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NEUROSCIENCE NIJMEGEN NEWSLETTER

FEAUTURED IN THIS ISSUE

We are Neuroscience Nijmegen. A association focused on offering motivated students the opportunity to learn about new developments within the field of neuroscience and push the boundaries of current knowledge through brand new research.

NEUROSCIENCE NIJMEGEN

In this issue we will go abroad, talk about the homunculus and much more!

Interview Dorothy Zhao

"Do not be scared to get out of your comfort zone and reach out to other people!"

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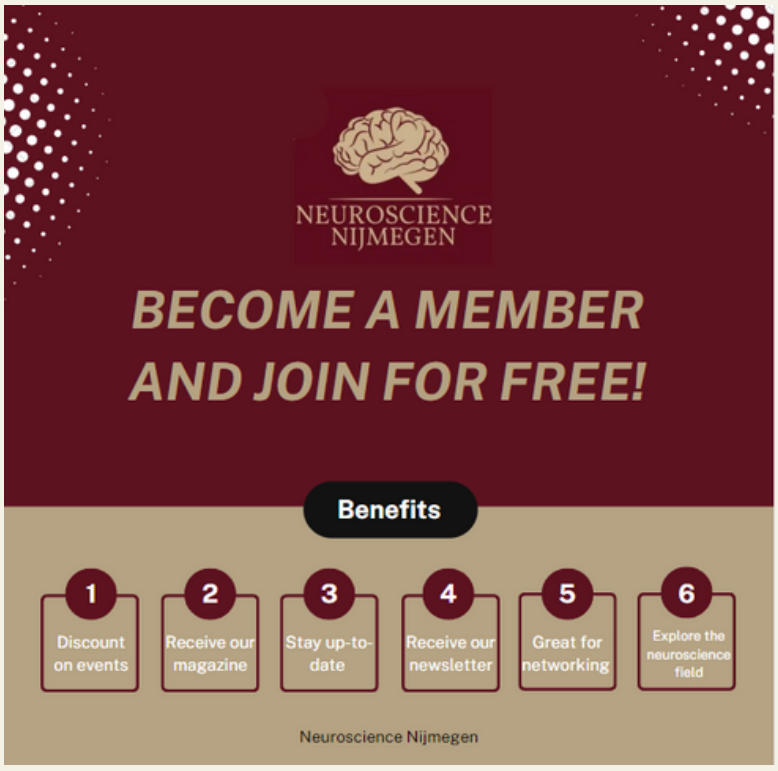
2 THIS YEAR'S ACTIVITIES

In this new academic year, Neuroscience Nijmegen will come with a variety of new activities, which will hopefully enlarge your interest in functional neurosurgery and neuroscience.

Soon we will come with more information about a special activity for the scariest holiday of the year. The subject of this activity will remain a secret for a short while, but stay tuned for more information!

In addition to this special activity, Neuroscience Nijmegen is in touch with an international high ranked university to organize our first international online event. We as Neuroscience Nijmegen hope to come up with a date and time soon about this international online event in collaboration with the University of Oxford. So make sure you are there!

As we have done in the past, another life event will also be hosted within this year. A speaker will present his/her view of a certain topic. What that topic is will remain secret for now, but for those who are fascinated by the human mind, stay tuned!



http://www.neurosciencenijmegen.com/Membership/

A RESEARCH INTERNSHIP AT:

Mount Sinai

The Neuroscience Nijmegen abroad section of the newsletter is dedicated to highlighting personal stories and experiences of members that are studying neuroscience related topics abroad. In this edition we would like to share a brief story about Neuroscience Nijmegen's presence in New York City. Our treasurer, Constantinus van der Wegen is currently interning at the department of vascular neurosurgery at the Mount Sinai Hospital. The Mount Sinai Hospital neurology and neurosurgery department was ranked 9th in the USA. The Mount Sinai hospital system has 3,919 beds, 144 operating rooms and over 43.000 employees.

During this internship he was involved in the COAST study, a multi-centered study which looked at specific medical devices' safety and efficacy when treating vascular aneurysms smaller than 5.0mm. A total of 300 patients from 12 centers from the United States and Canada were included.

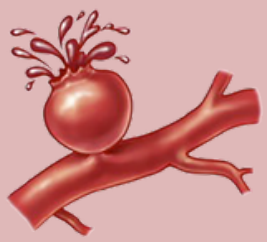
MicroVention's HyperSoft® and HydroSoft® 3D line of coils with sizes from 1 to 5 mm may help reduce the risk of adverse events. HydroSoft® coils are small hydrocoils. Hydrocoils are coils with a gel coating which slowly expand after coming in contact with blood in the aneurysm. The complex shape of both types of coils can help with a more stable framing of the aneurysms. The softness of the coils allows for increased confidence and safety when treating these aneurysms.

When using endovascular treatment to treat small aneurysms (1-6 mm), the risk of adverse events increases. It is difficult not to damage vessels, cause blockages or puncture the aneurysms. Furthermore, because of the small dimensions of the aneurysm it is difficult to secure a coil and fully occlude the aneurysms. The study aimed to prove the safety of treating these small aneurysms.

Aneurysm

An aneurysm is an abnormal swelling or bulge in the wall of a blood vessel, such as an artery.

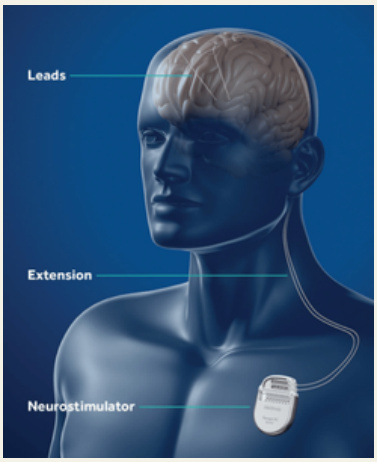
A ruptured anuerysm can lead to a fatal outcome



Along with the involvement in the COAST study, Constantinus was involved in the database management for all strokes that happened in New York City. This database is used for many research projects that range from epidemiology and demographic to the safety of treatments.

Outside of the research Constantinus has also taken action to be part of the Mount Sinai community. He participated with the Mount Sinai Neurosurgery team in the 10th Annual TeamCindy™ 5K Run for Research organized by the Brain Aneurysm Foundation. Currently over 80.000 dollars have been raised. “I found it easy to adjust to the fast paced lifestyle of New York, I was also able to connect with a lot of inspiring people within the field of Neuroscience”.

BEST WISHES FROM NEW YORK



IMPLANTABLE PSYCHOTHERAPY

NEUROMODULATION IN PSYCHIATRIC DISORDERS

A new technique

Most of us have heard of or seen psychotherapy in movies or TV shows. It has been shown to help all manner of psychological disorders. It is often portrayed as an intense treatment that takes a lot of time and is often combined with heavy medication. But psychotherapy does not work for everyone. Research within this field often talks about optimizing or innovating techniques to include those who fall between the cracks. An emerging new technique is the use of neuromodulation and it has already shown promising results.

Psyhoctherapy

To better understand the potential of this new technique we have to understand what psychotherapy is and its strengths and limitations. The American Psychiatric Association describes psychotherapy as follows: “Psychotherapy is a type of treatment that can help individuals experiencing a wide array of mental health conditions and emotional challenges”. Strengths of psychotherapy are helping alleviate symptoms and identify the condition’s cause. This can be followed by helping a person function better and improve emotional well-being and healing.

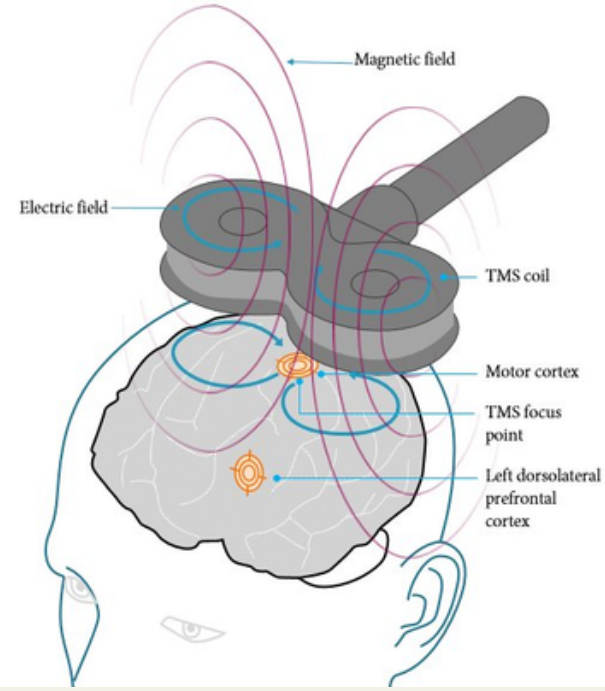
Normally sessions take around an hour and occur once a week which is easily incorporated in most patient’s lives. Limitations are however that for complex problems it may take years to improve mental conditions or patients may not be responsive to therapy at all.

Medication

Along with psychotherapy, medication is also widely used for the treatment of psychological disorders. Medication is designed to latch onto the chemical pathways within the brain that have been found to influence emotions. This direct approach to psychology shows results quickly and has given many people the ability to lead normal lives. There are limitations however are that many of these medications are strong, are not selective to specific brain regions and often have pathways that are not fully understood. The side effects can be severe and unpredictable for this reason. There is also a lot of variety of responses between different people. To find the right medication with the right dosage can take time and can be very frustrating for a patient. Along with this it is also possible that patients are unresponsive to medication altogether.

Neuromodulation

Neuromodulation has emerged as a potential candidate in treating complex psychological disorders. Neuromodulation can be done invasively or non-invasively. An invasive neuromodulation technique is using a chip to send an electrical pulse to a specific area of the brain. This is achieved by placing a small chip on the brain. The chip gives a continuous rhythmic pulse, activating a specific area in the brain. A non-invasive technique is Transcranial Magnetic Resonance. Here a large electromagnetic pulse is focused on a specific area of the brain. This causes an excitatory response of the neurons. The specific pathway is not known but this technique is thought to induce neuroplasticity.



History

Neuromodulation or neurostimulation as a technique is not new. It was used at the end of the 19th century for other disorders such as neuropathic pain with excellent results. Neuropathic pain has different variations of severity and can completely disrupt people's lives. Patients who previously considered suicide due to the constant and unbearable pain have reported strong decreases in pain or even became pain free. These patients are able to rebuild their lives.

Depression

More recent developments have shown that depression, mania, post-traumatic stress disorder, and many more psychological disorders can be treatable with neuromodulation. Clinical trials have shown that patients' symptoms improved such as lower depression scores or improved mood. The continued improvement of neuromodulation techniques has lowered side effects. Neuromodulation has certain limitations however, many neurological pathways are not yet fully understood. This makes it difficult to fully understand the placement of medical devices or the effect that can be expected. There is also variability between patients making it more difficult to standardize procedures. Many neuromodulation techniques are very costly which puts significant financial strain on the medical world. LAstly, due to the many recent advancements more large clinical studies are necessary to fully discover the potential and limitations of neuromodulation.

Conclusion

Neuromodulation has been a therapeutic solution for neuropathic pain and other diseases. Neuromodulation has shown promising results early in its development for psychological disorders. With technological development and large clinical trials we will better understand the potential and limits of this new application. In spite of the undeniable challenges present, there is potential for the inclusion of neuromodulation in the treatment of psychological disorders.

THE CANADIAN NEUROSURGEON: WILDER PENFIELD

In 1891, Wilder Penfield was born in Spokane, Washington. At the age of eight, he and his mother, sister and older brother moved back to Hudson, Wisconsin. His father stayed in Spokane to try re-establishing his medical practice.
The first step in Penfield's scientific career was his attending Princeton University. Next to the fact he was a good student at university, he excelled in sports, was named class president and voted "best all-round man" by his classmates. Penfield decided to pursue medicine during his time at Princeton. In 1914, he received a Rhodes Scholarship and started studying medicine at Merton College of the University of Oxford the following year.

Oxford had a few medical students, because many men were away at war. During his time at Oxford, Penfield became friends with Charles Sherrington. In 1922, Charles Sherrington was knighted and received a Nobel Prize in 1932. This Nobel Prize in Physiology or Medicine was awarded to Sir Charles Scott Sherrington and Edgar Douglas Adrian *"for their discoveries regarding the functions of neurons"*.

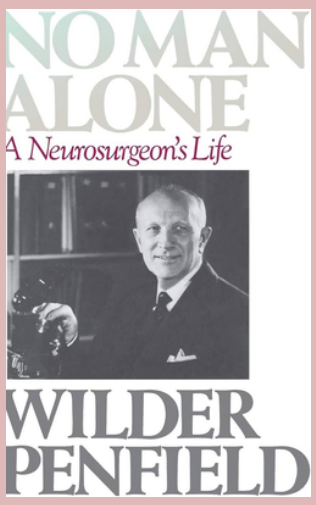
Penfield's first medical experience, serving at a Red Cross hospital in France in 1915, resulted in his fascination and amazement with the art of surgery. After his time at the University of Oxford, Penfield completed his MD at John Hopkins University in Baltimore. Under the supervision of Harvey Cushing, he interned in Boston at Peter Brigham Hospital. He continued practicing surgery for seven years at the New York Presbyterian Hospital, which resulted in a challenging time for Penfield. He faced and became aware at that time the limitations of available surgical procedures. Besides, the death of several patients discouraged him as a person.
Penfield returned to research because of the disenchantment he experienced in his work as a surgeon. In Spain he learned nerve cell staining techniques and in Germany the surgical techniques he would use later to treat his own patients. What later will be explained as the foundation of groundbreaking work for his study on the causes of epilepsy and contemporary surgical methods.
In 1934, Penfield established the Montreal Neurological Institute, "the Neuro", after a decade of fundraising and grant writing. This centre was soon established as the centre for training, research, and treatment of nervous system and brain disorders. Until 1960, Penfield remained director of this institute.

In 1937, the homunculus made his first appearance in the field of neurology. Wilder Penfield and Edwin Boldrey published in Brain the article entitled "Somatic motor and sensory representation in the cerebral cortex of man as studied by electrical stimulation"

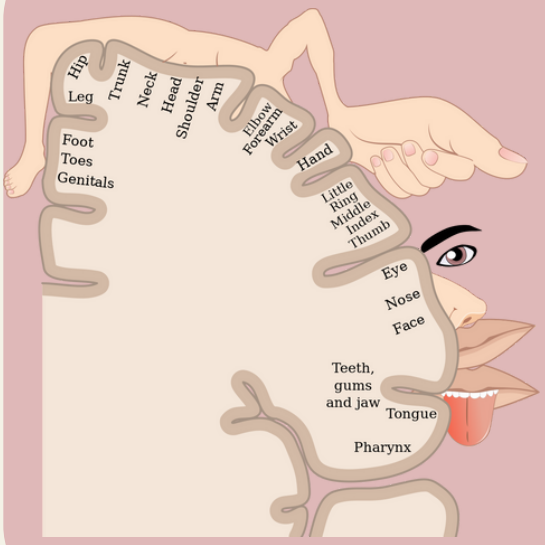
In 1952, “The Montreal procedure”, was published by Penfield and colleagues. This procedure was the first ablative therapy to treat epileptic patients and destroy the cells where seizures originated. By performing this Montreal procedure, Penfield and his team discovered a lot about the human brain. For instance, there is a story of a woman who reported smelling burnt toast before having a seizure. Penfield attempted to find this area of the brain by asking the woman when she was able to smell burnt toast while Penfield was stimulating parts of the brain.

After Penfield retired in 1960, he spent his time writing novels, medical biographies, and articles, traveling the world, lecturing and participating in the Neuro activities. At the age of 85 years, on the 5th of April 1976, Penfield died in Montreal, Canada.

Recommendation:



Penfield's autobiography



Homunculus

The homunculus represents the sensory or motor distribution along the cerebral cortex of the brain. The primary motor cortex is located in the precentral gyrus. The motor homunculus is a map of brain areas dedicated to the motor processing of different body parts.
The primary sensory cortex is located in the poscentral gyrus. The sensory homunculus is a map of brain areas dedicated to the sensory processing of different body parts.

Interested, read more:

References:
1. Alexis, J. (February, 2017). Penfield: the man who mapped the brain https://youngzine.org/news/science/penfield-man-who-mapped-brain
2. The Neuro. Wilder Graves Penfield https://www.mcgill.ca/neuro/about/history/wilder-graves-penfield

Neuroscience meets:

Dorothy Zhao

I am Dorothy Zhao, 20 years old, and an undergraduate student at Michigan State University. I am interested in neuroscience and functional neurosurgery, especially in relation to psychiatric disorders.

"The competition to get into med school is so fierce!" "

Why did you choose, as an undergraduate, to study psychology and neuroscience?

I initially chose to major in psychology, because psychology plays such a huge role in society. No matter what career path I chose, I knew I would be able to apply various psychology concepts to it. I participated in a study abroad programme, Foundations in Neuroscience, the summer after my first year of university. On that program, we went to Florence and London each for two weeks and around four days in Oxford. There I fell in love with neuroscience, especially with its rich history, and became curious about the possibilities of what we can do today. I also discovered functional neurosurgery and neuromodulation during that trip, specifically the use of deep brain stimulation for the treatment of treatment-resistant OCD. That is where I realized all my interests converged. .

Are you currently working on research as an undergraduate?

Right now, I am conducting research in two research labs at my university.

I am working in Dr. Erin Purcell's Regenerative Electrode Interface Lab, where I investigate microelectrode design and how to best design them for compatibility with brain tissue. I also work in Dr. Lisa Linnenbrink-Garcia's MI State Motivate Lab. Here I do research on educational psychology, where I am looking into the relationship between undergraduate cost perceptions and science GPA achievement.

What kind of topics are you interested in?

I am really interested in psychiatric disorders. Mainly, the intersection between functional neurosurgery and psychiatric disorders. Approximately 50% of the global population has a psychiatric diagnosis, of which up to 60% will experience treatment resistance. Therefore, the need for alternative therapies beyond traditional pharmacological interventions is imperative. Deep brain stimulation (DBS) is an extremely promising treatment for these patients, potentially offering a life-saving alternative to those who have yet to find relief through conventional treatments.

See page 2 of the interview

There is not one particular psychiatric disorder that I am specifically interested in, but DBS for depression is one topic that is of special interest to me. Additionally, I am also interested in the neuropsychiatric side effects, e.g., anhedonia, that are often associated with targeting the subthalamic nucleus (STN) in DBS for Parkinson's disease patients. It is fascinating to me on why these effects develop, and how these effects might be prevented. During my internship in Oxford last summer, I worked with my mentor investigating impulsive control disorders as a side effect of STN DBS. Overall, I am eager to explore various opportunities to investigate psychiatric disorders or side effects related to psychiatric disorders in the context of neuromodulation.

"Do not be scared to get out of your comfort zone and reach out to other people!"

What are your plans for the future?

I would like to do my PhD in the next few years at the University of Oxford. Broadly, I hope to investigate anhedonia as a side effect of Parkinson's disease patients treated with subthalamic nucleus deep brain stimulation. I am interested in pursuing my PhD at Oxford for multiple reasons. Mainly, I found it quite tricky to find a lab that does work on DBS for psychiatric disorders. Currently in Oxford, they have a few projects in that area which are of great interest to me. Additionally, as an aspiring physician, I would like to learn more about the different system of healthcare in the UK (when compared to the US) and therefore, broaden my view on health care.

Do you have any advice for young students who have an interest in neuroscience?

First of all, I would like to say, do not be scared to reach out to other people. I know that it can be very daunting, but most people are very welcoming and helpful regardless of if they are graduate students or professors. Just remember that they too also most likely experienced where you are at this moment in your career. I know that most students worry about their background, but in my own experience you shouldn't necessarily treat that as a limitation. Instead, I believe your motivation and determination matters most! And if you do not know where to start, just get involved in something that is of interest to you now, dig deep, and I'm sure you will find opportunities in whatever field you are most interested in. Immerse yourself!

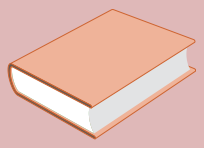
Our favourites

OUR FAVOURITES OUR FAVOURITES OUR FAVOURITES OUR FAVOURITES

To watch:

Emergency NYC

To read



When the air hits your brain: tales of neurosurgery

OUR FAVOURITES OUR FAVOURITES OUR FAVOURITES OUR FAVOURITES

Are you interested in our activities and would you like to be kept informed of any developments? Follow our socials and we will keep you posted!

We hope you enjoyed reading this newsletter!
Best wishes from the Neuroscience team
(Constantijn, Frédérique, Jeffrey, Jeremy, Lara, Maud en Stijn)

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