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EDITORIAL

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ENCODS: A novel initiative to inspire young neuroscientists

1 | INTRODUCTION

The European Neuroscience Conference by Doctoral Students (ENCODS) is a novel and unconventional scientific conference organized by and for doctoral neuroscience students from around the world. In this way, ENCODS intends to meet the interests of young researchers and promotes the exchange of personal experiences and the establishment of research networks at an early career stage. With its focus on the next generation of neuroscientists, this conference has a special emphasis on currents trends and future developments in the field. In 2018, a team of doctoral students from Essen and Berlin organized and hosted ENCODS in Berlin.

The first edition of ENCODS was held in France in 2012, when doctoral students, Silvia Viana da Silva and Matthias Haberl, decided to organize a conference to maximize benefits for doctoral students. To this aim, the conference embraced a wide range of fields in neuroscience to allow the students to broaden their perspective and develop their own focus in a future career. Furthermore, ENCODS intended to create a safe conference space where students feel confident to engage in discussions by inviting an audience of mostly junior researchers and a few selected senior scientists. Initially, the organizers thought of this experience as a single event, but enthusiastic participants from the first edition offered to continue the format of a neuroscience conference tailored for doctoral students. Since then, five versions of the conference have been held in different countries (2013/France, 2015/Portugal, 2016/Denmark, 2017/Spain and 2018/Germany). Since 2016, ENCODS is an official partner of the Federation of European Neuroscience Societies (FENS), which is the reason why every second year the event takes place in the same city as the FENS Forum.

There are three aspects that make ENCODS a novel and unconventional academic setting. First, the conference focuses on the needs and interests of neuroscientists at the doctoral level. Second, neuroscience doctoral students from the host country volunteer to organize the conference. They take responsibility for each step in setting up the conference, ranging from fundraising and program establishment, over publicity to contact with speakers. Finally, each team develops ENCODS from scratch. Apart from focusing on neurosciences, there are no predetermined formats, allowing organizers and future neuroscientists to innovate and evolve from year to year. In this meeting report, we expose some insights on the characteristics of the conference.

2 | ENCODS2018: THE ROAD AHEAD

The last edition of ENCODS took place in Berlin on 5th and 6th July 2018, and was held in Akademie Berlin-Schmöckwitz on the outskirts of the city. The event was attended by 76 doctoral students from 28 countries covering a wide variety of neuroscience research areas. Under the title 'The road ahead', we decided to involve our peers in a discussion about the future of neuroscience. First, researchers with expertise in cutting-edge areas addressed recent influential advances in imaging, computational modelling and mental health. Second, through four workshops the participants had the opportunity to improve career-specific skills and acquire useful tools for good scientific practice. Third, the meeting featured an 'unconference part,' which unlike the conventional conference format seeks to involve participants actively in the generation of content within the event. Finally, in a Science&Society session, neuroscience met arts. A film maker, a dancer and a musician shared how embodied cognition influenced their work on mental illness and learning.

3 | KEYNOTES: AN INSIGHT TO FUTURE NEUROSCIENCE

Following the theme 'The road ahead,' we invited experts in fields who will shape the careers of young neuroscientists in the coming years. ENCODS featured four keynote speakers (Thomas Knöpfel, Sakyasinga Dasgupta, Nancy Ip and Elisabeth Binder), who gave introductory talks on novel imaging methods, computational modelling and the future of health.

Over the past decade, the exploration of brain circuits through different imaging methods has become an important and illuminating field of research in the neurosciences (Pastrana, 2013). This approach provides insight for the understanding of phenomena such as the establishment of motor pathways (Economo et al., 2018), social behaviours (Benekareddy et al., 2018) and pathologies such

as post-traumatic stress disorder (Fenster, Lebois, Ressler, & Suh, 2018), Parkinson's disease (Ridler, 2019) and Alzheimer's disease (Busche & Konnerth, 2016).

Thomas Knöpfel, Chair in Optogenetics and Circuit Neurosciences from the Imperial College London, shared his experiences in the field of optogenetics. Optogenetics is a technique that has broken the borders between genetics, electrophysiology and brain imaging, allowing scientists to unravel structure and function of neural circuits by modifying cellular behaviour using light (Fenno, Yizhar, & Deisseroth, 2011). Knöpfel emphasized that although optogenetics allows the generation and recording of electrical signals, this does not imply neglecting classical electrophysiology. On the contrary, by using them together, we can overcome obstacles such as limitations in the number of cells that can be stimulated, spatial and temporal resolution, or recording depth and identification of cells (Knöpfel, 2012).

In the same way, he made clear that optogenetics faces further challenges. For instance, it is necessary to develop voltage sensitive dyes that allow to observe the whole spectrum of spiking activity of neurons, and find ways to determine the resting state of the cells, as the technique itself modifies cell properties. Two important challenges for the future of optogenetics will be the use of wavelengths other than visible such as infrared, and the development of more specific genetic mechanisms that allows finer control of cell properties or circuits. Finally, Knöpfel called participants to integrate technical and theoretical approaches. As optogenetics only shows correlations with behaviour, there is still a long way to unravel cause-effect aspects in the understanding of normal and pathological brain function.

'Can we create an algorithm that allows a non-biological organism to think or remember?,' asked Sakya Dasgupta at the beginning of his talk on computational modelling in neuroscience. Previously a researcher in theoretical neuroscience for many years, Sakya Dasgupta currently works as Chief Technology Officer at Neuri PTI LTD, a company developing artificial intelligence for financial markets. He shared with the participants how to apply research in theoretical neuroscience on memory and learning problems to develop more efficient training routines for artificial networks in robots and trading. Robotics and artificial intelligence (AI) not only need contributions from engineering, but also from disciplines such as neuroscience. In this regard, Dasgupta pointed out the large gap between the abilities of today's AI systems and biological brains. In learning, for example, AI systems require large amounts of data, whereas biological systems generally need few examples to learn a task. Brains can generalize, building models of the world which include fundamental concepts like gravity. In contrast, AI systems drive cars and detect cancer without any understanding of physics or medicine. This gap is both a research question and a large potential job market for neuroscientists in the future, given the demand for ever more complex automation and robotics.

The third big theme discussed at the conference was how neuroscience will shape the future of health. Prof. Elisabeth Binder and Prof. Nancy IP pointed out different directions in which neuroscience could develop regarding mental health and neurodegenerative diseases. Ip, the Director of the State Key Laboratory of Molecular Neuroscience at the Hong Kong University of Science and Technology (HKUST), focusses her research on synaptic dysfunction and neuroinflammation in the context of Alzheimer's disease to unravel the mechanisms behind this disease that affects nearly 44 million people worldwide. Surprisingly, important insights for Prof. Ip's work on the ephrine inhibitor, a potential therapeutic treatment for Alzheimer's disease, came from ancient Chinese medicine. A take-home message was that re-examination of ancient knowledge could be useful to face present-day research questions.

Prof. Binder, currently the director of the Department of Translational Research of the Max Planck Institute of Psychiatry in Munich, Germany, offered the participants an insight into how personalized medicine would become increasingly important, especially in the field of mental health. Binder's lab focuses on epigenetic research where they study the interaction between genes and environment. Her research shows that current health professionals group patients into a similar category even though they might have different underlying disease mechanisms. As a leader in translational medicine, she believes that current treatment strategies should be complemented with an individual approach (Matosin, Halldorsdottir, & Binder, 2018).

4 | WORKSHOPS: MAKING NEUROSCIENCE A BETTER DISCIPLINE

ENCODS2018 offered four different workshops. Soft skills in academia (Anna Elena Pepe) and the Publication Process workshop (Paul Bolam, EJN) trained the essential skills that scientists require to share their work with peers or the general public. Anna Elena Pepe, a transformational coach and founder of Phoebus Coaching, shared how to achieve effective communication among scientists at all levels, from the working setting to international conferences with the participants. She drew attention on identifying how different people communicate by default, and provided some hints for assertive communication employing a flexible attitude. Participants understood that listening is fundamental to communication and build trust, as well as deal with emotions and provide and receive feedback. Through practical exercises, doctoral students had the opportunity to improve aspects such as their visual, vocal and verbal behaviour when addressing

an audience. Most participants agreed on the importance of training their presentation skills in an environment where both, the speaker and the audience, feel comfortable enough to express doubts, ask questions freely and give and receive constructive feedback.

On the other hand, the workshops on experimental design (Chris Hartgerink) and Open Science (Bianca Kramer and Jeroen Bosman) addressed a specific problem that current science faces: the crisis of reproducibility and scientific malpractice. Although some researchers even dismiss this problem (Fanelli, 2018), since the beginning of the millennium it has been widely shown that reproducibility and bias in scientific publications are undermining science practice (Ioannidis, 2005). However, insufficient action has been taken, and the academic and publishing system continues to encourage what might be called 'bad science' (Begley, Buchan, & Dirnagl, 2015; Smaldino & McElreath, 2016). Among the many aspects involved, stands out the inadequate design of experiments and the non-availability of original data (Button et al., 2013; Holman et al., 2016).

Regarding scientific reproducibility, Chris Hartgerink provided ENCODS participants with insights and tools to improve experimental design. Three important aspects came to light. First, the effective need to make an experimental design based on power calculations to estimate the number of animals needed to observe a given effect if it is present. Second, the need for statistical analyses that fit the characteristics of each experiment and sample, not the tradition of the laboratory. And finally, the importance of using tools such as the pre-registration offered by the Open Science Framework (Open Science Framework, 2019) or journals such as the European Neuroscience Journal, to promote scientific research with quality and transparency (van der Steen et al., 2018). One interesting input from the attendees was that most of them were not aware of the standard steps needed to design an experiment, but are guided only by previous experiences or advice from their co-workers.

In an attempt to counteract scientific malpractice, many initiatives have formed in the last decade promoting open science. In the open science workshop, Bianca Kramer and Jeroen Bosman from the Utrecht University Library emphasized that making science open and public, strongly contributes to the advancement of research and removes unnecessary barriers between scientists. During the session they introduced participants to tools like Zenodo, Figshare, Open Science Framework, Github and other valuable tools that researchers can use to make their research results public at any step (Kramer & Bosman, 2019). The joint discussion showed that although doctoral students support data sharing or open access publishing, they face difficulties when they try to change habits in their laboratories and are often unaware of ways to make their research open. In the final round, the workshop leaders invited the participants to think of a practical step that would make their own research more open such as uploading their last conference poster on figshare or proposing an open access journal to their co-authors.

In recent years, different benefits of open science have been exposed (Gewin, 2016), not only for basic research (Magee, May, & Moore, 2014), but also for the development of technology and the implementation of public policies in fields as delicate as energy, health or global warming. The workshops revealed vivid interest of the doctoral students in better tools for experimental design and the movement of open science. The digital age offers a wide range of tooling, but scientists have to be trained to use them. With training events such as ENCODS, the next generation of neuroscientists can change current habits and make their scientific data public and scrutinizable by anyone. During the discussions at the conference, a general agreement was that open science is the guide to progress.

5 | UNCONFERENCE: A SUCCESSFUL FORMAT FOR SHARING EXPERIENCES AND INTERESTS

In an 'unconference,' participants actively create content and self-organize to address common interests. As a participant-driven event, unconferences are bottom-up events, reversing the top-down character of a classical scientific meeting. At ENCODS, the unconference afternoon aimed to create a space where the doctoral students could bring forward their own interests and address them in direct and intense exchange with their peers. But as a novel meeting format, unconferences could also prove valuable at other scientific gatherings. Therefore, the following short introduction to how the event was organized hopefully facilitates adopting it at other events.

At the conference, we followed the approach of the unconference facilitator Harrison Owen, who proposed the open space format to prepare the ground for a successful self-organized meeting (Harrison, 2019). At the beginning of the unconference, the participants gather and create a schedule. Each participant can propose a session and announce a time and location. The duration of a session is 45 min, but during this time a session has no further constraints in addressing its topic. The same freedom holds for the session topics, which can range from technical discussions to dancing or yoga experiences. During the sessions, four simple rules help to have a productive and enjoyable atmosphere: (a) Whoever comes is the right people. (b) Whatever happens is the only thing that could have. (c) Whenever it starts is the right time. (d) When it's over it's over. A valuable resource for setting open an unconference is the collection of 'Ten simple rules for organizing an unconference' (Budd et al., 2015).

Bottom-up events thrive when participants are engaged and take initiative. And at ENCODS, the doctoral students were indeed enthusiastic about the open space format. The participants proposed more than 40 sessions divided into 10 parallel tracks and four time slots. In all their diversity, sessions revolved around five themes. First, they deepened key concepts from the previous talks and workshops. For example, a session on 'AI insights in neuroscience,' where the students drew inspiration from the talk by Sakya Dasgupta about the application of neuroscience in robotics and machine learning in neuroscience. Second, the students addressed practical topics from their own research: water maze protocols, growing astrocytes and independent component analysis in fMRI, among others. Third, some sessions focused on strategies to overcome the difficulties in completing doctoral studies like 'breaking the pessimism' and 'time management and work life balance'. A fourth focus was neuroscience and society, where students discussed how modern science can contribute to popular topics like meditation. Lastly, students participated in experience-driven sessions like salsa and Scottish folk dance classes, a field trip, or watching the world championship quarter-finals. All sessions are available in the conference wiki (ENCODS2018, 2019).

The unconference was a highlight and will be continued in the 2019 edition. As unconferences are still rare in scientific meetings, ENCODS aimed to popularize this format among future neuroscientists as a way to facilitate interdisciplinary exchange and give participants a stronger voice in a meeting. As the bottom-up character of an unconference addresses a common shortcoming of classical conferences, participants have already brought the format to other neuroscience meetings such as the PhD symposium at the 2018 Bernstein Conference of Computational Neuroscience (Bernstein Conference, 2018).

6 | SCIENCE AND SOCIETY: WHAT SCIENCE CAN LEARN FROM ARTS

Our aim was to spice up the conference and create a space that would surprise and inspire the participants. To this aim, we included the Science&Society session which featured artistic perspectives on brain science (Schering Stiftung, 2019). The Science&Society series, an initiative of the Schering Foundation Berlin, supports natural science conferences which include sociological, philosophical, ethical or artistic perspectives. Scientists and artists have several ideas and experiences to share, but there are few academic spaces that bring them together. We believe our conference was an exception. In the session 'Methods of an Embodied Mind' developed and curated by Lindsay Petley-Ragan, we had the cinematographer and producer Kalina Bertin, the dancer and therapist Carolien Hermans, and musician and educator Luc Nijs as guests. A common interest in their work is embodied cognition, the relation of mind and body, which they explore in virtual reality, dance and music.

The Canadian filmmaker Kalina Bertin inspired young neuroscientists by presenting her video-documentary research on the history of mental illness in her own family (Bertin 2018a), and presented her virtual reality application ManicVR that allows the user an immersion in the 'reality' of a person suffering from bipolar disorder (Bertin, 2018b). These were an unprecedented demonstration of how artistic knowledge can be translated into tools that science can use for the diagnosis, understanding and treatment of psychopathologies such as the bipolar disorder suffered by Kalina's siblings. Although in this decade virtual reality has been recognized as a tool to treat different phobias and mental disorders (Freeman et al., 2017, 2018), the experience that Kalina shared with the participants aroused the interest of the attendees about this application.

Carolien Hermans, a choreographer and dance pedagogue based in Amsterdam, explained how she uses dance as a tool to work with children with special needs. 'Dance and music are two tools that affect the brain in different ways…. rhythm is very important,' she said. She sees dance as a way to approach the mind via the body and employs a model of active cognition called participatory sense-making: 'We are not aware of this, but when we dance, we anticipate movements and when we work with the children we can observe and analyze these behaviors.' Exemplary of her work, she brought a collection of videos of dance classes with autistic children.

Luc Nijs, musicologist from the Ghent University, shared his approach to a key question in neuroscience: how do we learn? As a musician and educator, he observed that students who move, when they practice an instrument, tend to learn faster. According to Luc Nijs, music naturally engages movement, so that moving enriches the experience of playing an instrument and allows for 'flow.' Flow is a state of mind, where we focus on what we do instead of how we do it. And in flow, we learn more effectively. Motivated by the flow theory, Luc searched for technological ways to improve learning and created the music paint machine (Nijs, 2019; Nijs et al., 2012) which students could try throughout ENCODS. The music paint machine combines the movement and instrument sounds created by a musician into brush strokes on a canvas.

Along the aspects of mental illness, dance and music, the Science&Society session showed an instructive picture of embodied cognition. The body is an important door to the mind. Via the first-body experience using virtual reality, the creation 'ManicVR' of Kalina Bertin enables a unique view and understanding of bipolar disorder. In dance, Carolien Hermanns taught participants how the mind becomes visible in the way it moves the body. Finally, Luc Nijs demonstrated how movement can facilitate learning as a musician. In their

talks, the speakers demonstrated that art could be used to enhance the understanding of the public of mental diseases or to illustrate scientific concepts. Dance, music or film make science more relatable, which is crucial when fields like neuroscience develop a growing impact on society. An interesting thought from the final discussion was that scientists often neglect their bodies as a medium for thinking. Science happens mostly exclusively in our heads, when we sit motionless in front of a display, only to occasionally move the mouse or press a key. An often told story says that Albert Einstein discovered special relativity while imagining he was sitting on a light ray. In a similar way, virtual reality and computer simulations could boost science by making it a more bodily experience, enabling scientists to literally walk through a text, listen to data in form of music or dance an analysis.

7 | CONCLUSION AND PREVIEW OF NEXT ENCODS

In the conference landscape of neuroscience, ENCODS puts a unique emphasis on the interests of doctoral students. Whereas other training opportunities are often the initiative of engaged senior researchers, this conference originates from the vision of doctoral students themselves. Each year, a new group of volunteering doctoral students from the host country organizes a new edition. In this way, ENCODS offers a playground for innovative meeting formats and continuously adapts as a platform for the next generation of neuroscientists. In addressing doctoral students from all fields of neuroscience, this conference builds bridges between different research communities and acts as a window into the future of neuroscience.

At ENCODS2018 in Berlin, the doctoral students experienced a conference setting quite different from the ordinary, in which they explored their road ahead in neuroscience. First, ENCODS questioned the format of classical scientific meetings and put alternatives to the test. Whereas the mornings followed a classical conference scheme with invited speakers, the afternoon program had the motto 'talk to each other instead of being talked at.' In this regard, the 'unconference' afternoon at ENCODS proved to be a strong catalyst for peer-to-peer exchange and succeeded in reversing the classical top-down into a participative bottom-up. Second, in workshops on different themes, the doctoral students showed strong interest in ways to address shortcomings of current scientific practice like the lack of reproducibility and transparency. Like in other fields, future neuroscientists will need to embrace the tools of a digital world and make their science more open, for example, by sharing their analysis code and data. Finally, the Science&Society session engaged the doctoral students in a dialogue between arts and science. More than any other natural science, neuroscience touches our picture of what it means to be human and needs to engage into a dialogue with the arts.

When we volunteered to organize this version of ENCODS, we had the vision of a conference that feels like a science festival, where participants experiment, learn and experience. At the end, the participants described the experience as a 'friendly atmosphere; open mindedness; acceptance and tolerance; enthusiasm and energy of participants.' With this feedback, we would like to encourage future organizers of ENCODS, but also the heads of more established conferences, to continue to explore novel ways to engage participants in scientific discussions and make conferences fun.

This year, ENCODS will be held in London, a city with one of the largest and diverse neuroscience communities in the world. Organized by and for early career researchers, this edition will be a unique forum for learning, interaction and interdisciplinary conversations. Held at the newly opened Francis Crick Institute on the 24th and 25th June, participants will have the chance to interact with internationally renowned scientists and peers, fostering discussions, collaborations and excitement about science. The Nobel Laureate and father of systems neuroscience, John O' Keefe, headlines an exciting programme of talks by world-leading neuroscientists, skills workshops and career sessions. Participants are at the heart of the programme and every attendee will get a chance to present a poster or give a talk, guaranteeing everyone will come away with a new skill, experience or useful piece of feedback. Ultimately, ENCODS 2019 aims at an enjoyable, career-making doctoral student meeting that brings together the diversity of European neuroscience in the lively, world-leading city of London.

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CONFLICT OF INTEREST

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REFERENCES

Begley, G., Buchan, A. M., & Dirnagl, U. (2015). Robust research: Institutions must do their part for reproducibility. *Nature*, *125*, 25–27.

Benekareddy, M., Stachniak, T. J., Bruns, A., Knoflach, F., von Kienlin, M., Künnecke, B., & Ghosh, A. (2018). Identification of a Corticohabenular Circuit Regulating Socially Directed Behavior. *Biological Psychiatry*, *83*, 607–617.

Bernstein Conference (2018). PhD symposium. Retrieved from https://www.bernstein-network.de/en/bernstein-conference/past-conferences/2018/phd-symposium

Bertin (2018a). Manic. Retrieved from https://vimeo.com/ondemand/manic

Bertin (2018b). ManicVR. Retrieved from http://www.kalinabertin.com/manic-vr/

Budd, A., Dinkel, H., Corpas, M., Fuller, J. C., Rubinat, L., Devos, D. P., … Wood, N. T. (2015). Ten simple rules for organizing an unconference. *PLOS Computational Biology*, *11*, e1003905.

Busche, M. A., & Konnerth, A. (2016). Impairments of neural circuit function in Alzheimer's disease. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *371,* 20150429.

Button, K. S., Ioannidis, J. P. A., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S. J., & Munafò, M. R. (2013). Power failure: Why small sample size undermines the reliability of neuroscience. *Nature Reviews Neuroscience*, *14*, 365.

Economo, M. N., Viswanathan, S., Tasic, B., Bas, E., Winnubst, J., Menon, V., … Svoboda, K. (2018). Distinct descending motor cortex pathways and their roles in movement. *Nature*, *563*, 79–84.

ENCODS2018 (2019). Unconference. Retrieved from https://sites.google.com/view/encods2018/general-info/program/Unconference

Fanelli, D. (2018). Opinion: Is science really facing a reproducibility crisis, and do we need it to? *PNAS*, *115*, 2628–2631.

Fenno, L., Yizhar, O., & Deisseroth, K. (2011). The development and application of optogenetics. *Annual Review of Neuroscience*, *34*, 389–412.

Fenster, R. J., Lebois, L. A. M., Ressler, K. J., & Suh, J. (2018). Brain circuit dysfunction in post-traumatic stress disorder: From mouse to man. *Nature Reviews Neuroscience*, *19*, 535–551.

Freeman, D., Haselton, P., Freeman, J., Spanlang, B., Kishore, S., Albery, E., … Nickless, A. (2018). Automated psychological therapy using immersive virtual reality for treatment of fear of heights: A single-blind, parallel-group, randomised controlled trial. *Lancet Psychiatry*, *5*, 625–632.

Freeman, D., Reeve, S., Robinson, A., Ehlers, A., Clark, D., Spanlang, B., & Slater, M. (2017). Virtual reality in the assessment, understanding, and treatment of mental health disorders. *Psychological Medicine*, *47*, 2393–2400.

Gewin, V. (2016). Data sharing: An open mind on open data. *Nature*, *529*, 117–119.

Harrison, O. (2019). Opening space for emerging order. Retrieved from https://www.openspaceworld.com/brief_history.htm

Holman, C., Piper, S. K., Grittner, U., Diamantaras, A. A., Kimmelman, J., Siegerink, B., & Dirnagl, U. (2016). Where have all the rodents gone? The effects of attrition in experimental research on cancer and stroke. *PLOS Biology*, *14*, e1002331.

Ioannidis, J. P. A. (2005). Why most published research findings are false. *PLOS Medicine*, *2*, e124.

Knöpfel, T. (2012). Genetically encoded optical indicators for the analysis of neuronal circuits. *Nature Reviews Neuroscience*, *13*, 687.

Kramer, B., & Bosman, J. (2019). Innovations in scholarly communication. Retrieved from https://101innovations.wordpress.com

Magee, A. F., May, M. R., & Moore, B. R. (2014). The dawn of open access to phylogenetic data. *PLoS ONE*, *9*, e110268.

Matosin, N., Halldorsdottir, T., & Binder, E. B. (2018). Understanding the molecular mechanisms underpinning gene by environment interactions in psychiatric disorders: The FKBP5 model. *Biological Psychiatry, Molecular Signatures of Stress and Posttraumatic Stress Disorder*, *83*, 821–830.

Nijs, L. (2019). The music paint machine. Retrieved from http://www.musicpaintmachine.be/

Nijs, L., Coussement, P., Moens, B., Amelinck, D., Lesaffre, M., & Leman, M. (2012). Interacting with the Music Paint Machine: Relating the constructs of flow experience and presence. *Interacting with Computers*, *24*, 237–250.

Open Science Framework (2019). Register your project. http://help.osf.io/m/registrations/l/524205-register-your-project

Pastrana, R. (Ed) (2013). Focus on brain mapping. *Nature Methods*, *10*, 481.

Ridler, C. (2019). Parkinson disease gene therapy rewires brain circuits to improve motor function. *Nature Reviews. Neurology*, *15*, 2.

Schering Stiftung (2019). Science & Society Sessions New perspectives in the natural sciences or life sciences. Retrieved from https://scheringstiftung.de/en/programm/dialog/veranstaltungen/science-society/

Smaldino, P. E., & McElreath, R. (2016). The natural selection of bad science. *Royal Society Open Science*, *3*, 160384.

van der Steen, J. T., van den Bogert, C. A., van Soest-Poortvliet, M. C., Fazeli Farsani, S., Otten, R. H. J., ter Riet, G., & Bouter, L. M. (2018). Determinants of selective reporting: A taxonomy based on content analysis of a random selection of the literature. *PLoS ONE*, *13*, e0188247.