Spirituality in Science
Editorial

Is spirituality a topic that neuroscience should shun? We don’t think so! That’s why the September issue of the CNS newsletter is taking a closer look. Besides exploring what religiosity looks like in your brain (pages 3 and 13), we invite you on a journey through the world of psychoactive drugs and plants (pages 6 and 7). But, as our frequent readers know, that’s not where we stop. We looked at what religion itself (page 11) and several “spiritual” practices can do for your mental (and physical) health, including fasting (page 14), meditation (page 5) and yoga (page 12). As a special treat for you, we also sat down with neuroscientists from Berlin to find out how they relate to faith (pages 8-9).

While some people struggle with bringing the spiritual and the worldly together in the workplace, we don’t! In fact, this issue features one of the longest career sections in the history of our newsletter. We are excited to cover an interview with a neuroscientist-turned-yoga-teacher (pages 16-17), a recap of this year’s BioBusiness Summer School and annual Neurasmus meeting (page 18) and show you how to use activating teaching methods (page 19). And if you don’t agree with our take, we will even show you how to call BS (page 20).

Want to find out more? Grab a copy of this issue, lean back and enjoy. Amen, Namaste, Salem Aleikum, Shalom and happy reading!

Helge Hasselmann & Constance Holman
Co-editors-in-chief

Contest

Like what you see? Interested in contributing? We are always looking for new authors and submission on anything related to the topic of neuroscience. Send us an article, some beautiful shots from your microscope, poems, short stories, critiques, reviews – anything! The best contribution will be rewarded with the book Advice for a Young Investigator by Santiago Ramón y Cajal.

Come on and write like there’s no tomorrow! Send your contribution to cns-newsletter@charite.de to win. Deadline for submission for the next issue is October 20th.

This issue’s winner is Ioana Weber, who not only wrote a great article on being a better teacher, but also provided us with our beautiful cover.

Congratulations, and thank you very much for your contributions!
What makes humans religious? There must be something about our brain that makes religion a common denominator of humanity. Is there some area in our brain dedicated to the perception of the divine? Or maybe it is all just in our minds. Studying the neural correlates of religious behavior is no easy task, but some scientists have dared to address these questions.

To Believe Or Not Believe, Is That the Question?

How can we study the neural underpinnings of religion, this complex cultural phenomenon that affects many aspects of human behavior? Well, we can start by asking people if they believe in it. It is assumed that having faith is a prerequisite to comprehend and find relevance in religious activity. Whether or not faith and belief are the same thing is an ongoing debate in theology. Nevertheless, it is obvious that religious people believe that the specific word view provided by their religion is true. Therefore, an important area of research has focused on the neural correlates of what is happening in the brain when you judge a statement as true or false.

Interestingly, in a study in which subjects were asked to rate different kinds of statements as true, false or undecided, agreement generally activated the same brain area: the ventromedial prefrontal cortex (vmPFC) [1]. The vmPFC is strongly connected to the limbic system and incorporates emotional and reward associations to factual knowledge and reasoning tasks. This means that the act of agreeing with a statement, be it “2+2=4” or “Jesus is the son of God”, activates the same area of the brain linked with positive emotions. In contrast, rejecting a statement as false differentially activated areas associated with feelings of disgust, such as the anterior insula, an area involved in the perception of pain and unpleasant odors.

In another study [2], the same group compared the brain activity of Christians and non-believers when agreeing or disagreeing with religious and non-religious statements. The answers (either true or false) to non-religious statements activated temporal areas of the brain associated with memory retrieval like the hippocampus, while the answers to religious statements activated similar areas of the brain found for disagreement in the previous study (likely from non-believers). In addition, the posterior medial cortex was activated, an area that is associated with the evaluation of self. That means that the participants were affirming their identity when agreeing or disagreeing with religious statements.

Also interesting was the response to blasphemous statements like “the Biblical God is a myth”. The ventral striatum, a critical component of the reward system, was highly activated when believers rejected the blasphemy as false as well as when non-believers accepted the blasphemy as true. These findings make sense as we all know how Christians enjoy rejecting blasphemies while non-believers seem to take special pleasure in affirming them.

Talking To God – As a Friend

A key belief across religions is in the capacity to communicate with their God(s) through prayer. It was shown that praying, both through “official” religious texts and personal prayer, activates the reward system, specifically the dorsal striatum, which is associated with the expectation of future rewards and habit maintenance [3]. Interestingly, personal prayer activates areas of social cognition. In a study that compared personal prayer versus the Lord’s Prayer (an important part of Christian religious ceremonies) or making wishes to Santa Claus in committed Christians (who believed in God but not in Santa), it was found that personal prayer differentially activates the temporoparietal junction, temporopolar region and the anterior mPFC. These three regions have been described as the “theory of mind” (ToM) areas, which are active when thinking about other people’s emotions and intentions [4]. This indicates that personal prayers imitate everyday social communication with real persons and provides God with intent and reciprocity (all the participants affirmed that God answered their prayer in some way). Indeed, it was found in another study that the activation of the ToM areas occurred before the activation of other non-ToM areas when accepting religious statements [5].

So far, no “God brain area” has been found. However, these findings tell us that religious people are no different than non-religious in the process of believing or disbelieving, which always comes with an emotional tone. In addition, it seems that religious thoughts are strongly linked to identity and social cognition. Interestingly, this supports theories from evolutionary psychology that religiousness might have emerged as a by-product of increasingly sophisticated ToM areas [6]. In other words: if there really is a God or other holy figure(s), it might just as well be that we believe in them “by (evolutionary) chance”.

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(1) Harris et al, Ann Neurol, 2008
(2) Harris et al, Plos One, 2009
(4) Schjoedt et al, Soc Cogn Affect Neurosci, 2009
(5) Kapogiannis et al, Brain Connect, 2004

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Where Faith Meets Science - How Neuroscientists Relate to Religion

...this is the name of a post from Mayim Bialik [1], whom many of you know as Amy Farrah Fowler in the TV series “The Big Bang Theory”. It describes two topics that wouldn’t go together for many neuroscientists. Or would they? Are religion and neuroscience (any science, in fact) really that incompatible?

As scientists we try to deduce our knowledge from well-planned experiments and believe what we can see with our own eyes, or through the microscope. A religious person believes in the relation of humanity to the transcendental. On first sight it seems as if these are two contradictory paradigms since there seems to be no experimental evidence for the transcendent (yet), but nevertheless 51% of biological and medical scientists in the U.S. believe in either God or a universal spirit or higher power, according to a Pew Research Center survey in 2009 [2]. Therefore, religion apparently has an influence on today’s scientists and conceivably on their research.

Religious and a Scientist?

Dr. Andrew Newberg, for instance, uses neuroscientific methods to investigate religious and spiritual experiences, pioneering the field of neurotheology (see also article on page 10). Studying the connection between neuroscience and religion, he came to the conclusion that “whether or not God exists out there” is something that neuroscience cannot answer [3]. Dr. Mario Beauregard is another scientist who deals with the existence of a soul. In his book “The Spiritual Brain”, he argues in favor of a reality outside the brain that people actually sense during intense spiritual experiences [4].

However, Dr. Michael Graziano, professor of Psychology and Neuroscience at Princeton University, focusing on the brain basis of awareness, likes to describe spiritualism as a fundamental mode of perception by which humans relate to the world. The perceptual world that emerges from that theory is to him not contradicting or threatening science, but a psychological phenomenon that is of high importance to the human existence [5]. Taking this into consideration, the idea of bringing together the world of religion and neuroscience in a single person’s belief system does not seem to be impossible anymore.

For Dr. Mayim Bialik, a former neuroscientist from UCLA and reformed-turned-orthodox member of the Jewish faith, working in neuroscience has even deepened her belief in a divine plan for the universe. Importantly, God to her is not an old man in the sky, fulfilling one’s wishes if you pray hard enough, but rather “the force in the Universe that drives all of the phenomena that we experience as human beings”. Mayim explains that “understanding the relationship between science and God makes [her] a better scientist and a more complete person.” When reading her post “Where faith meets science” you immediately recognize that for her, being religious doesn’t mean regarding the Torah as a science book. Instead, it signifies being grateful and humble in the face of how amazing our universe is, how amazing we are and how amazing our brains are [1].

Two Sides of the Same Coin

All these people seem to tell a story: the story of “Oneness”. Even though religion and science seem to be different concepts, they might have more in common than we think. If we regard both as the quest for a description of the same entity, namely the universe and everything in it, then bringing them together could be a really interesting experiment worth trying.

Many great scientists throughout history seemed to be inspired by religiousness in the broadest sense. To quote Albert Einstein: “Veneration for this force beyond anything that we can comprehend is my religion” [6]. In a letter to Maurice Solovine in 1951, he wrote “whenever this feeling is absent, science degenerates into uninspired empiricism”.

With all this in mind, we should put the relationship between religion and science to the test with skeptic but open reasoning!

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References:
On Mind White Matter and Meditation

In our modern times, everyone rushes between appointments, fulfills work-related tasks all day and is busy with several means of self-optimization. In a bid to find their inner center again and rest, people are increasingly turning to centuries-old traditions like yoga and meditation.

Meditation is a concept from several Asian spiritual traditions where one’s attention is focused on a single thing such as breathing, bodily sensations or certain words or phrases known as “mantras”. For example, an easy approach is progressive muscle relaxation, where you consecutively contract and then relax different muscle groups to focus on that particular sensation. In principle, meditation means turning away from distractions of any form and concentrating on the present moment. While it sounds relatively simple, it is not easy to escape outer and inner noise. To those wondering whether they meditate correctly, there is an easy way of checking: “if you are feeling better at the end, you are probably doing it right.” [1].

Another aspect of meditative practice (which appears very Buddhist in its own right) is that there is no right way to meditate because there is no goal to reach. Instead, the journey is the real aim [2]. And just like physical exercise, you will perform better with practice.

There Are Many Paths to Meditation
What actually happens during meditation that drives Homo economicus to adopt centuries-old traditions to calm down? For several decades, science has been trying to elucidate the psychological and physiological mechanisms behind mindfulness and meditation. Unfortunately, despite increasing popularity in research, this particular field of study faces severe methodological problems: there is an immense degree of individual variety among the general background of neuro-connectivity, meditation practice, and expertise of the subjects. As a consequence, and even though researchers readily make use of EEG, fMRI, PET and other sophisticated neuroimaging techniques, results are often inconclusive.

One of the earliest studies reported a decrease in blood pressure of hypertensive patients following meditation [3]. EEG studies showed a reduced frequency of alpha and theta waves linked to meditative state [4]. Depending on the type and tradition, meditation may lead to different effects. For example, researchers found increasing sympathetic activity and arousal with practice of Hindu tantric meditation as opposed to heightened parasympathetic activity and calmness when following other traditions [5]. Network connectivity studies with expert Taoist meditators reported significant differences in brain white matter and functional network topology between resting state and during meditation [6], while others find activation of basal ganglia (caudate body), limbic system (entorhinal cortex) and medial prefrontal cortex (MPFC) [7].

Changes in brain activity and/or connectivity may also underlie the beneficial effect of meditation and mindfulness on pain. Pain consists of two elements: the sensory perception and the cognitive evaluation of this perception as painful. A review discussed the changes in brain activity with meditation practice as a consequence of increased thalamus and insula activity (where the sensation itself is processed) and a reduction in MPFC activity (responsible for the evaluation of pain). Therefore, it seems that meditation and mindfulness are effective because they alter the way sensory perception is assessed [8], a concept which may be applicable to a variety of health and mental problems.

Meditation to Improve Mental Health?
Recently, a large review took a deeper look at these topics [9]. Of all evaluated 18,000 citations, only 47 studies showed satisfactory methodological quality and could be included. From these, the authors conclude that meditation is likely not superior to active treatments (e.g. psychotherapy or medication) regarding stress-related problems, such as anxiety, depression and pain, yet a legitimate alternative in terms of side effects. One of the best accepted effects of meditation and mindfulness is stress reduction. It is not surprising, therefore, that big tech companies have started using these practices as a general leadership strategy to increase creativity and productivity [10].

What about you? Have you got experience with stress or ever lost your head over endless to-do-lists and half-baked could-be-done ideas? Maybe it is your turn to take your time and shape up your brain connections in order to become more creative, focused and happy!

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Psychotropic Substances: An Introductory Journey Through the World of Drugs

Since the beginning of recorded history, people have puzzled about spirituality, and how strong feelings linked to it may be related to forces beyond our control. How can one pin down mystical experience, or life-changing epiphanies? One way is to get down to the nitty-gritty of chemical reactions in the brain. Psychoactive drugs are substances that cause temporary alterations in mood, behavior, perception and consciousness [1]. These substances can be divided according to their origin (synthetic or naturally occurring) and purpose of use, such as medical, recreational or as entheogens for spiritual experiences.

The history of psychoactive drugs linked to religious practices use goes back thousands of years to ancient cultures like Mesoamerica or Egypt (see also page 7). Many ancient cultures consumed mostly organic substances for medical purpose, but also in shamanistic rituals to communicate with their gods. Even in some present-day societies, such as some indigenous groups in Mexico or Brazil, this is actively practiced as part of local culture. Throughout history, humans have always been drawn to experimenting with their state of consciousness. This reached a scale that international authorities felt obliged to set up a Convention on Psychotropic Substances, signed by the United Nations in 1971, to rein in the increasing availability of drugs that ‘have negative health effects and lead to lowered moral standards’ [2]. What has changed, however, is people’s motives: nowadays, people are more likely to use these drugs for fun and improved performance rather than spiritual experience.

**Moral Remarks**

Dr. Timothy Leary, a former leading proponent of hallucinogen use, postulated a theory in the 1960s based on personal experiences [3], in which he stated that the effect of a psychotropic substance on an individual is influenced by the chemical and pharmacological nature of the drug, but also by the individual’s psychological and physical settings. Probably, however, the dose has the strongest influence, as some substances are pleasurable and beneficial when consumed in small doses, but turn into harmful or even fatal substances in higher doses, which applies even to inconspicuous substances like the ‘laughing gas’. Interestingly, this was already hypothesized nearly 500 years ago, when Paracelsus said: “sola dosis facit venenum” (“The dose makes the poison.”) [4].

**The Pocket Library of Psychoactive Drugs**

Whatever the purpose, recreational or religious, the pharmacological effects of psychoactive drugs (and, as a consequence, what they are primarily used for) can vary widely. Below is a concise table of some of the most important substances and their mode of action [2]. It should be noted that the listed licit and illicit drugs often have multiple biological effects, including side effects, which also depend on their dosage.

**Drugs affect consciousness differently**

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**References**

[4] Paracelsus, Septem Defensiones, 1538
Exploring the Mind Through Sacred Plants

In our society, there is amazement surrounding hallucinogens, especially among young people and artists who are curious about mind altering substances. There is a large wave of “psychonauts” that travel far to consume magic mushrooms or other exotic substances; for example, to Latin America, where some of these plants originate, or to countries where consumption is legal (like Uruguay and the Netherlands).

Shamanism Is an Ancient Profession

It is important to underline that in traditional cultures these sacred plants were used for divination and healing purposes. For many indigenous people, psychoactive plants have divine qualities and are used in ceremonies guided by a shaman. A shaman is a practitioner who has expertise with the substance and the wisdom to diagnose and cure soul affections and is believed to have special powers to perceive and interact with the transcendent world [1]. Among such rituals, there are different paradigms: the healer is the one engaging in a trance state to be able to give a diagnosis and apply a remedy. The shaman is the one who guides the persons during the ritual to facilitate self-understanding. The substances might also be consumed during folk religious ceremonies [2].

One of the immediate side effects is vomiting, which is believed to aid “purification of the soul”. The desired effect, a spiritual trance, is a complex phenomenon of altered consciousness and usually triggers states of deep introspection and insight. The experience is unique for each consumer but generally depends on the potency of the batch, the setting, the mindset of the user and the culture. The most notable effects are visual alterations that range from seeing visual images and illusions to concrete and substantive hallucinations [3].

The Vine of the Soul

One of the most vastly studied hallucinogens is ayahuasca, a botanical preparation used in healing ceremonies throughout the area of the Amazon in South America. Ayahuasca can be translated from Quechua as “vine of the soul”. The brew includes the ayahuasca vine (Banisteriopsis caapi) containing β-carbolines, like harmine and tetrahydroharmine, which are monoamine oxidase (MAO) inhibitors, preventing dopamine breakdown in the synapse; and the chacruna shrub (Psychotria viridis), providing the hallucinogen alkaloid DMT. Sometimes the chacruna shrub is substituted with other plants containing DMT [3, 4]. MAO inhibition and DMT together produce boosted hallucinations, the “magical” effect of this drink [4].

There is another important drug for psychonauts: magic mushrooms containing the active compounds of psilocybin, psilocin and baeocystin. They have been part of human culture since prehistoric times (see Image 1). The Aztecs worshiped them to the level that they named them teonanacatl, “the flesh of the god” in nahuatl. The large diversity of mushrooms is used for religious rites by the Mazatec in Oaxaca, Mexico, but also other communities.

The cactus peyote (Lophophora williamsii) was also consumed extensively by the Aztecs, believing it would grant them divine protection and guidance during hunting or warfare. Nowadays, it continues to be used by the Huichol in the desert zone of Real de Catorce in northern Mexico [3]. The members of this tribe depict their ritual gatherings and the hallucinations experienced under the effect of mescaline, the active component of peyote, in extraordinary colorful artistic works (Image 2).

Where Sacramental Traditions and Neuroscience Meet

Since colonial times, these sacramental plants have largely remained prohibited. However, during the last decades, they have become increasingly known across the Western World, leading to a growing number of research studies that analyze their effects on the brain and their potential clinical value. Now it is known that all these hallucinogenic chemicals have a stereocchemical similarity to serotonin. By acting as serotonin receptor agonists, particularly of the frontocortical 5-HT2A subtype [5], they produce alterations of perceptions, mood, and cognition.

A leading group in this field is the Brazilian team of Dr. Jaime Hallack in the Ribeirão Preto Medical School, University of São Paulo. They have identified promising therapeutic benefits for diseases like depression, anxiety and drug dependence for these substances [6, 7]. Additionally, these medications may have a greater safety profile than regular addictive drugs, an extremely low mortality rate and produce almost no physical dependence [8]. So, if you are a psychonaut or are interested in this topic, keep your eyes wide open, as there is still a great deal to learn from these ancestral sacred plants.

References

Faith and Perspective - An Interview With Three Berlin Neuroscientists

Recently, we sat down for a chat with three researchers of the Neuroscience community in Berlin, the topic ranging from juggling neuroscience and faith to common misconceptions about religion. Here’s what they had to say.

Could you please tell us a little about your faith?

- I am a Christian, as were my parents. When I was in grade 12, I accepted Jesus Christ as my personal savior and converted to Evangelical Christianity. And I would say during my stay in the university, I came much closer to God. I started seeking him with all my heart; the more I know Him, the more I reflect His character: love and kindness.

- I was born into a Hindu family. I have been practicing Hinduism since childhood. During the course of my studies and my PhD in neuroscience, I have started to question both religion and science - specifically whether either of them can fully answer questions on consciousness.

- I was born in a Muslim family and had the privilege of having parents that loved to read and had a large collection of books on religion (mainly Islamic) as well as comparative religion-oriented. They encouraged me to read and I spent a great deal of time combing through books at my home. During my childhood, much like other kids, I practiced religion more out of watching what my parents and grandparents did. As a teenager, I became more inquisitive, and started practicing my religion with more reason, intent, and curiosity.

How does your faith help or influence you as a neuroscientist?

- My faith shapes every part of my life, and everything I do is based on principles from the Bible. For example, I am faithful - faithful to God, faithful to the people standing next to me in the lab, faithful in everything that I do. I believe that God is watching, hence, I do whatever I do with all my heart. And I consider the opportunities I have got as an immense privilege that I should nurture and care for. Besides, living in harmony with God lets me have internal peace and keep me secure no matter what happens around.

- The concept of Hinduism urges one to ask questions about one’s inner self/consciousness (also known as Advaita philosophy) which helps me as a neuroscientist to shape and ask questions about workings of the brain leading to conscious behavior.

- In our holy book, the Quran, there are hundreds of verses which encourage us to study and ponder. In fact, in the very first verse, where the truth about Allah is revealed to the prophet Muhammad, the first divine command is “Read!”. A quest for knowledge is thus one of the most important pursuits that one can have in life. Many people in different religions are taught that they cannot contest what is written or preached, but I believe that Islam teaches us always to be skeptical and build strong counter-arguments, or put things to the test. Using this type of reasoning is extremely important for me as a neuroscientist. Furthermore, Islam teaches us that we should gain our livelihood through righteous means. That means if you happen to be a researcher, do research with a purpose and rationale behind it. We are held accountable after death for how we used our health, knowledge and time during life. Therefore, whatever we do has to be legitimate and meaningful. So, in that sense, faith definitely influences neuroscience in that it gives me a purpose behind the daily struggles of research because I know that even if I fail, I learn a lot more and that all these efforts are not futile.

What do you believe your faith can teach you about neuroscience?

- I know that God has placed eternity in our heart and mindset to seek and explore what has been done under heaven. But, there are questions that science is not able to answer; about creation and existence, purpose of life, etc. People might seek and try lots of things, but there is always a void inside our heart that God can only fill. The Bible teaches us that we were uniquely, fearfully, and wonderfully created as part of a perfect system. It is fascinating to see how the universe operates by itself. Hence, being a scientist (as well as a Christian) gives me great appreciation for how intricate biological systems are perfectly made, and work together in harmony. And this makes me wonder how one can perceive it as a random event.

- Hindu scriptures like Vedas and Upanishads have dealt with mind and brain in depth. For example, there are concepts of divisions of mind like Buddhi (intellect/logical part of brain), Manas (emotional parts) and Indriyas (senses). Furthermore, these texts have a lot of insights on how senses interact with the mind.

- The Quran teaches us that our intelligence is what sets us apart from animals - the ability to think and reason. Islam instills in an individual that he or she is so much more than the sum of all their synapses or microbiome. Of course, with great power comes great responsibility - we shouldn’t take it all for granted. Islam thus teaches us that to lead a meaningful life, we need to use our brains!

Has neuroscience changed the way that you see your faith?

- If anything, I think it’s the other way around!

- Neuroscience has definitely helped me form more solid ideas of mind and brain combining the aspects of mind mentioned in Vedas.

- Yes. Science is all about inquiry, and established knowledge changes fast. This has helped me be more enquiring and skeptical about my own faith. In my everyday life, I try to reason with myself a lot about the how’s and why’s of the lifestyle I follow. Neuroscience reinforces this habit.

Has anyone ever challenged you about your faith as a scientist?

- Well, I am having discussions with colleagues all the time, and I think sometimes they might get perplexed with my faith.
are always looking for concrete proof, something tangible to prove things about God and the universe. But faith is something that has to be experienced – it’s something that I personally have experienced, and it is something that no one can take away from me. To help you understand, look at the concept of love. It’s something that I (and most other people) have experienced, yet is completely intangible and needs to be felt to be believed. It can’t be measured!

Actually, I never felt a clash between ideas in Hinduism and neuroscience. Hinduism encourages one to seek answers for questions on ‘Paramatma’ which is the ‘Primordial Self’. In my opinion, that is also the ultimate goal of neuroscience – to understand perception and consciousness.

Oh yes, I am challenged all the time! I have lots of friends from different religions, including some who identify as atheists. Discussing religion and science with them is a favorite topic of mine. Having your beliefs questioned is also refreshing in the sense in that it teaches you that beliefs or ideas that form your core personality may not have any significance for others – and that’s ok. Or the fact that one need not believe in a theistic religion to go out and do good in society or some seriously awesome science. I firmly believe that if the Quran is a divine miracle, its prophecies or claims will be testable and could not be falsified. My knowledge regarding both religion and neuroscience is fairly basic but this very reason motivates me to question both and improve my understanding.

Are there any misconceptions that you feel people have about your faith?

The biggest misconception I have faced is ‘faith and science are considered incompatible’. When I tell people I am a Christian, I have been asked how do you believe and be a scientist at the same time. With science, I try to understand life with Him through the ups and downs.

Well, it’s not specifically neuroscientific, but whenever I say I’m from India, people ask “are you a vegetarian?”. I am actually, but not all Hindus are (laughs). Some confusion also arises about the number of Gods that we have. Even though we have millions of Gods as a way of placing and expressing faith, we all believe in Paramatma, ‘Primordial Self’.

There are two misconceptions that I’ve noticed a lot. First, that Islam hinders scientific progress as it’s just a set of rituals from the 7th century. This is absurd and any hindrances to science per se are products of people’s actions (combine less education and in depth study of religion + science) rather than their faith. This also extends to people’s take on women and STEM. Despite societal constraints on women in some Muslim countries, there have also been some remarkable outcomes. If you look at countries like Iran or Pakistan, they have some of the highest number of women in STEM professions in the Muslim world. A second big misconception is that Islamic teachings are rigid, set in stone and cannot be challenged. Also not true. In fact, the Quran openly challenges people to bring a counter argument against its verses and claims to promote a lifestyle model that can adapt to the change in time.

What do you think is the most important thing for people to understand about your faith?

Faith and science are not incompatible. It just takes an open heart to experience God like love. It is not something you can validate and understand with logic. It is not rocket science either, if we genuinely and humbly seek God with an open heart, we will find Him. He is not hidden or somewhere far away. He is around revealing himself in one or another way throughout our journey. Believing in Christ gives eternal life, internal peace, meaning to life and a positive way to look at everything. A life worth living is a life with meaning and purpose. God loves you!

People have thought about understanding the brain since many centuries, which is reflected in the religious scriptures like Vedas. Perhaps one could get answers by reading these scriptures!

As I mentioned before, the concept of skepticism and inquiry is very important. As far as scientific research is concerned, Islam encourages people to do that as it may be one way of recognizing the common design involved behind the universe and the man. For modern day issues like organ-donation and blood transfusion for instance, it encourages “ijtihad” (thorough exertion of a jurist’s mental faculty in finding a solution to a legal question). Finally, Islam stresses that acquiring knowledge and then having the wisdom to act on that knowledge is what makes us distinct from our relatives in the animal kingdom. In the Quran, the reader is warned that not acting on acquired wisdom (be it through religious books or years spent in scientific training) will demote the status of its believers. Herein lies the key problem, and the majority of Muslims who passively follow Islam like a religion of rituals and obligations don’t bother to treat it as an all-encompassing lifestyle that could be so much more beyond prayer and supplications. Believing in Quran and its writer (the Almighty) do not automatically entitle anyone to any kind of superiority (religious or educational) over others who don’t. Success in any walk of life is guaranteed to those who work hard for it.

A big thank you to all interviewees!

Content has been edited lightly for clarity and length with participants’ permission.

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Neuroethology: Can You Mix Buddha and Brain?

What’s the main purpose behind cognitive neurosciences? Yes, you’re right: it’s to improve our understanding of what makes people tick. And what is one of the most important drivers of human behavior? You’re right again: religion. So how come most researchers cringe when hearing the words Brain and Buddha in the same sentence?

Spirituality is often regarded as the exact opposite of science. The credo that God is something that you can only experience, but never measure, makes scientists naturally uncomfortable. And especially in the natural sciences, religious dogma and scientific progress have not exactly been best friends throughout history.

However, with tensions having eased significantly, religious experience itself – independently of whether there is a God at all – has become a focus for scientists in their struggle to understand humans. Because if there is anything that has been around for a long time (like really long), it’s the belief in supernatural forces. For instance, as far back as 3500 BC, the Egyptians worshiped Isis, Osiris and Horus. The fact that religious beliefs have been a constant in human history has even led some researchers to claim that we are hardwired for spirituality.

Neuroscience + Theology = Neurotheology
So what does neuroscience tell us about spirituality? If there are God particles, are there also God neurotransmitters, God modules or God gyri? Several studies have looked at the neural correlates of religious experiences (see article on page 3). The limbic structures, in particular, are activated when people engage in religious sensations [1]. These results fit well with the observation that patients suffering from temporal lobe epilepsy often have religious or mystical experiences [2]. In fact, this happens in 2% of epilepsy patients in the pos-tictal phase (after an epileptic seizure when consciousness is still affected).

Another promising way to study religious experiences (or “altered perception”, as the cold scientific nomenclature describes it) is offered by pharmacologists. There are several potent substances that alter our state of consciousness in a way that changes our sense of time, triggers hallucinations or synesthetic experiences – sounds familiar, right? Psilocybin, a naturally occurring compound found in mushrooms, seems like a particularly potent God-drug. In the brain, its actions are mediated by serotonergic neurons which have also been suspected of giving you trips after ingesting MDMA (see article 6 and 7). So are devotees who are experiencing divine revelations, in fact, tripping? As deprecating as that may seem, in terms of brain function, this may well be the case.

Another reason why humans are probably prone to religious experiences has to do with psychological factors. Humans tend to see patterns and shapes where there are none – especially faces. This could be one reason why some people claim they see Jesus or another person with religious significance in everyday objects – such as a grilled cheese sandwich [3]. Likewise, humans struggle with the fact that some things are completely determined by chance. Instead, they believe that everything is there for a purpose, a cognitive bias called teleology. This presupposes to believing in some kind of supernatural agent that created the world in the first place. There are several other cognitive biases at work that make us, as Deborah Kelemen from Boston University says, “intuitive theists” [4]. In fact, it has been suggested that religiousness is the consequence of reliance on cognitive autopilot, or intuitive thinking [5]. And there is evidence that an intuitive cognitive style is associated with a stronger belief in God (even among people with similar levels of education, intelligence and other demographic variables) [6].

Is God in a Grilled Cheese Sandwich?
So are we hardwired to believe in some kind of God? The answer is probably yes. But if so, why do some people believe devoutly (or even with hesitation) while others fundamentally renounce the existence of any kind of supernatural agent? Maybe it has to do with personality. If religiousness is the result of intuitive thinking, does skeptical and analytical thinking protect against any kind of spiritual belief? Indeed, subtly nudging people towards analytical thinking seems to increase religious disbelief [7]!

At the same time, spirituality is not unidimensional and there are surely more factors at work than a mere disposition to intuitive thinking or stimulation of a certain kind of receptor in the brain’s limbic areas. But awareness of what happens behind the curtains of our mental states gives us insight into what sways people towards either pole – or makes them keep a gnostic distance.

Divine revelations are like MDMA trips

2. Devinsky and Lai, Epilepsy Behav, 2008
3. http://nyti.ms/2sM1S1A
5. Willard and Norenzayan, Cognition, 2013

[3] http://nyti.ms/2sM1S1A
Islam: Spirituality and Mental Health

The World Health Organization defines health as “a state of complete physical, mental, and social well-being...” [1]. At present, this definition does not include spirituality, though attempts have been made for its inclusion [2]. Studies that show positive effects of mindfulness meditation [3] provide the possibility of it being used as a therapeutic intervention (see also article on page 5). When it comes to mental health, the spiritual philosophy in Islam is often overlooked or not thoroughly delved into. Islam is mostly taken as a religious dogma comprising of political, religious and legal doctrines without considering its spiritual and moral dimensions [4].

Do We Need Spirituality?

Ibn-e-Hazm (994-1064 AD), a famous Muslim polymath, remarked “I searched for a common goal amongst humankind, to which all would agree to strive for excellence. I have not found anything other than the vanquishing of anxiety” [5]. The decline in mental health has been dramatic in the past few decades, with rates of depression increasing from 1988-2007 in the US [6]. Furthermore, the incidence of suicide has increased almost 40% in the middle-aged population [6]. The results of a cross-cultural study indicated that while wealthy countries may score higher on a happiness scale, they scored lower than poor ones on perceived meaning in life [7].

One of the core features of spirituality lies in man’s ability to extract meaning from the world. According to Ibn-e-Hazm, the ephemeral nature of the world drives a person into an existential crisis and the only way to achieve happiness is to return towards God Almighty [4]. In Islamic tradition, spirituality may involve pondering over the ayaat (signs) of the Almighty and building character. Surrendering oneself may offer liberty from the physical, but also the psychological well-being of an individual [13].

“Sabr” and Its Role in Depression

Positive psychology includes studies that correlate self-regulation and gratitude with a lower incidence of mental illness. Dr. Timothy Strauman has suggested clinical depression to be a consequence of self-dysregulation [8]. In Islamic tradition, this practice of self-regulation is called sabr and Ibn al-Qayyim (1292-1350 AD) describes it as restraining and building character [4]. He also argued that the past cannot be changed with sadness, but by contentment, gratitude, patience, and a firm belief that everything that happens occurs due to the will of God [9].

In Islam, there are numerous supplications to ward off anxiety and depression. One factor that might explain the reduction in anxiety and depression experienced by depressed people performing supplications could be due to supplication working as a spiritual therapy. This practice may produce neurochemical alterations that may decrease the need for pharmacological intervention (which does not undermine the efficacy of the latter) [10]. The interesting aspect about supplication or du’aa is that it can be used as a powerful form of psychotherapy. The crux of many supplications is not a request, but rather admitting one’s helplessness and asking for the Almighty’s mercy. Surrendering oneself may offer liberty from the world and its tribulations because the individual leaves the matter in the hands of someone far more powerful than him or her [4].

Many supplications call on to the Almighty by using names and qualities that evoke feelings of awe. According to Jonathan Haidt, the reality of awe involves a two-step cognitive process: vastness (anything experienced by the mind that is larger than one’s self) and accommodation (upon experiencing vastness, the mind adjusts to assimilate new information) [12]. So, experiencing awe by calling on the Almighty provides contentment in times of adversity. Islam envisages trials and tribulations as opportunities for submitting to the Almighty and building character.

Imaging Spiritual Prayer

A preliminary study in 2015 attempted to uncover the neurophysiological effects of salah (prayer) [11]. Muslims performing salah and dhikr (remembrance) showed less frontal lobe activity (crucial in executive functioning). The study also compared subjects performing prayer with and without spiritual concentration (khushu). Those performing prayer in a ritualistic manner without a lot of spiritual focus did not display any changes in brain activity, while those performing prayer with more spiritual fervor showed less activity in the frontal lobe and more in the basal ganglia (involved in the reward system) and anterior cingulate gyrus (involved in mood) [11].

Many studies have been conducted to assess the psychological impact of Islamic prayers and their effect on mental illness [10]. They have been shown to improve mood, anxiety, depression, and stress levels. A study conducted in 2012 found that prayer could help reduce anxiety and depression in patients with schizophrenia [13].

In Islam, spirituality is intertwined in different everyday rituals and serves to elevate not only the physical, but also the psychological well-being of an individual [13].

Islamic prayers are a form of spiritual purification


References:

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The Neuroscience of Yoga: Bridging the Gap Between Spirituality and Science

Yoga has become increasingly popular in the last decades and anyone who has attended a handful of yoga classes would agree to feeling an increased sense of emotional stability and mental clarity after practice. Nowadays, thanks to sophisticated brain imaging techniques, neuroscience is revealing exciting and transformative insights about the art and science of yoga. Western science is finally confirming what eastern practitioners have been reporting and documenting for over 2,000 years: that yoga and meditation can literally rewire the structure of the brain.

What Is Yoga, Anyway?

Yoga (from Sanskrit meaning “unity”) is an ancient practice that unites the innate capacity of human beings to realize their true potential. We recognize our highest potential through the practices of the various yoga disciplines, such as yoga asana or physical postures, breathing regulation, meditation, study of teachings, devotional chanting, among others. In the West, we became familiarized with yoga asana, which only represents one aspect that the practice uses to align us with our highest potential and develop higher qualities, such as more love, compassion, humbleness, kindness, empathy, insight and service.

In the early 2000s, Richard Davidson from the University of Wisconsin jump-started the convergence of both worlds with his famous research on meditating Buddhist monks, finding mental training in form of meditation may induce short and long-term neural changes in the brain [1]. Several other researchers have followed, including Sarah Lazar, who found that brain regions associated with attention and sensory processing were thicker in people practicing meditation. The changes were observed even in novice meditators with as little as two weeks experience. This means that not only meditation professionals benefit from the practice [2].

Sharpening Higher Cognitive Functions

In as little as 15 years, the emerging field has witnessed almost a 10-fold increase in published research papers on the impact of yoga in human health [3]. Several papers focus on the prefrontal cortex and the attentional engagement that yoga requires. Positive changes in the brain structure and function of areas related to awareness, decision-making, executive functions, self-regulation and attention have been observed [4], leading to an efficient regulation of emotions, social behavior, impulsivity, fears and conflicting thoughts. This area is also strongly implicated in human qualities such as empathy, consciousness, social and emotional intelligence, insight, intuition and attuned communication [5]. One of the most interesting studies in this area found that 50 year-old meditators had similar cortical thickness as 25 year-olds, suggesting that yoga might offset age-related cortical thinning [2].

Nowadays, one of the most prevalent health threats is stress. Everybody has experienced it in one way or another. Long-term stress can have significant adverse effects on health and is a risk factor for many major illnesses, such as heart disease, stroke and depression [6]. Neurobiological studies have implicated the amygdala as a crucial area involved in our stress response. A recent study found that participants following an 8-week yoga intervention reported significantly reduced perceived stress and a reduction in the right basolateral amygdala gray matter density [7], furthering our understanding of why we feel so good during and after a yoga class.

Breathing Into Your Memory Center

The hippocampus plays a vital role in long-term memory, learning, navigation and spatial orientation. Recent studies have found an increased hippocampal volume in elderly participants over a period of 6-months, suggesting that yoga could have the potential to alleviate age-related neurodegeneration, findings of particular importance for the field of neurodegenerative diseases, such as Alzheimer’s disease [8]. Furthermore, depression is a potential risk factor for cognitive decline and dementia and recent reviews suggest that a yoga intervention might effectively reduce these symptoms [9].

I think everyone who has taken a yoga class can relate to the unique experience that this practice brings to one’s day. Our mind can be in an absolute turmoil when getting to class, thinking about the next deadline, the shopping list, answering our boss’s email, and so on, but then we feel absolute peace when lying down in savasana, the final resting posture. Yoga has been shown to restore the autonomic nervous system to a healthy balance by stimulating the parasympathetic nervous system. It reduces our heart rate and blood pressure, eases our respiration and increases heart rate variability – all signs of improved parasympathetic tone and a peaceful smiling face after class [10].

A number of published papers conclude that breathing, meditation, and posture-based yoga increases overall brain health and yoga practice may be an effective treatment for a clinical and healthy aging population, in addition to being relatively easy and cost-effective to implement [11]. So now, if you have not yet experienced a yoga class, I invite you to attend one and feel for yourself all the benefits this millennial practice has to offer. After a while, yoga becomes not what we do, but rather how we do something. When we invite an ever-present awareness of why we feel so good during and after a yoga class.

Yoga might offset age-related cortical thinning

[2] Lazar et al., Neuroreport, 2005
Spiritual Experience and the Default Mode Network

Ecstasy, awe, peace, the experience of the insight that “all is One”, a sense of being “outside of time”, the feeling that you experienced something sacred and holy, a gain of insightful knowledge experienced at an intuitive level...Trippy, right? Well, these are all elements from the Revised 30-item Mystical Experience Questionnaire [1] that is based on the seven dimensions of mystical experience, described by the British philosopher Walter Stace in 1960 [2]. This questionnaire has been used in the study of mystical experiences elicited by psychotropic drugs, like psilocybin and LSD (see article on page 6).

Ceremonial use of hallucinogenic drugs dates back many thousands of years and is still part of many indigenous cultures of America (see also page 7). Although the reasons for using these substances in the ceremonies are varied, the goal is usually to facilitate the occurrence of a spiritual experience. Mystical or spiritual experiences occur also in the absence of drugs and have been reported inside and outside religious contexts. Meditation practices (page 5), for example, can lead to the experience of unity or pure awareness. For that reason, psychotropic drugs and meditative states have been used as models to study the neural correlates of mystical experience.

What Is the Default Mode Network?
Changes in the activity and connectivity of the default mode network (DMN) have been identified in studies where psychotropic drugs were used to elicit mystical experiences. This same network also shows changes during different meditation practices [3]. The default network is pretty much like the screen-saver of your brain. It is the network that gets active when you are not engaging in any activity that requires external focus, but rather just resting and letting your mind wander. The main components of the DMN are the medial prefrontal cortex (mPFC), the posterior cingulate cortex (PCC), the parahippocampal cortex (PHC) and the inferior parietal lobule (IPL) [4]. All these areas have a high density of serotonin 5-HT receptors, which are the targets of psychotropic drugs. What is interesting about this network is that it appears to be involved in the perception of self. Since it integrates information from different areas of the brain, it appears to be giving a constant update on self-awareness. The PHC, for example, stores episodic memory [5], while the mPFC and PCC overlap with social cognition and self-referential areas of the brain [6]. These areas are active when you are entertained in your own internal dialog, thinking about yourself or other people’s thoughts and intentions. The IPL, on the other hand, has been implicated in the processing of time perception [7].

Brain imaging studies using psilocybin, LSD or mescaline, as well as studies that looked at the brain of experienced meditators, found both a decreased activity and decreased connectivity of the DMN. Therefore, it is hypothesized that a decrease in the connectivity of the IPL with the rest of the DMN mediate the feeling of timelessness and spacelessness, while the decreased connectivity in the PCC and mPFC mediate the feelings of unity and ego dissolution [3].

On Cloud Nine?
It is always exciting when common neural correlates can be found for such a broad and subjective human phenomenon like the spiritual experience. However, the mystery of mystical experiences still remains. It is interesting, for example, that these transient experiences of ego dissolution come with long- (often life-long) lasting feelings of insight and positive behavioral changes. How can a momentary detachment from our persistent self-awareness give us the feeling of an encounter with an ultimate truth?

Interestingly, the salvation or liberation from the self is a recurrent idea in many religions. To become part of the Absolute, reach Nirvana or be in God’s glory is the ultimate goal of the major religions of the world. Religious/spiritual practices aim to achieve this state through self-transformation and self-renunciation. Certain attitudes like the distancing from practical life and detachment from one’s and others’ needs and affections can facilitate the emergence of spiritual experiences [8].

How attached are you to your ego?

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Fasting: Cleansing of Spirit and Body

Let’s face it: we live in a throwaway society and, in our daily lives, the longest period of food withdrawal lasts from dinner to breakfast the next morning. However, back when the word “globalization” did not exist, our ancestors used to undergo alternating periods of overfeeding and starvation, caused by fluctuating weather conditions and food availability. Fasting was a part of life. Nowadays, regular periods of fasting are still practiced around the world, but mainly for traditional, religious, or cultural reasons [1]. But what exactly are the effects of fasting on the brain and is it really healthy to fast?

Fasting Comes in All Shapes and Sizes!

Before getting into the brain facts of fasting, let’s work a bit on terminology. Fasting is defined as abstaining from all kinds of food or drink and can last for short or extended periods of time, typically between 12 hours and 3 weeks [2]. Intermittent fasting is a type of fasting where you cycle between periods of fasting and non-fasting. In addition, fasting can also refer to abstaining only from selected foods, which usually lasts for longer time periods. On the other hand, starvation is defined as chronic nutritional insufficiency and although it is sometimes used synonymously for fasting, it generally describes more extreme forms [2].

One example of short intermittent fasting is Ramadan, one of the best known religious fasting practices. Ramadan is the ninth month of the Islamic calendar during which Muslims don’t eat or drink from dawn to sunset [3]. Other fasting practices can be observed in several religions and range from abstinence from some or all kinds of food or drinks. Examples are Yom Kippur, the Day of Atonement in Judaism, when adults abstain from any food or drink for 24 hours [3], and fasting practices of the Greek Orthodox Christians, who forgo certain foods for a total of 180-200 days each year [4].

Effects on Our Bodies

While the purpose of religious fasting is primarily spiritual, it also has the potential to greatly affect one’s physical health [4]. Prolonged fasting is a strong physiological stimulus and initiates a variety of responses in the body. Stunngly, intermittent fasting has been shown to enhance network plasticity, reduce oxidative stress and inflammation in the brain, increase neurotrophic factor availability and enhance stress resistance [2]. It is therefore not surprising that fasting is sometimes used in clinics: physicians monitor patients while they are fasting for periods lasting for one week or longer (usually only consuming water or a very low-calorie diet with less than 200 kcal/day) in order to improve weight management, disease prevention or treatment [2]. Fasting also seems to relieve various form of pain, ranging from non-specific chronic pain and fibromyalgia to migraines [5].

Lifting Up Your Spirits

Even more surprisingly, fasting doesn’t make you grumpy - on the contrary! Several studies have found that prolonged fasting is accompanied by increased alertness, better mood, a subjective feeling of being well and sometimes even euphoria [1]. One explanation for this could be an increase in tryptophan availability and serotonin turnover in the brain and the release of endogenous opioids [5].

Animal and human studies indicate that fasting – when done right, with the supervision of a professional - can have beneficial effects by reducing inflammatory markers and age-associated processes and be useful in the treatment of many different diseases [2].

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Do You Believe in Sickness and Health?

» Faith After Brain Pathology

The brain is the source of religious thoughts. Regardless of the discussion about the dualism of body and soul, all our thoughts originate in the brain – the spiritual ones being no exception. But what happens when our thinking organ is damaged (see below) or functionally altered? Nowadays we can determine which areas of the brain are active during religious thinking (see pages 3 and 13). Whatever the origins of faith are, these brain areas can, as all parts of the human body, be altered by trauma or disease. But how does that affect our beliefs?

Are Religious Visions Just Epileptic Auras?

Throughout history, there has been a peculiar connection between religious visions and epilepsy. The French martyr Jeanne D’Arc had visions of God that were possibly caused by epileptic seizures. However, the presence of genes linked to epilepsy in DNA extracted from her hair is still to be confirmed [3]. Similar are speculations that the sudden conversion of Saul to Paul the Apostle might also be thanks to a grand mal seizure accompanied by a vision [4]. And, apparently, epilepsy-caused divine visions made the Pharaoh Echnathon in Egypt found the Aton religion [5].

Another famous example is Dostoyevsky. He suffered from seizures which he called divine as the moments before the seizure brought him great joy and happiness. As he put it, “I felt that heaven descended to earth and swallowed me” [6]. He suffered from “ecstatic epilepsy”, a rare form of temporal lobe epilepsy. But of course, epilepsy is not only divine. Karen Armstrong, a former nun who now writes about religion describes her epileptic seizures as a glimpse of God as well as of hell. As it took many years to diagnose her epilepsy, she made her think: “is it possible that the feeling I have had all my life that something – God, perhaps? (...) is it simply the result of an electrical irregularity in my brain? (...) Or “can it be that God, if He exists, could have created us with that capacity for Him, glimpsed at only when the brain is convulsed?” [17]. This thereby picks up on the capacity for Him, glimpsed at only when the brain is damaged [8].

But it seems to work the other way around as well – a stronger belief can change your brain. This might even give you an edge against psychiatric illnesses such as depression. For example, one study found that spiritual practices such as meditation increased the thickness of the cortex, which is thinner in depressed people [13].

If seizures can induce visions, maybe we can do so by other means as well? To find out, neuroscientist Michael Persinger created the so-called “God helmet” in the 1980s. This helmet was equipped with coils to induce magnetic fields acting on the temporal lobe of the wearer, where the researchers claim they found God’s cerebral seat. Indeed, the majority of the participants had strong and vivid epiphanies of a religious nature, sensing another being in the room or seeing Jesus [14]. A disciple of Persinger even created helmets for sale to recreate the spiritual experience at home whenever needed [15]. Persinger ran with the idea, attempting to explain all kinds of spiritual experiences by the effects of Earth’s energy fields [16].

Vision or Hallucination?

If alterations in brain functions have such an impact on spirituality, it seems be-
From Neuroscience to Yoga and Meditation

Interview with Stephanie Bianchi, MSc in Neuroscience; Yoga, Meditation and Mindfulness Instructor

You hold a Bachelor in Molecular Biology and a Master in Neuroscience. Would you tell us more about your background? As a little child, I always knew what I wanted to study. I was fascinated by the perfection of nature and felt driven to study more about how it originates all, hence my degrees in molecular biology and genetics. Later on in my career, I had the opportunity to collaborate on a research project on Fragile X Syndrome with the MIND Institute in Sacramento and the National Fragile X Syndrome Foundation in Guatemala. As I was completing the research project, I knew I wanted to expand my knowledge and understanding on the brain and molecular neurobiology.

In 2012, I received a scholarship from the Neurasmus program to study neuroscience and made my way back to Europe. Now that I look back, that time of my life has probably been the most transformative and life-changing period so far. I loved every second of it, even when I was at my lowest. I love neuroscience and the program made me fall deeper in love with that curiosity of wanting to know and experience “the mind” at its fullest. In 2014, I graduated from the University of Bordeaux and University of Coimbra as a MSc in Neuroscience.

How did yoga and meditation come into your life? While I was in the middle of my master’s degree I suffered a major breakdown. I was suffering from depression, severe anxiety episodes, paranoid events, adrenal fatigue, dysregulations on the whole endocrine system and on the way to a hypothyroidism, just to name a few. In a matter of months, my health and mostly my mental health had deteriorated as never before. As ironic or serendipitous as life is, while I was being diagnosed with these disorders, I was also studying them at university. I went to several physicians and none of them offered me a holistic solution that would get to the root of the problem. From the little understanding of myself that I had back then, I deeply knew the problem was in my mind.

As a result and with the guidance of a wonderful team of experts in California, I started to dive deep into yoga, meditation and mindfulness practices, hand in hand with making some necessary lifestyle changes. In a matter of weeks, I could notice the benefits of strengthening the mind-body connection and my conditions started to subside. I felt deeply relieved and somewhat astonished by the awareness I was gaining from simply sitting with myself and observing my thoughts. I was truly amazed by the incredible potential of these practices that invite you to experience life from within and I wondered how come there was so little scientific research on the topic. From that point on, I have been deeply involved in the study of yoga, meditation and mindfulness, traveling to different countries and learning from different teachers and schools of thought.

What motivated you to change careers so radically? When my health started to improve, I felt more alive, utterly happy, deeply empowered and enjoyed a vitality never experienced before. I was able to perform better in less time, all my relationships improved, I felt an overflowing sense of peace and stillness and I had just discovered a highly improved quality of life. I always sensed there was more to life, and I guess I finally felt like this was a life worth living.

Don’t get me wrong, I lived a wonderful life. I had lived in 5 different countries in 8 years, spoke 5 languages, had a supportive loving family and a global network of friends and I was on the way of what promised to be the purpose of my life had been redefined.”
be a successful career – yet I felt as empty as ever. I used to live with the constant chatter on my mind, chasing worldly pleasures and instant gratification, such as titles, success stories, material things, social status, the next big party and any other cue of social success – and while it was all great, I just could not care less about any of it anymore.

At that time, I thought I had just gone through a small crisis and my life would finally resume to finish my last year of university. Little did I know that it had only been the beginning of the transformation. The next year of my life I underwent a major transformation, on a physical, emotional and mostly on a mental level. It had been as if the very basis of my whole existence had been deeply questioned, restructured and I was now rediscovering the nature of the self, now with a deeper understanding of the mind.

I love neuroscience and I highly enjoyed all the years in the field, I just did not feel the same drive to pursue a career in research now that I had found what it felt to me like “wellness gold”. I personally had undergone a major crisis, where using mostly mind-body practices I had been able to restructure and rewire my brain into a more healthy, fulfilling, joyful and plentiful life. This had to be shared. It was as if the purpose of my life had been challenged and redefined to what I do now. I could no longer devote myself to my lab work and spend years on a research project. I felt driven to go out there and go deeper into the experience of the mind and share with the world the very known but untapped benefits of these millennial practices.

Soon after my graduation, I took a long journey to the Indian Himalayas and Thailand, where I studied different meditation traditions, attended teachings of the Dalai Lama and studied yoga at Ashrams in different parts of India.

Nowadays, I continue to enrich my practice under the study of different teachers. The experience of my disciplined and deep meditation and yoga practices never ceases to amaze me. I feel deeply inspired and motivated to continue to share the long list of benefits of these millennial practices all around the world.

Did you experience any fear or doubt when you left science?
Yes and no. Yes, the fear was always present. The mind chatter was constant: “what if you fail?”, “you are committing career suicide”, “you will regret it, you will never be able to come back to science again”, etc. But I had now gained a deeper understanding of the self and the way the mind works. I stood strong by a deep resilient conviction that this was the path I was supposed to take and so I did. With time, this resilient and empowered knowing has only become stronger, finding myself revered and constantly revitalized, energized and empowered by what I do every day. I sleep less, enjoy a wealth of well-being, wake up every day looking forward to what I call my job and I feel so grateful to have found a new and more suitable lifestyle and career for me.

Are you still involved in science in any way?
Two years ago I co-founded a foundation called Mindful Guatemala, in which we teach children, teenagers and adults how to use practical Mindfulness-Based Stress Reduction (MBSR) techniques to assist behavioral, emotional and physical issues and to generally improve their quality of life.

We are now on the way to becoming a for-purpose organization, raising awareness of the potential therapeutic benefits of these standardized techniques, implementing them in national and regional companies, organizations, schools and foundations as a way to empower individuals to prevent stress-related conditions and to help them navigate through difficult situations. In the near future, we aim to support the 8-week MBSR interventions with scientific evidence.

In addition, I have been collaborating with an institution that provides higher education for teens and adults with neurodevelopmental disorders, where I have been teaching mindfulness, yoga and meditation techniques for the last 3 years, and observing amazing results in participants with Autism, Down Syndrome, Fragile X Syndrome, Angelman Syndrome, among others. We are now collaborating with a group of psychologists and physical therapists developing a curriculum on how to teach the different populations different techniques according to their needs and our experience in these past years.

My deepest wish is to be of assistance to bringing forth this convergence we have been seeing in the last years between Western scientific research methods and Eastern millennial practices. Why only settle for one world when we can combine the best of both?

Stephanie Bianchi
MSc in Neuroscience / Mindful Guatemala
BioBusiness Summer School

From June 26th to 30th, I participated in the ninth edition of the BioBusiness Summer School in Amsterdam. Having always been interested in the combination of business with healthcare, I found the call for the course to be just what I had been looking for. I had high expectations – and they were fulfilled. In the short but very efficient five-day course, I learned an incredible amount. We had lectures with biotech entrepreneurs, big company CEOs, R&D scientists, venture capitalists, patent attorneys, CFOs (finance specialists), consultants, business developers... to name a few. On the final day, we headed to the Bio Science Park in Leiden (one of the top five life sciences clusters in Europe) and visited Janssen, a pharmaceutical company of Johnson & Johnson. There was also plenty of time for networking, interacting with the speakers and getting to know the other 80 young and enthusiastic participants.

Interested?
The BioBusiness Summer School is organized by Hyphen Projects and happens once a year. Although participation costs are not exactly cheap (€1,115 this year), they can be covered by conference and travel funds of a PhD scholarship.

Neurasmus Annual Meeting

This year’s annual meeting of the Neurasmus Master’s program, in which Charité is a partner university, took place in the first week of July in Göttingen. As usual, the graduating students presented their Master theses on the first day, and this time also attended a lecture by Prof. Erwin Neher, father of the patch-clamp technique and Nobel laureate in 1991. In the evening, a guided tour through the university town welcomed the participants.

Focus on Career Development
The Neurasmus program has become strongly committed to offering career guidance to its students. The second day of the meeting was dedicated to this topic: it started with a workshop where the current students discussed their career questions and issues with the alumni. The afternoon followed with talks by invited speakers from Sartorius, a biotech company from Göttingen and parallel meetings amongst the students and the advisory board for the program coordinators to come up with ideas to improve the career development of Neurasmus students.

Art and Culture
The third day was reserved for a day trip to the neighboring city of Kassel, which included a guided tour through Documenta – a contemporary art exhibition that takes place there every five years – and the ‘Hercules Park’ and its several waterfalls and fountains. And, of course, the annual meeting is never complete without its traditional karaoke night.

Closure and Next Steps
On the fourth and final day of the meeting, MedNeuro alumna and program officer Julia Rummel conducted a design thinking workshop powered by her company, Innoki. The goal for the students: to investigate how to find a suitable lab for a PhD. In the evening, the graduation ceremony and dinner for the second-year students took place in a beautiful outdoor setting. It is hard to say goodbye to Neurasmates, but we know it is always a mere ‘see you later’. Next year’s annual meeting will take place in Bordeaux, the Neurasmus headquarters, at the end of August, together with Orientation Week for the freshmen. Until then, we in Berlin are looking forward to welcoming the new Neurasmus students who are about to start their studies at the Charité.

Mariana Cerdeira
PhD Student, AG Harms

Credit: BioBusiness Summer School / Hyphen Projects

Source: Mariana Cerdeira
Activating Methods as a Tool for Effective Teaching

Teaching is an almost inevitable part of academic life. Since I predict several teaching assignments on my career path, I recently decided to enroll in a course about activating teaching methods [1]. I had no prior knowledge about what these methods entailed, but enrolled in the course simply because I was not familiar with any teaching methods aside from frontally presenting information to students. So, on the day of the course, I entered the seminar room willing to be surprised, and that happened immediately; the first thing the instructor asked me to do was to draw a playing card from a deck. I took my seat, still curious about what the use of the card was, only to be shortly summoned by the instructor to form a group with the other participants that had the same card color as I did and to talk about what expectations we have from the course. If my thoughts were in any way astray at the very beginning of the course, at this point I was positively surprised, and excited that I would not have to sit through eight hours of someone monotonously lecturing, and be much more engaged with my peers and the course.

From Daydreaming to Participating

Engagement with the content is precisely what activating teaching methods are about. In the past, classroom dynamics were always dominated by the teacher. As a pupil, your engagement level could be on a continuum from overzealous question-asker to daydreaming scenery-admirer. To ensure that as many students as possible actually profit from class, activating teaching methods seek to help the students stay alert and, as the name suggests, actively participate in class. This way, the task of content delivery is shared by teacher and students. The art of teaching thus morphs from designing speeches and slides into finding ways for bringing out the best ideas from the students themselves.

There are many small exercises that can be used to achieve this, ranging from the well-known drawing of mind maps and explaining concepts to peers, to more obscure, but just as useful drawing of mind maps and explaining concepts to achieve this, ranging from the well-known teaching techniques to previous knowledge and discuss them in order to solve a puzzle composed of paper pieces. The paper pieces can either be inscribed with parts of a process or shaped like the pieces of a complex, and they have to be brought in the right order or arrangement. I used this when teaching high schoolers about CRISPR-Cas systems: each group received an envelope with pieces representing the Cas9 protein, the target DNA, the tracrRNA, and they had to figure out how the DNA cleaving complex is assembled.

“Divining models”:

“Divining models” is a technique that requires groups of students to make connections to previous knowledge and discuss them in order to solve a puzzle composed of paper pieces. The paper pieces can either be inscribed with parts of a process or shaped like the pieces of a complex, and they have to be brought in the right order or arrangement. I used this when teaching high schoolers about CRISPR-Cas systems: each group received an envelope with pieces representing the Cas9 protein, the target DNA, the tracrRNA, and they had to figure out how the DNA cleaving complex is assembled.

Alternating Teaching Phases

Naturally, these techniques are no one-size-fits-all solution for every teaching context. Activating teaching techniques only make sense when used in alternation with timespans where the students receive information from the instructor. The idea of alternating these two phases comes from the educationalist Klaus Döring [3]. The beauty of this approach is that it can be applied both for individual units as well as the entire course. One example of this could be interspersing units in which the students have to provide most of the content, like giving presentations or preparing posters.

I went on to use these methods in a course I taught to high schoolers about the CRISPR-Cas technology. My conclusion is that activating teaching methods require a much more intensive kind of preparation as a course instructor than plain presentations. One does not only have to have a clear array of concepts that students must learn in a given course unit, but also script-writing skills in order to orchestrate an engaging balance between the different types of activities, minimal crafting skills in order to prepare appealing materials and moderation skills in order to keep the course on the right track. Tiring as this endeavor might be, it resulted in highly positive feedback, both for the course I audited and for the one I taught.

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[1] Training with Elmar Groß at the Charité
You Can Take A Course on Calling BS Now – For Real

I present to you "Calling bullshit in the age of big data", a university-level course tackling bullshit in numbers, words and graphs rampant in the world around us.

You know a course will be off to a good start when the intro reads “The world is awash in bullshit...” “Calling bullshit in the age of big data” is taught by Carl Bergstrom (biologist) and Jevin West (information scientist), two professors at the University of Washington. In case you didn't get the memo, the course kicked off in Spring 2017 and is fully available online for free [1]. You can continue at self-paced tempo, as the lectures are divided into five or six parts of 3-12 min each.

Combating New-School Bullshit

Allow me to elaborate a bit on why the course is totally worth your time. It begins with an introduction to bullshit, its philosophy, interesting examples and measures to refute it. Hilariously, during one point in the first lecture the professors called bullshit on their own bullshit by butchering the claims that they saw explosive growth in the course website's visibility once it was up-and-running. This was all in a bid to explain “new-school bullshit” whereby people try to overwhelm others by fancy graphs. Aside from explaining statistical traps and trickery and big data gimmicks, the course offers useful ways to debunk bullshit even for the lay audience. Beware though: certain parts such as replication crisis and predatory publishing etc., may sound like a (very interesting) repetition of themes from the lab.

Ducks and Glass Slippers

There were certain parts that made me laugh long after I had finished the course and was reviewing my notes. First, the concept of data “ducks”, coined by Edward Tufte. A duck is any graphic so heavily decorated with design elements that it distracts the reader with its visuals rather than communicating meaningful information. Another one was “glass slippers” (inspired by Disney’s Cinderella), which refers to forcefully trying to mold your data to a standard model. Importantly, the professors defended science while exposing all the bullshit that comes with practicing it. They argued that science is not bullshit even amid a big reproducibility crisis because most of the hypotheses researchers come up with are at least plausible. Moreover, there are multiple ways to deviate from the null hypothesis. Science and replication are cumulative and conflicting results help to drive the field forward by compelling researchers to think of alternative explanations.

For those of you who just had a feel-good rush after reading that science is not completely a recipe for disaster, let’s go to the sobering part. The professors laid bare the factors that motivate scientists. And no, they don’t talk about the quest for the unknown or saving the humanity (get real!). Their premise is that just like all the other fields, people in science respond to incentives. Scientists are often driven to research for recognition [2], prestige and, most importantly, grant money and job security. Furthermore, Goodhart’s law (1975) [3] and Campbell’s law (1979) [4] also state that when a type of measure (number of citations in elite journals, for instance) becomes a target for researchers, it is no longer a good measure.

Lastly, much to my delight, the professors addressed the hotly debated issue of fake news as well. Money is the driving force behind fake news. Creating fake news stories is one thing but why do people spread them? Many factors contribute to this fast spread of bullshit, such as laziness to do some serious fact-checking, self-validation and sharing links just to increase social visibility. Social media is a free resource that gives everyone the opportunity to create and disseminate bullshit. However, it becomes a problem of even greater magnitude when reputable media also become an accomplice. Their aim is to take the lead in breaking the news and triggering people, by any means necessary, towards click-bait.

How to Call Out Someone on Their BS Effectively

So where does that leave us? As scientists, we have an even greater responsibility not to get carried away by the cancerous trend of sharing for the sake of social visibility. In order to efficiently call out a skeptical claim on its BS, collect all relevant information, double-check your facts, and run them by someone who knows more about the subject matter. If you err, admit your mistake, and admit it fast. Refute bullshit by tackling the core facts, spend less time explaining the dubious ones, and keep your argument simple – or else your approach may backfire.

Fun, engaging and equal parts thought-provoking, “Calling bullshit” is a timely course for young would-be scientists as well as lay people. It is neither too long nor too predictable content-wise. You can follow the course on Twitter here: https://twitter.com/callin_bull

Zara Khan
MSc Student, MedNeuro

References

Source: https://twitter.com/callin_bull, used with permission

Practice fact-checking online
New Master’s Program Regulations

Several modules are now split up into single modules:

1. The former “Basic Neurobiology” module is now split into:
   - Nervous System: Structure, Function, and Development (5 ECTS)
   - Neurophysiology (5 ECTS)
   - Lab Rotation 1, incl. Methods (10 ECTS)

2. The former “Neuropathophysiology” module is now:
   - Neuropathophysiology (5 ECTS)
   - Neurotransmitter Systems: Pharmacology and Signal Transduction (5 ECTS)
   - Neuronal Systems (5 ECTS)
   - Clinical Neuroscience (5 ECTS)
   - Lab Rotation 2, incl. Methods (10 ECTS)

3. The former “Clinical Neuroscience” module has been merged with the 2nd term (5 ECTS)

4. New modules include:
   - Statistics, including introduction to R (5 ECTS)
   - Critical Thinking (5 ECTS)
   - Scientific Communication (5 ECTS)

5. Advanced Problems and Topics in Neuroscience (5 ECTS) remains roughly the same

6. Lab rotations (1-3):
   - Now consist of a (methods) exam as well: 25% exam, 75% lab report. They will be conducted along with other modules’ examinations.

7. The Individual Focus module, however, is reduced from 10 to 5 ECTS. There will not be an examination anymore.

8. The Master Thesis module is now graded 80/20:
   - 80%: grading of thesis
   - 20%: oral presentation/defense of your thesis project

9. Experimental Design remains the same (5 ECTS)

10. Renewed: The MedNeuro PhD Retreat
    - From September 7th to 9th, we will have another edition of the MedNeuro PhD Retreat. This time, we will be at a location a bit closer to Berlin, just an S-Bahn ride away. We will have presentations and also provide the PhD students with a workshop on “Successful Presenting and Disputation” by Mark Edwards.

11. New PhD Students
    - We warmly welcome: Tadhg Crowley (AG Siffrin), Bassam Al-Fatly (AG Endres), Sandra Jagdmann (AG Dirnagl), Boris Bouazza (AG Rosenmund), Christian Ebner (AG Larkum), Maria Lucia Pigazzini (AG Kirstein) and Anniki Knop (AG Priller).
    - Boris, Christian, Lucia and Anniki are recipients of the NeuroCure fellowship program.
    - Welcome to our PhD program! We see great potential in all of you and wish you the best of luck.
Brain in Press

Stress and Pharmacology: Chill Out, Dude!
In a recent study from the Washington State University, researchers have found that chronic, long-term cannabis use made participants more relaxed during stressful situations. The study used the Maastricht Acute Stress Test (MAST), a paradigm where participants are asked to solve math problems on camera, and sharply reprimanded for making mistakes. Comparing samples of salivary cortisol before and after the intervention, as well as THC levels in urine, scientists found that daily cannabis users had a weaker cortisol response to stress. These findings corroborate earlier work on dulled adrenal activity, and are particularly interesting for the growing body of research on marijuana use in conditions like post-traumatic stress disorder. However, the researchers also caution that lowered emotional reactivity could prevent chronic users from being properly responsive to danger in the environment.

Cutler et al, Psychopharmacology, 2017 via Science Daily

Not Tonight Dear, My FRUM Circuitry Is Inhibited ...
Sleep or sex: decisions, decisions... A study from Yale has recently found that competing drives for sleep and sex are differentially expressed in male and female fruit flies. Sleep deprivation for male flies appeared to drive down their sex drive, while female flies continued to be sexually receptive even when exhausted. In converse, aroused males slept less, while females did not.

To zero in on why this might be the case, the researchers focused on the gene FRUM, previously shown to be necessary for sex drive in males. Using genetic labelling and manipulation of FRUM-expressing cells, they found that this trade-off between rest and recreation could be tied to a neural circuit between two distinct cell types. Perhaps further work will also shed light on female behavior...

Chen et al, Nat Comm, 2017 via Science Daily

Freezing Parkinson’s In Its Tracks
Some exciting news has emerged this month from the University College London, where a clinical trial has shown promising results for the drug to treat Parkinson’s Disease (PD). In a study with 60 patients, participants were assigned either a placebo or Exenatide, a drug normally used for controlling blood glucose levels in type-2 diabetes. Patients who received the drug did not show a decline in PD symptoms akin to that of controls over the 3 months of the study. Furthermore, some even showed improvement on movement disorder rating scales.

Researchers are not quite sure why Exenatide has this effect, but believe that it improves glucose homeostasis in the brain and exerts neuroprotective effects. While such findings are extremely rare in PD research in humans, the study leaders are careful to note that further replication is needed before such findings make their way to the clinic.

Athauda et al, Lancet, 2017 via the BBC

The True Cost of a Touchdown
Proponents of high-contact sports such as American football have been dealt a stunning blow by a study from Boston University. Researchers have just released the results of a study examining post mortem brain tissue samples from professional and non-professional players. They were on the lookout for signs of Chronic Traumatic Encephalopathy (CTE), a neurodegenerative condition caused by repeated blows to the head. Histological findings were then matched with players’ medical and employment records, as well as reports from friends and family.

Shockingly, almost all professional players (88 and 99% of samples from the Canadian and National Football League, respectively) showed signs of CTE. These findings were corroborated with symptoms of personality change, behavioral problems or dementia. Of course, the study presents a skewed sample of brain donors, but it is still an important contribution to ongoing discussions about long-term effects of contact in sport.

McKee et al, JAMA, 2017 via Science Daily

Raging Rodents: Circuit for Territorial Aggression in Mice Revealed
Despite their diminutive stature, male mice are extremely territorial creatures, and will attack other males on their turf even if there are enough females and food to go around. A team from Stanford University has shown that stimulation of a small clump of neurons in the ventromedial hypothalamus seemed to ramp up this rage, leading mice to attack even their reflection or inanimate objects in their environment.

However, the scientists also found that the environment has a huge role to play in these cells’ activity. Stimulation of male mice that had been housed in groups could not elicit the same level of aggression. The key appeared to be the activation of progesterone receptors on the cells – the same chemical in mouse pheromones that signal the sex of intruders. In short, the odor of single male mice seems sufficient to make other singles fly off the handle. As in so many other ways, sticking together appears to be the key for societal harmony.

Yang et al, Neuron, 2017 via Science Daily
Follow Up – Child and Family Space at Charité

In our March edition of the newsletter (Vol. 10, Issue 1), we included a series of interviews with female members of the Charité research community. One of our participants mentioned the lack of a room in the CCO for breastfeeding women, or staff members who need a room to rest during their pregnancy.

Kimberly Mason from the NeuroCure office pointed out that such a room equipped with a couch or mattress for anyone needing a rest was initially planned. Unfortunately, when the Charité highrise renovations began, the CCO had to absorb several groups and services. There was an intense scramble for space and the resting room got repurposed.

However, such a space does actually exist: on Campus Mitte you find it in Hufelandweg 9, Level K1, Room 006. There is also a parent-child room on the Virchow Campus. For details see: https://familienbüro.charite.de/charite_mit_kind/kinderbetreuung/kinderzimmer/

Since one room does not cover the needs of all pregnant women and parents with their children for the whole campus, maybe there is something we can do. We want to explore creative alternatives and would like to hear your opinion.

Thank you Kimberly for the helpful information!

WhazzUp

September

7.-9. Drug Science 2017 (at Charité Campus Mitte)

October

2.-4. 27th Alzheimer Europe Conference
3. German Unification Day
13. ECN Berlin Neuroscience Meeting
6.-15. Festival of Lights
http://bit.ly/2sUfkEn
16.-17. 17th Global Neuroscience Conference
http://bit.ly/2sXY4Y

November

1.-5. Jazzfest Berlin
http://bit.ly/2sUgBv6
11.-15. SFN 2017
http://bit.ly/2tx5o1o
12.-15. Frontiers of Serotonin Beyond the Brain
http://bit.ly/2sFObVe
16.-18. 12th Global Neurologists Annual Meeting on Neurology and Neurosurgery
http://bit.ly/2sFObVe

December

31. New Year’s Eve Party
http://bit.ly/2kYYrZA

Open Position

The working group “Neural Regeneration and Plasticity” at the Department of Neurology (Charité Campus Mitte) is looking for a student (m/f), who is interested in a Master’s Thesis about the interrelation of Alzheimer’s disease and Type 2 Diabetes in a mouse model.

Focus:
- behavioral tests in mice
- histology (preparation and staining of brain tissue)
- microscopy

Contact: Stefanie Schreyer (AG Steiner) stefanie.schreyer@charite.de

Upcoming event

Between Conferencing and Changing Nappies

A forum for open discussion organized by and for PhDs and Post-Docs with children (both genders welcome!!!)

You can choose between two locations/dates:
- September, 4th, 2-4 pm, in Mitte, main building of the Humboldt University: Room 2070A
- September, 11th, 2-4 pm in Adlershof, Erwin Schrödinger Centre: Room 1’308

We offer free child care and kindly ask you to register with us beforehand:
hgs-frauenbeauftragte@hu-berlin.de

Save the Date:
21.11.2017 - Panel discussion on “Reconciling Family and Career for Early Career Researchers”
Senatssaal, Main Building of the HU

Imprint

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„Wie die TK mich durchs Studium begleitet: Respekt!“

Katerina Mihova, TK-versichert seit 2009