyond the traditional scope of physiotherapy. These highly trained professionals can take on specific tasks typically performed by other healthcare team members, which helps better manage the workload of these professionals. With their extensive training, APPs can diagnose, treat, and manage a wide range of health issues, making them particularly suited for these new roles in various medical settings. Advanced physiotherapy practice has seen significant evolution in many countries, especially with the adoption in 2019 of the first global policy on APPs by the World Physiotherapy Association. In Switzerland, the 2030 health strategy emphasizes the importance of these advanced practice roles, aiming to optimize coordination between different healthcare professionals and improve the quality of care provided to patients.

## Can you share some examples or preliminary results from similar pilot projects internationally, and how might these results influence the deployment of the HAPP-I project in Switzerland?

**Simone Gafner:** Emergency departments (EDs) face significant challenges, including a shortage of healthcare professionals and increasing patient visits, leading to workload overload. Several international studies have demonstrated the effectiveness of APPs in EDs, highlighting tangible outcomes such as reduced wait times and improved diagnostic accuracy. For example, pilot projects in Swiss hospitals, particularly at Winterthur Cantonal Hospital, have already begun integrating APPs and show promising results. At the University Hospital of Bern, the addition of APPs not only improved the accuracy of clinical diagnoses but also fostered fruitful collaboration between different healthcare professionals, thereby increasing both patient and staff satisfaction. These preliminary re-

sults highlight the potential positive impact that the HAPP-I project could have on the efficiency of emergency services in Switzerland, leveraging the skills of APPs to optimize patient care pathways.

## What is the importance of interprofessional collaboration in the HAPP-I project, and how will you foster such collaboration?

**Simone Gafner:** The HAPP-I project aims to define the roles that APPs could take on in emergency departments, introduce them, and evaluate the impact of their presence on patient care. We hypothesize, based on previous research and stakeholder expectations, that clearly defined roles can be established and that their introduction will be well-received by the entire care team. We firmly believe that patient outcomes, including reduced wait times and improved care experiences, will improve with the integration of APPs. The interdisciplinary approach of our project includes all stakeholders, from healthcare professionals to the patients themselves. This ensures successful implementation and allows for valuable feedback throughout the process. By fostering collaboration and complementarity between the different disciplines, we hope not only to ease the burden on emergency departments but also to lay a solid foundation for the future development of the Swiss healthcare system.

# Interview

## Olivier Lorentz | Executive Director of The Sense Associate Professor at the School of Health Sciences

### Can you tell us about your activities at The Sense?

**Olivier Lorentz:** I am the Executive Director of The Sense, which operates under a co-leadership model. On one side, we have the executive leadership, which I oversee, and on the other, the scientific and academic leadership, headed by Professor Micah Murray (professor at CHUV).

My role as Executive Director includes managing interactions with our founding institutions—CHUV, UNIL, and HES-SO Valais-Wallis. I am also responsible for the budget, communication, and all operational and executive aspects of The Sense.

### Can you describe a typical day for you?

**Olivier Lorentz:** I usually start my day early, around 6:30 a.m., which helps me prepare efficiently for my teaching schedule. Besides my role as Executive Director of The Sense, I'm also an associate professor at the University of Applied Health Sciences (HEdS). During the academic year, I begin work around 8:30 a.m. with lectures on biochemistry, cellular biology, and molecular biology for students in the Specialized Health Maturity program.

After class, I often have lunch with my team and HEdS colleagues, which is always a great time for exchanging ideas. My afternoons are typically filled with various activities, often focusing on meetings, particularly those of The Sense's management committee, or other tasks. I also devote time to the communication strategies of The Sense, regularly discussing ongoing and upcoming initiatives with Esteban Crespo (Head of Communication & Marketing at The Sense). On the financial side, I frequently meet with Ms. Nathalie Blanchy (Financial Manager of The Sense) to review expenses and work on consolidating them across the different institutions.

At the end of the year, a major part of our work involves preparing the budget for the next year, which we then submit to the Sense Council for approval.

### What are the upcoming steps for The Sense?

**Olivier Lorentz:** One of the key challenges for The Sense is ensuring its development at the institutional level. To address this, we

have created a strategic development plan that has already been approved by the Council. As part of this plan, we are actively working to integrate new researchers, especially from other faculties at UNIL.

This requires time and multiple discussions to understand their research activities, determine how they align with ongoing or future projects at The Sense, and identify new collaboration opportunities. To support this effort, we've established an affiliation process for prospective new members within the management committee.

In the coming weeks, we plan to meet with four or five principal investigators (PIs) from UNIL's Faculty of Social and Political Sciences. Their integration would mean that two faculties are directly involved with The Sense, further enhancing our interdisciplinary approach.



Professor Murray on the left and Professor Lorentz on the right

*"One of the key challenges for The Sense is ensuring its development at the institutional level. To address this, we have created a strategic development plan that has been approved by the Council."*

# Sensory Awakening

## "Breathing Square" Illusion

**[Find more illusions on Michael Bach's website](#)**

### **What to Observe:**

Start by watching the demonstration on the right. Pay particular attention to the blue shape hidden by the orange squares.

After one cycle, you'll recognize that it's a blue square of constant size rotating slowly. However, for almost all viewers, it appears that the square is changing size, "breathing," so to speak.

### **Comments:**

Typically, we are remarkably good at detecting and identifying surface contours despite incomplete visual information. However, in "breathing illusions," rigid rotating surfaces seem to pulse or deform, even though a simple geometric interpolation across space would reconstruct the actual surface contour. It's believed that this non-rigid outcome results from a failure to apply a rigidity constraint across spatiotemporal discontinuities (more details: Bruno 2001).

This phenomenon appears related to "motion binding".

### **Sources:**

Shiffrar M & Pavel M (1991) Perception of rotation through apertures. *Z Exp Psychol: Human Perception and Performance* 17:749-761

Bruno N (2001) Breathing illusions and boundary formation in space-time. In: Shipley TF, Kellman PJ (eds) chapter 17, 531-556 (ISBN-13: 978-0444505064)

# Support us we develop the projects of tomorrow

for our well-being and the well-being of future generations

## POURQUOI SOUTENIR THE SENSE?

The Sense works on the senses to try to improve the trajectory of life. By supporting The Sense, you contribute to its ambition to have an impact not only on people's health but also on prevention and public health.

## TAX DEDUCTION

### Save taxes with a clear conscience

The donations you claim on your tax return reduce federal and cantonal tax bills.

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