the sense
innovation and research center

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newsletter 02

Inside The Sense 6–11

Perception & Cognition

Focus on the domains of pain and introspection with Prof. Chantal Berna Renella, and taste with Prof. Sandra Galle.

Generative AIs

Generative AIs such as Chat GPT or Midjourney have taken center stage this year. Interview with Prof. Jean-Paul Calbimonte on the potential use of these AIs in the field of Research.

Ch. de l'Agasse 5
1950 Sion

Av. de Provence 82
1007 Lausanne

Edito

Prof. Frédéric Herman
Rector of the University of Lausanne

François Seppey
Director of HES-SO Valais-Wallis

Prof. Frédéric Herman

Rector of the University of Lausanne

After completing a civil engineering education at the University of Liège in Belgium and the University of Bristol in the United Kingdom, Frédéric Herman moved to Canberra to pursue a Ph.D. with Prof. Jean Braun at the Australian National University. During his Ph.D., he began working on the interactions between climate, erosion, and tectonics. Since August 1, 2021, Professor Frédéric Herman has been the rector of UNIL, a role he undertakes with curiosity, clarity, and the serenity of a scientist aware of the major current upheavals, yet keen to situate his project in the long term. He is one of the world's experts on the interactions between climate change and mountain evolution.

François Seppey

Director of HES-SO Valais-Wallis

Since March 2012, François Seppey has been leading HES-SO Valais-Wallis, a tertiary-level school educating over 2,600 students and being a member of the University of Applied Sciences Western Switzerland (HES-SO). Previously, he worked for 10 years as head of the Economic Development Department of the canton of Valais. François Seppey studied economics at the University of St. Gallen and underwent postgraduate training at the Institute of Advanced Studies in Public Administration (Idheap) at the University of Lausanne.

News

Change in the Scientific Advisory Board (SAB)

The Sense's management is delighted to announce the arrival of Professors David Sander (University of Geneva) and Fiona Newell (Trinity College Dublin) to the Scientific Advisory Board. We are excited about this future collaboration and look forward to leveraging their expertise. We also take this opportunity to thank Professors Robert Riener (ETHZ) and Anna Nobre (Yale University) for their service to The Sense during its initial stage.

→ DISCOVER THEIR PROFILES

Annual Report 2022

The Sense's annual report is now available. It embodies The Sense's commitment to transparency and positive impact in the field of innovation and research. The interactive digital format not only caters to the needs of the general public, but also underscores The Sense's dedication to interaction in scientific communication.

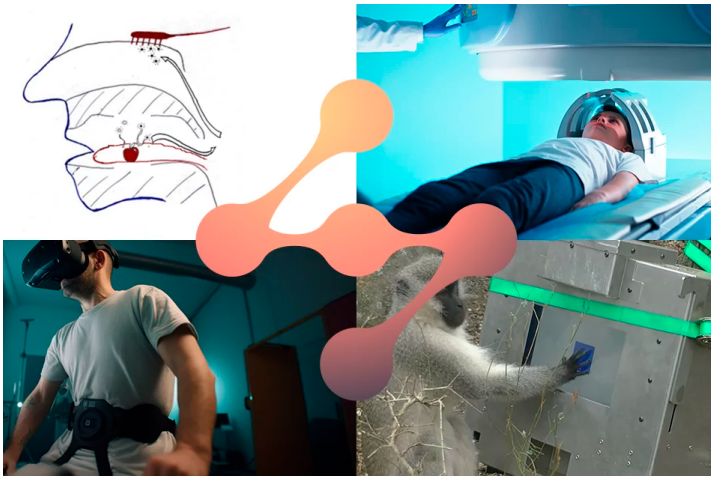
→ DISCOVER THE ANNUAL REPORT

Upcoming events

11.16.23

Rehabilitation after Sensory Deprivation
Prof. Clas Linnmann (Harvard Medical School)

News



Projects Funded by The Sense in 2023

The Sense is pleased to announce the four new projects that funded this year via our highly competitive internal call. These inter-institutional projects are all coordinated by individuals affiliated to The Sense who had not previously received internal support. Notably, three of these projects are coordinated by female researchers.

→ DISCOVER THE FOUR PROJECTS

Conference "When Economics Meets Health (and Vice Versa)"

On February 24th, Professor Joachim Marti (Unisanté) delivered the second distinguished lecture at of The Sense on the theme "When Economics Meets Health (and Vice Versa)". Professor Marti's research hasd direct impact on the study areas of The Sense, providing a more objective view of health economics and both micro- and macro-scale factors contributing to the introduction of new treatments into the healthcare system.

What do we mean by health economics?

Economics aims for the optimal allocation of limited resources to satisfy unlimited needs. This issue is particularly relevant in the field of health, where trade-offs are necessary at various levels (individuals, providers, the state, etc.)...

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→ ALL OUR EVENTS

Inside The Sense

Focus on Two Units of the Perception & Cognition Axis. Firstly, discover the Pain & Interoception Unit, which examines the use of integrative and complementary medicine in hospital settings. Secondly, delve into the perception of taste with the Chemical Senses Unit. Finally, an interview with Prof. Jean-Paul Calbimonte on the development and use of generative AIs (Chat GPT or Midjourney) and on his Unit Knowledge and Management Data Streams which belongs to Devices & Data Axis.

The Pain & Interoception Unit

The Center for Integrative and Complementary Medicine (CEMIC) focuses on two distinct research programs. On the one hand, it explores the neuroscientific aspects of non-pharmacological therapies aimed at relieving pain. The goal is to better understand how practices such as hypnosis, mindfulness meditation, and mental imagery can influence pain perception. To achieve this, the CEMIC employs various physiological monitoring methods and neuroimaging, including functional MRI and EEG.

On the other hand, the unit led by Professor Chantal Berna Renella focuses on integrating complementary medicines into academic hospital settings. This approach examines the feasibility, effectiveness, and satisfaction regarding the use of practices such as acupuncture, hypnosis, and art therapy in patient care.

Chantal Berna Renella

Professor Chantal Berna Renella, MD, PhD, is a clinician-researcher leading the Center for Integrative and Complementary Medicine at the CHUV. Trained as an internist in psychosomatic medicine, hypnosis, and interventional pain management, her clinical practice focuses on the management of chronic pain. Her research investigates the mechanisms of various complementary medicines used in pain treatment, as well as the implementation of integrative medicine in hospital settings.

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Current Studies

The research programs of the CEMIC were initiated at the CHUV with the acquisition of initial funding in 2018. Since that time, the group has made significant progress, and their efforts have been acknowledged through various publications. Currently, they benefit from increasingly robust financial support, amounting to a total of over 600,000 CHF for the 2022-2023 period.

Future Developments and Collaboration with The Sense

The clinical research methodology developed within the Pain & Interoception Unit opens up new and highly interesting collaborative perspectives with specialized fields beyond pain management, notably in neurology, neurosurgery, sleep medicine, and perioperative care.

Currently, promising collaborations within The Sense focus on various subjects, such as hypnosis treatment for non-REM sleep disorders (Francesca Siclari), alterations in body perceptions in female patients with chronic pain (Michela Bassolino), possibilities for specific physiotherapeutic rehabilitation (Paul Matusz), as well as physiological monitoring of stress responses in patients with lower back pain during virtual reality tasks (Antoine Widmer, Julien Favre).

Inside The Sense

The Chemical Senses Unit

The research conducted by the Chemical Senses Unit focuses on several fundamental aspects related to the natural improvement of the nutritional value of food products. On the one hand, it explores methods of biotransformation of raw materials, particularly through enzymatic processes or fermentation, aiming to optimize the nutritional composition of products. On the other hand, it delves into olfactory and gustatory mechanisms in humans, analyzing the release of aromas in food matrices and studying the oral and cognitive perception of these aromas. These research efforts aim to make significant advancements in the field of nutrition and sensory understanding. Specifically, they aim to enhance our understanding of the interactions between food, the senses, and nutrition, with potentially significant implications for the food industry and public health.

Sandra Galle

Sandra Galle is a food biotechnologist with international experience in both industry and academia. She pursued her studies at the University of Vienna in Austria and Michigan State University in the United States, ultimately earning her Ph.D. in Food Science and Technology from University College Cork in Ireland. During her doctoral studies, Sandra conducted part of her research at the University of Alberta in Canada, where she began working as a scientific researcher. In 2013, Sandra joined Nestlé and achieved success in the R&D domain, initially as a scientist and later in product development, earning various Nestlé Business and R&D awards. Since 2021, she has been serving as an Associate Professor at the School of Engineering and Institute of Life Technologies at the HES-SO Valais-Wallis.

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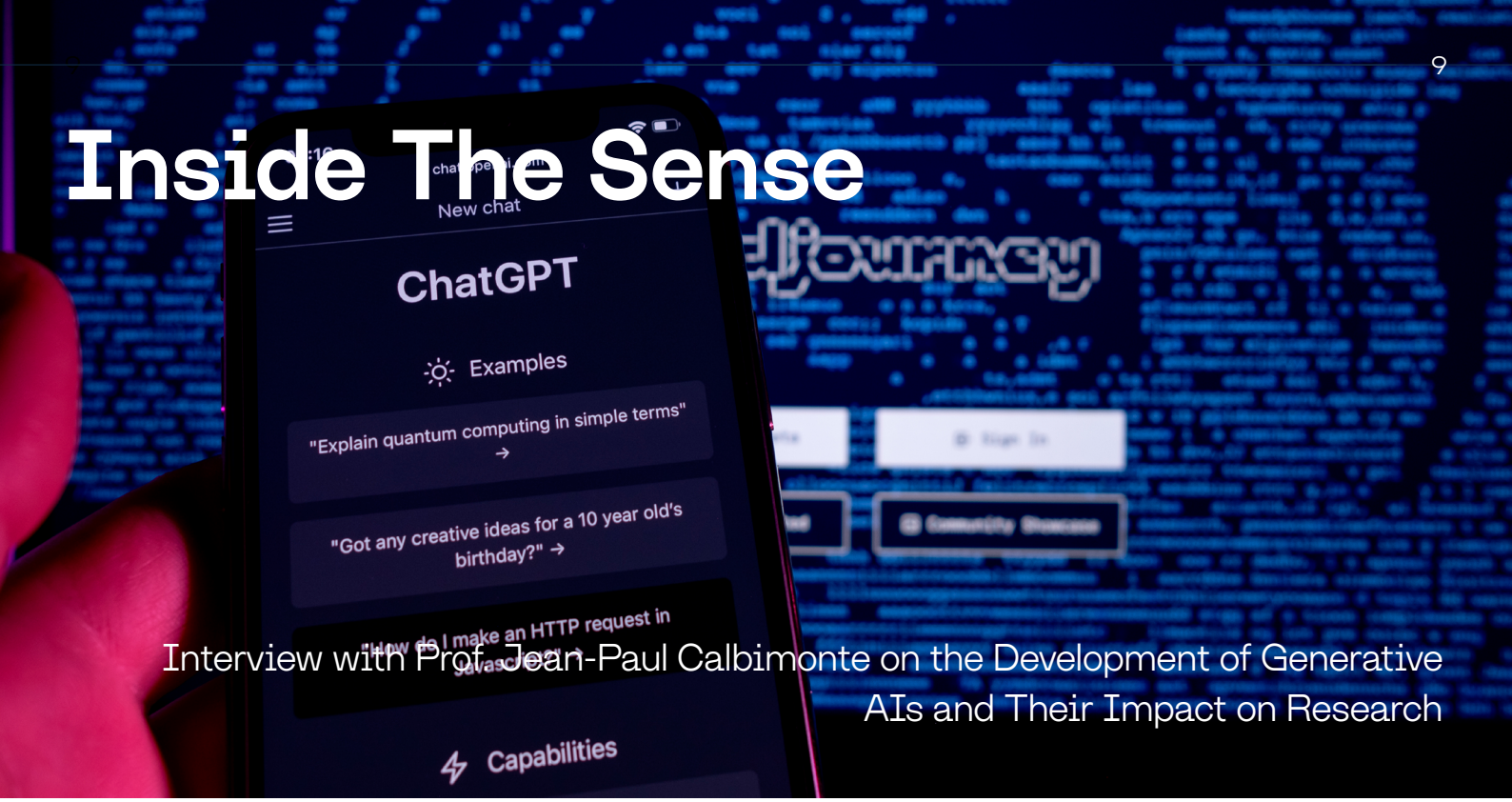


Interview with Prof. Jean-Paul Calbimonte on the Development of Generative AIs and Their Impact on Research

- What is your opinion on the development of new generative AIs such as ChatGPT, DALL-E2, or Midjourney?

Jean-Paul Calbimonte : Many AIs have recently become available to the general public. With this accessibility for everyone, it not only demonstrates progress in the technical/technological domain but also shows that all these technologies can now be used in our daily lives or daily work. For example, to prepare a text, answer questions during a test, prepare for various tasks, or generate images. This new technology raises important new challenges, such as determining whether information or an image is true, false, or generated by an AI. Currently, we are not yet able to reliably answer these questions.

Can we trust everything generated by this technology, whether AI-related or not? This question also raises some concerns. Some people are beginning to have somewhat apocalyptic views on this matter and are wary of the rapid development of these AIs. From a scientific point of view, these AIs are not really something innovative. These are techniques that have been used for a long time in science. However, it is only their scope and public use that have disrupted the habits of the general public.

- What is your opinion on the use of these AIs in the world of research?

Jean-Paul Calbimonte : Personally, I think there are obviously challenges and ethical questions that are not entirely clear. For example, where do the data feeding these AIs come from, and are they reliable? Do we really have the right to use any kind of data to feed these tools?

To use this technology, there is a whole set of ethical questions that need to be clarified. I think we should not fear these technologies too much and even consider them as new opportunities. It would also be relevant to determine how to exploit them for research, as we also have research questions, especially in applied research, that could benefit from all these advancements. The role of researchers will be to find cases where these technologies are interesting to apply. In my opinion, it is in the application and interdisciplinarity that we will find ways to work with these available AIs.

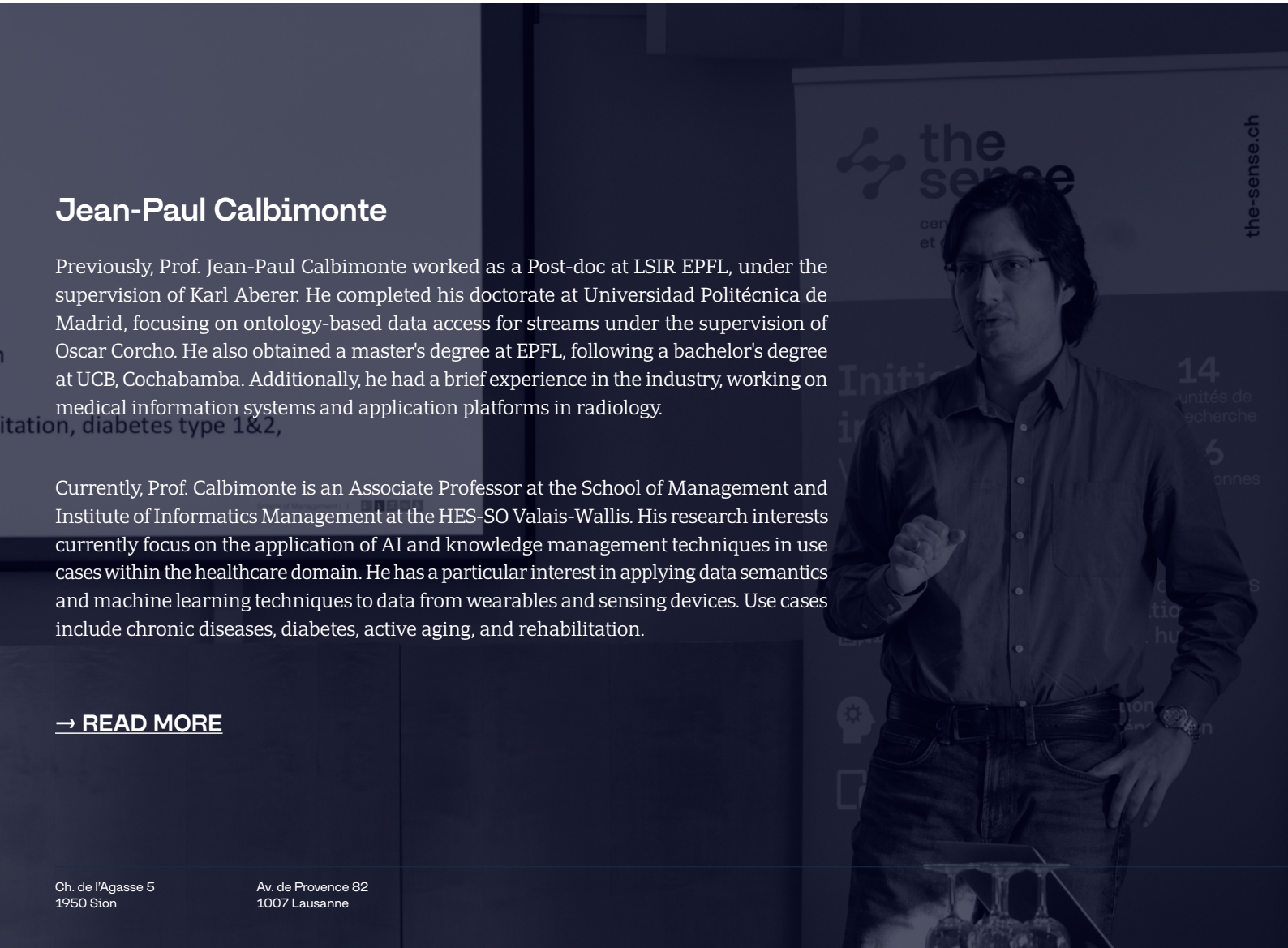
- Are you currently using these generative AIs in your research?

Jean-Paul Calbimonte : Artificial intelligence includes machine learning algorithms that we use every day in our work, whether for movement classification (e.g., with videos) or behavior classification in a monitoring environment, health, etc. The ones we are talking about today concern generative AI, which is also of great interest to us. It could allow for better interaction with personnel such as patients, caregivers, or hospital staff. This could greatly facilitate the lives of people working with decision support systems or information retrieval systems, etc. So all these chat systems, information management, and automatic content generation are extremely interesting for this type of case that touches different areas in health.

- In the context of your research, do you use AI?ȷ

Jean-Paul Calbimonte : Yes, regarding my recent work, we have extensively used various artificial intelligence algorithms. For example, in decision support systems aimed at providing support to cancer survivors. We use AI algorithms to study retrospective

data and then try to predict future outcomes for each individual. Is it possible that these individuals develop new cancers? Can we anticipate new risks for the patient based on other data? Another example of the use of AI in my research is the use of video data. We can extract information regarding movements, behaviors, and interactions of individuals. We can extract information regarding movements, behaviors, and interactions of individuals.



Jean-Paul Calbimonte

Previously, Prof. Jean-Paul Calbimonte worked as a Post-doc at LSIR EPFL, under the supervision of Karl Aberer. He completed his doctorate at Universidad Politécnica de Madrid, focusing on ontology-based data access for streams under the supervision of Oscar Corcho. He also obtained a master's degree at EPFL, following a bachelor's degree at UCB, Cochabamba. Additionally, he had a brief experience in the industry, working on medical information systems and application platforms in radiology.

Currently, Prof. Calbimonte is an Associate Professor at the School of Management and Institute of Informatics Management at the HES-SO Valais-Wallis. His research interests currently focus on the application of AI and knowledge management techniques in use cases within the healthcare domain. He has a particular interest in applying data semantics and machine learning techniques to data from wearables and sensing devices. Use cases include chronic diseases, diabetes, active aging, and rehabilitation.

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Interview

Gianluca Giacchi | PhD Candidate

- Can you introduce us to your research activities at The Sense?

- **Gianluca Giacchi :** I am enrolled in a double-degree doctoral program between the University of Bologna and the University of Lausanne, under the joint supervision of Professors Nicola Arcozzi, Micah Murray, and Benedetta Franceschiello. The aim of this program is to utilize my background in signal compression and Fourier analysis to improve magnetic resonance imaging (MRI). In brief, the MRI signal is acquired below its Nyquist frequency, meaning that the information needed to reconstruct an anatomical image is only partially sampled by the MRI scanner. To recover the missing information, the acquired data undergo numerical processes that depend on the choice of tuning parameters. These parameters are empirically chosen by technicians, and there is no precise, efficient, and mathematically grounded technique to provide these parameters, making the MRI image processing very time-consuming. My current research, conducted with contributions from Bastien Milani (CHUV), Isidoros Iakovidis (University of Bologna), and Benedetta Franceschiello (HES-SO), aims to address this gap.

- Why did you choose to pursue research?

Gianluca Giacchi : After obtaining a degree in mathematics at the University of Milan, I was undecided about whether to teach at high school or start a doctorate. Teaching has always been one of my dream jobs, but I quickly realized that teaching commitments, along with the transmission of passion for mathematics to future generations, took a back seat to pedagogy. For this reason, I seized the opportunity to start a double doctorate, with a personal goal of contributing to our understanding of this world.

- Can you describe your typical day as a Ph.D. candidate?

- **Gianluca Giacchi :** Pursuing a double degree requires fulfilling the requirements of two doctoral schools simultaneously. That's why I strive to attend classes and seminars. I also take advantage of my time in Lausanne to attend as many in-person classes as possible. Now that I have almost completed all the required credits, I have more time to dedicate to research. Being a doctoral student in mathematics and neuroscience offers a lot of freedom and independence. Indeed, working on a project simply requires a laptop for programming and a few sheets of paper to prove theorems. Due to my affiliations, I need to go to HES-SO Valais-Wallis, in Sion, twice a week, where I usually work alongside my supervisor, Prof. Franceschiello. I enjoy spending time discussing research and perspectives with her much more than proving results! The rest of my days are spent at the Sense offices in Lausanne, between research, classes, coffee breaks, and croissants.

Sensory Awakening
Inverted Phi Illusion

Find more illusions on Michael Bach's website.

What to observe

Above, you see a video, and something is moving, obviously, but not really going forward, is it?

Notes

The movie consists of a total of 4 images. The first 2 images are consecutive frames of a film, the next 2 images repeat the first two, but in negative. The apparently continuous forward motion is explained by the fact that our motion detectors are sign-dependent. The simultaneous inversion of contrast and direction of movement does not reverse the perceived direction of movement. This effect is also known as "four-frame motion". The unsettling effect of this movie comes from a conflict: (1) our motion detectors indicate continuous movement, but (2) feature tracking indicates a jump forward and backward.

Source

Anstis S (1970) Phi movement as a subtraction process. Vision Res 10:1411–1430

Anstis SM, Rogers BJ (1975) Illusory reversals of visual depth and movement during changes in contrast. Vision Res 15:957–961

Anstis SM, Rogers BJ (1986) Illusory continuous motion from oscillating positive-negative patterns: implications for motion perception. Perception 15:627–640

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

WHY SUPPORT 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.

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