

CNB Newsletter

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Dear CNB members,

With the CNB Newsletter, we intend to inform you about upcoming CNB events, ongoing projects and give insights into the research topics of selected CNB members. In this edition we look back on the Brain week 2024 and are looking forward to the 19th Annual Meeting 2024 which will take place on September 6th. The CNB annual meeting will again have a poster session, that is open to all types of research and all career stages. Please note that graduate students may obtain a credit for presenting their posters. Registration link: <https://www.conftool.com/cnbam2024>

CNB provides excellent opportunities for exchanging ideas and building novel collaborations within the University of Bern neuroscience community. This issue reflects the versatility of the CNB and introduces two researchers from different fields. Prof. Olivier Levionnois' (Vetsuisse) contribution discusses the Division of Veterinary Anaesthesiology and Pain Therapy and Prof. Dr. Manuela Eugster (ARTORG) provides a preview of the upcoming Annual Meeting on 06.09.24 and introduces the Neuro Robotic Group.

Please reach out to us, if you would like to showcase your research in the next newsletter. Please also indicate if new groups should be included in the CNB platform.

Please also note that we are updating and upgrading the CNB-Website, so please feel free to contact Ms. Alessia Carlucci (alessia.carlucci@unibe.ch) if you want to make changes on your research group-site (e.g. add photos, videos, members etc.). If you follow us on X (formerly Twitter), we are happy to repost your research articles to spread the word about your science. The X handle is @clin_neurobern.

We hope you enjoy reading the July 2024 edition.

Prof. Dr. Sebastian Walther
President CNB

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Brain week Bern

Monday, 11th of March 2024 – Thursday, 14th of March 2024

The Brain Awareness Week was a great success this year. The theme "Gute Zeiten und schlechte Zeiten für das Gehirn" of Brain Week 2024 caught the interest of many, leading to a large audience. Exciting lectures and discussions shed light on the latest advances in brain research from various perspectives. There was a focus on external and internal influences on brain health about good and challenging times.

The evenings on Monday and Tuesday were particularly well attended, with the auditorium completely filled. Additionally, on Wednesday, there was a screening of the film "Girl, Interrupted" at Cinema Rex. Concurrently, Young Researchers had the opportunity to actively engage in discussions about their research during an aperitif and poster session at the VonRoll area.

To conclude the Brain Week, a panel discussion on the topic of "Myths and Truths" took place on Thursday evening. This evening was also very popular, and we were pleased to welcome 150 guests.

Monday, 11th of March 2024

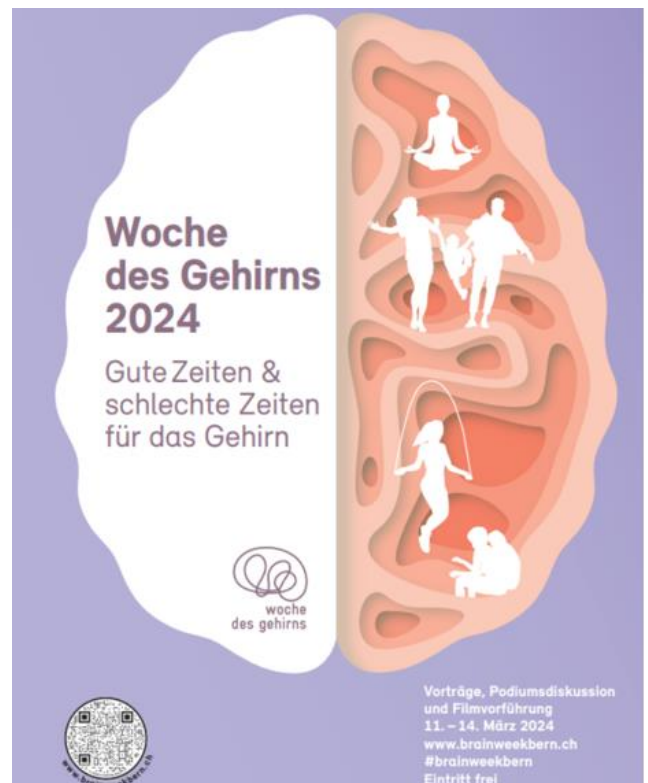
Moderation: Prof. Dr. Thomas König

Sponsor of the day: Wurzelflug

"Global and individual stress as triggers of mental disorders in young people"

Prof. Dr. med. Michael Kaess, Clinical Director/ Chair of Child and Adolescent Psychiatry.

The lecture provided an overview of the current research regarding the link between stress and the development of mental disorders. A focus was placed on the development of self-harm and suicidality as transdiagnostic symptoms of many stress-related disorders. A distinction was made



between individual stressors (e.g. academic pressure, bullying) and global stress (e.g. the pandemic, social media). Possible measures for stress prevention in young people were also discussed at the end.

Presentation of Research Award from the Swiss Brain League

The Maupertuis Research Award 2024 from the Swiss Brain League is awarded to the research group of Prof. Urs Fischer and the entire research team of the ELAN trial. The research group was able to demonstrate that early treatment with blood thinners prevents the risk of experiencing another stroke, without increasing the risk of intracerebral bleeding.

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"How our brain succeeds at not forgetting - trauma and trauma-related disorders"

Prof. Dr. med. Katharina Stegmayer, Head of the division (UPD)

On this evening, Prof. Dr. Katharina Stegmayer reported on her latest research findings on anxiety and PTSD. She explained the basics and origins of anxiety, as well as how individuals perceive, react to, and act on it. Throughout the evening, she discussed PTSD with the audience, explaining how such a disorder can develop and its consequences on a neural and endocrine level. She also introduced different types of trauma and the risk factors that may contribute to trauma. In conclusion, she described options for prevention and treatment.

Tuesday, 12th of March 2024

Moderation: Prof. Dr. Mirjam Heldner

Sponsor of the day: FRAGILE BERN

"Resilience in good and bad times"

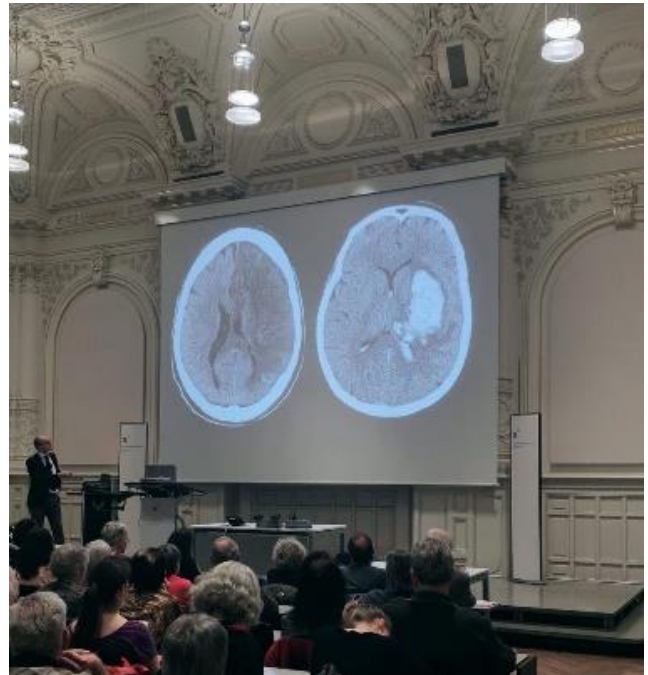
Prof. Dr. Gregor Hasler, Fribourg

In his lecture, Prof. Dr. Gregor Hasler discussed stress. He explained the different types of stress and the physical symptoms they bring about or show. Additionally, he highlighted the important role of how an event is evaluated and how nutrition can help counteract stress.

"Medical Hypnosis in Pain Treatment - How to do it and what happens in the brain?"

Prof. Dr. Peter Sandor, Bad Zurzach

The fascinating lecture by Prof. Dr. Sandor focused on pain and its treatment. He started by discussing the various types of pain, before emphasizing chronic pain. Furthermore, he explained his method of using hypnosis in pain treatment. At the end of his presentation, he invited the audience to participate in a hypnosis exercise.



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Wednesday, 13th of March 2024
REX Cinema

"Girl Interrupted"

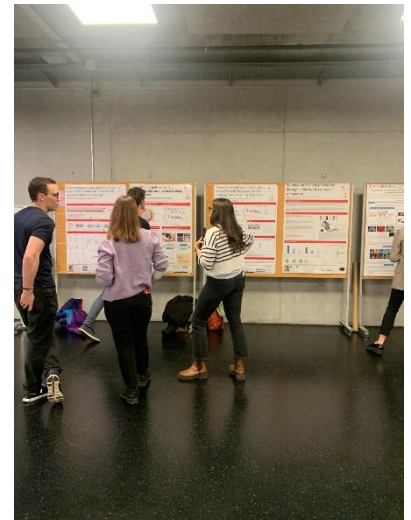
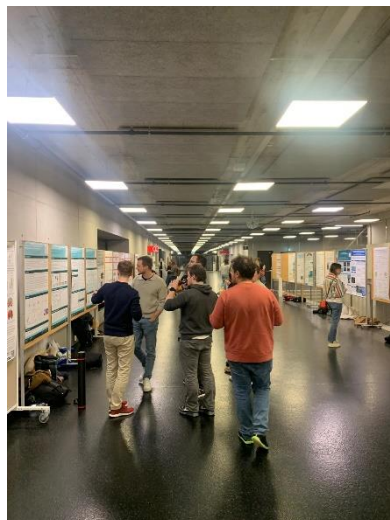
The movie is about a young woman named Susanna Kaysen, who is admitted to a psychiatric hospital in the 1960s after attempting suicide. The story revolves around Susanna's time in the hospital, where she meets other female patients struggling with various mental health issues. As she tries to understand herself and her mental health, she gets to know the other women and develops close friendships with them. The film addresses themes such as mental health, self-discovery, friendship, and the stigma surrounding people with mental health issues. It also highlights the challenges and difficulties faced by people in psychiatric facilities and raises questions about the definition of normality and madness. Prof. Thomas König anchored this movie night at the Rex cinema. Following the film, discussions were held about the challenges and difficulties faced by people in psychiatric care.



CNB Poster Session, VonRoll 8

The poster session took place on Wednesday at VonRoll. A total of 48 scientific projects were showcased by students from GHS, GCB, and the institute of psychology. Also advanced researchers from multiple departments presented their work as posters. The session provided a valuable platform for sharing ideas and showcasing ongoing research. The event also featured tasty food and drinks, adding to the overall enjoyable experience. Thank you to all poster presenters! We can't wait to see you again next year!

Don't forget to save the date for the next Poster Session: **Wednesday, 12th of March 2025.**



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Thursday, 14th of March 2024

Panel discussion "Myths and Truths"

Moderation: Prof. Dr. Sebastian Walther

Panel discussion: Prof. Dr. Maxime Baud, Prof. Dr. Claudio Pollo, Prof. Dr. Penner, Prof. Dr. Seidel und Dr. Debove.

During the panel discussion "Myths and Truths", various common statements and misperceptions were presented and discussed. The experts spoke on different areas of expertise and answered the audience's questions. Prof. Maxime Baud discussed epileptic seizures from a neurological perspective, followed by Prof. Claudio Pollo who rounded off the topic from a neurosurgical point of view. Prof. Penner spoke about Multiple Sclerosis and its consequences. Prof. Seidel then gave a presentation on surgical techniques to make brain functions visible during operations. Dr. Debove concluded with a presentation on Parkinson's disease.



The next Brain week Bern will take place from the **10th to the 13th of March 2025**. The program and further information will be published on the Brain week homepage: www.brainweekbern.ch. You also find the programs and impressions from past events on that site.

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Selected Research Groups

Division of Veterinary Anaesthesiology and Pain Therapy

Prof. Olivier Levionnois

Prof. Olivier Levionnois is currently a Group Leader at the Division of Veterinary Anaesthesiology and Pain Therapy, directed by prof. Claudia Spadavecchia, within the Vetsuisse Faculty at the University of Berne. Prof. Levionnois embarked on his veterinary journey, graduating from the Veterinary Faculty of Nantes, France, in 2001. His passion for advancing veterinary care led him to pursue specialized training, including a clinical internship in equine medicine in Canada and a clinical specialization in Veterinary Anaesthesia (Dipl. ECVA, 2007) at Berne, culminating in his PhD in 2011. His doctoral research focused on the antinociceptive properties of NMDA-antagonists (ketamine), utilizing advanced neurophysiological models to deepen our understanding of pain management in animals.



Over the years, Prof. Levionnois has honed his expertise in pharmacokinetic-pharmacodynamic modeling of anaesthetic and analgesic drugs. However, his recent focus has been on investigating the impact of anaesthetic drugs on the electroencephalographic (EEG) signal in animals. This cutting-edge research aims to unravel species-specific dif-

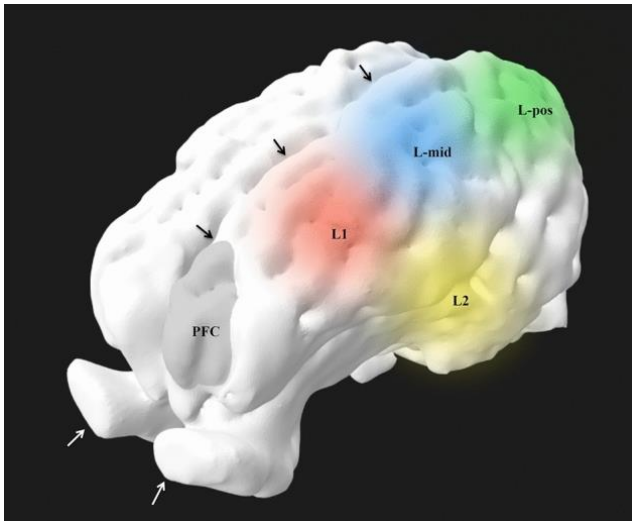
ferences in EEG signals, identify optimal measurement settings for discriminating various anaesthetic planes, and determine EEG-derived parameters that offer sensible and repeatable information.

The Division plays a pivotal role in the clinical education of veterinary students and young assistants at the Clinics of the Veterinary Hospital. With a comprehensive approach covering all animal species, it offers daily top-tier services across the spectrum of Veterinary Medicine. In addition to his clinical duties as a senior anaesthetist, Prof. Olivier Levionnois receives invaluable support from Dr. Alessandro Mirra, who is dedicated to the division's research projects as part of his post-doctoral fellowship. This collaboration ensures a seamless integration of cutting-edge research into clinical practice, enriching the educational experience for students and advancing the field of veterinary anaesthesiology.

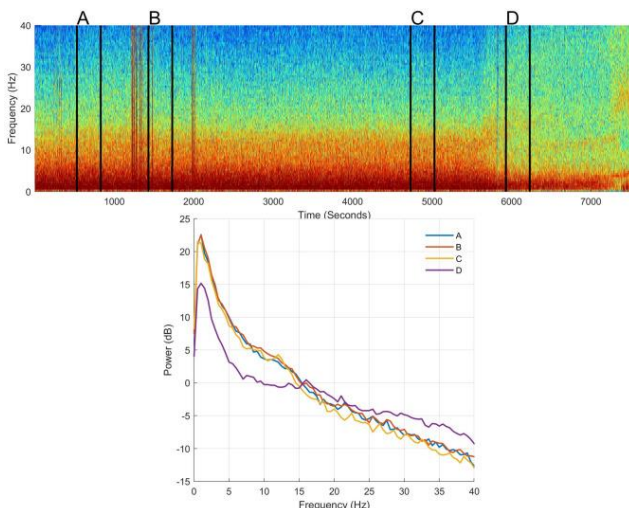
One notable achievement of Prof. Levionnois's research group is the refinement of an animal model for EEG monitoring under general anaesthesia in juvenile pigs. This model not only provides valuable insights for clinical veterinary anaesthesiology but also enhances the quality of experimental data obtained from similar animal models. Their meticulous work includes refining electrode placement to target relevant EEG signals and creating a brain map for transdermal electrode application based on advanced imaging techniques (magnetic resonance imaging, computed tomography) and anatomical knowledge.

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While the methodology of spectrogram analysis is commonly employed to characterize the neurophysiology of sleep in humans, its application during the anaesthetic state is a recent development, particularly novel for veterinary patients.

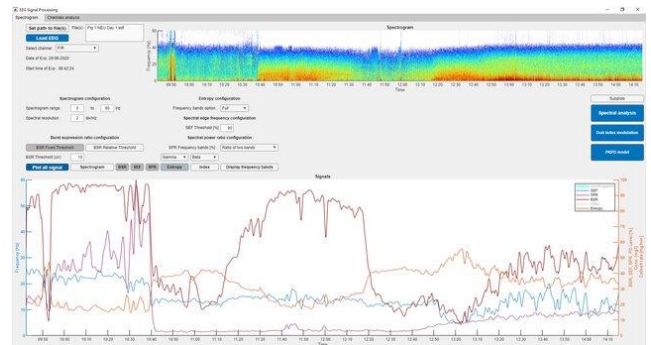


In the depicted graphs, a notable graphical distinction is evident at time point D during recovery from propofol anaesthesia compared to other time points during stable anaesthesia. This spectrogram offers a dynamic, 3-dimensional representation of EEG activity over time, presenting an invaluable tool for anaesthetists. It can aid in decision-

making processes and ensure the maintenance of appropriate depth of anaesthesia, especially crucial during noxious procedures such as surgery.

In collaboration with experts in biomedical engineering, Prof. Levionnois's team developed a tailored digital interface for real-time EEG data collection and analysis. Furthermore, their collaboration with Prof. Alena Simalatsar resulted in the development of a Machine-learning/Deep-learning-generated algorithm for computing an Index of Depth of Anaesthesia, with ongoing investigations into the impact of nociceptive stimulations on EEG parameters.

The ultimate goal of this groundbreaking research is to enhance our understanding of EEG activity in detecting loss of consciousness and gradual depression of the brain induced by anaesthetic drugs. We eagerly anticipate further insights from Prof. Levionnois and his team as they continue their investigations in veterinary anaesthesiology.



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Neuro Robotics Group

Manuela Eugster
Tenure Track Assistant Professor of Robotics and Micromechanics

ARTORG Center, University of Bern & Department of Neurosurgery, Inselspital Bern



My research group focuses on the development of novel surgical instruments for neurosurgery based on robotics and micromechanics technology. Our goal is to develop innovative robotic systems and mechatronic devices to improve the precision, efficiency, and safety of neurosurgical procedures. At the core of our work is the close collaboration with medical professionals, emphasizing the crucial synergy between technological innovation and clinical expertise. This partnership ensures that our developments are seamlessly aligned with the clinical needs of neurosurgery.

My background is mechanical engineering (MSc ETH, ETH Zurich) and biomedical engineering (Dr. sc. med., Medical Faculty, BIROMED-Lab, University of Basel). During my PhD I focused on the robotic challenges developing a system that enables minimally invasive bone-cutting using a laser (Figure 1) [1,2].

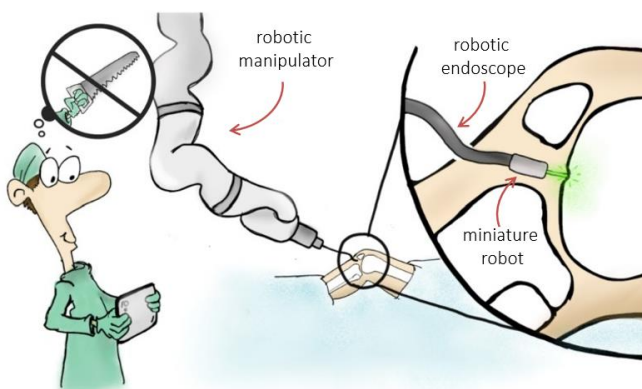


Figure 1: A laser osteotomy system for knee surgery [1].

The developed concept and initial design of the overall mechanical system are conceptually feasible for minimally

invasive applications. The system consists of three robotic system components: a miniature robot [3] capable of positioning a laser with sub-millimeter accuracy on the target tissue (Figure 2), a robotic endoscope [4] with an outer diameter of 8 mm, an inner tool channel of 4.8 mm diameter, and 6 joints capable of inserting and positioning the miniature parallel robot, and a commercially available robotic manipulator that mounts these instruments and is responsible for positioning them on a larger scale relative to the patient.

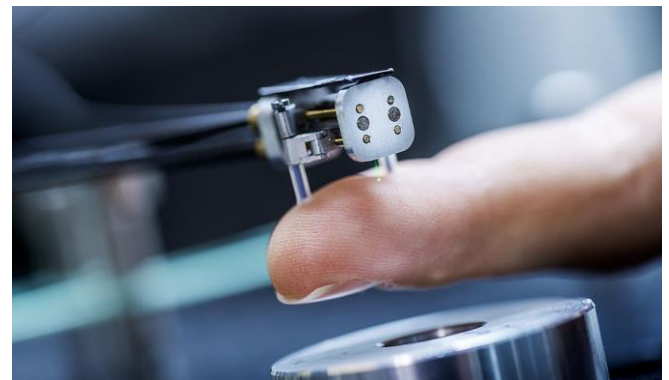


Figure 2: Miniature parallel robot capable of laser positioning. Photograph by Frank Brüderli (Werner Siemens Foundation)

The performance of the miniature robot has caught the interest of dentists and led to an Innosuisse project at the [BIROMED-Lab](#) (University of Basel). This project focuses on precision dentistry, with the goal of creating a miniature robotic device for tooth preparation. The aim is to enable a fully digital treatment workflow, facilitating precise and automated tooth preparation based on digital planning.

I began my assistant professorship in Bern at the end of last year, eager to apply my expertise in mechanical and biomedical engineering to the field of neurosurgery. While most commercially available robotic systems for neurosurgery employ industrial-type manipulators to position surgical instruments externally, research in this field encompasses a broad spectrum of technologies ranging from conventional industrial manipulators to advanced microrobots capable of navigating within the body to address pathologies minimally invasively. My motivation is to bring technical innovation to enhance patient well-being and assist neurosurgeons in their challenges, including limited maneuverability for surgical instruments, delicate tissues, restricted navigation, lengthy procedures, and suboptimal ergonomics.

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In addition to our research activities in the field of neurosurgery, we welcome collaborations with other research groups and aim to support Bern's biomedical research landscape with our robotics and mechatronics expertise.

Researchers require access to specialized tools and facilities to transform their innovative ideas into tangible outcomes. The ARTORG Center addresses this need by providing a comprehensive set of core facilities, including a [mechanical workshop](#), an [electronics laboratory](#), and a [3D-printing facility](#). Do not hesitate to contact us with your requests.

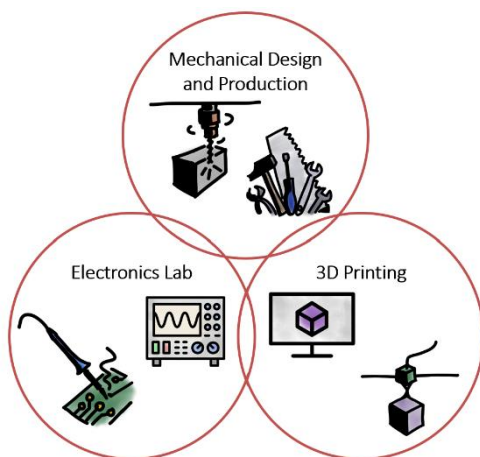


Figure 3: Core facilities of the ARTORG Center. You will find contact information under <https://www.artorg.unibe.ch/services> or you can contact us directly.

References

- [1] Eugster, Manuela. "[Robotic system for accurate minimally invasive laser osteotomy](#)" at - *Automatisierungstechnik*, vol. 70, no. 7, 2022, pp. 676-678.
- [2] Eugster, Manuela, Dissertation „[Robotic system for accurate minimally invasive laser osteotomy](#)“, 2021
- [3] Eugster, M., J.P. Merlet, N. Gerig, P.C. Cattin and G. Rauter. 2022. [Miniature parallel robot with submillimeter positioning accuracy for minimally invasive laser osteotomy](#). *Robotica* 40(4): 1070–1097.
- [4] Eugster, M., C. Duverney, M. Karnam, N. Gerig, P.C. Cattin and G. Rauter. 2022. [Robotic endoscope system for future application in minimally invasive laser osteotomy: first concept evaluation](#). *IEEE Transactions on Medical Robotics and Bionics*.

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Upcoming events

06. September 2024	19 th Annual Meeting
10 th -13 th March 2025	Brain week Bern
12 th March 2025	CNB Poster Session with Apéro
05. September 2025	20 th Annual Meeting

For any inquiries, please contact:

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